

Attracting Private Solutions and Participation in the Power Sector in Sub-Saharan Africa

Findings from a Survey of Investors and Financiers

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Abstract

This paper develops a classification of investor risks and surveys 51 private investors and financiers in the power sector in Sub-Saharan Africa. The paper aims for a better understanding of what can be done to attract private solutions to fill the investment gap. It finds that the average investor assigns more weight to power sector policy and regulatory framework risks than to the wider sector and country context risks. And, despite many challenges, investors perceive three segments as ready for private solutions in Sub-Saharan Africa: power generation, off-grid electrification, and mini-grids. Investors see lower readiness in distribution, transmission, and retail. The paper finds

that the average investor is forward-looking, as neither the track record of the power sector nor the firm's personal track record is as important as the growth potential in the market. The paper uses the findings to reality-check data-based measures of regulatory readiness, namely the Regulatory Indicators for Sustainable Energy and Power Sector Reform Index and analyzes which elements correlate best with investor sentiment to optimize and streamline these indexes accordingly. The results provide important lessons for governments and development partners to devise appropriate de-risking instruments tailored to the risks that matter most to investors.

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Attracting Private Solutions and Participation in the Power Sector in Sub-Saharan Africa — Findings from a Survey of Investors and Financiers¹

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1. Introduction

Sub-Saharan Africa faces investment needs in the hundreds of billions to achieve affordable, reliable, sustainable, and modern energy for all by 2030. Fifty-seven percent of the population—around 600 million people—do not have access to electricity, and continuous power outages constrain the economic performance of those already connected to the grid (IEA, 2018; Blimpo and Cosgrove-Davies, 2019). Tax revenue and development finance are unlikely to be sufficient to close this investment gap, and rising concerns about debt distress in the developing world limit the scope to take on more public debt (Gaspar *et al.*, 2019).

It is widely understood that private solutions—defined here as private sector participation in service delivery or private financing—can contribute to filling the resulting investment gap, if appropriately structured to minimize sovereign obligations and contingent liabilities to governments (Eberhard *et al.*, 2016). For example, a well-established literature shows that privately-run utilities score higher on corporate governance² than public utilities, which in turn is correlated positively with service delivery (Foster and Rana, 2019). Apart from private service delivery, private finance also plays an important role in the power sector, often making use of different funding instruments that underpin the capital structure of power projects,³ including equity, debt and hybrid instruments (with both debt and equity) (IRENA, 2016).

What is less widely understood is what constitutes suitable conditions for attracting private solutions in the power sector, including the relative importance of different risk factors related to the policy and regulatory framework, the sector context, and the country context (Waissbein *et al.*, 2013). Yet, understanding the relative importance of these risk factors to private investors and financiers is critical to devise public instruments that can effectively and efficiently attract private sector solutions in the power sector.

Existing studies that investigate the factors that allow countries to attract private capital into their power sector commonly focus primarily on investors from industrialized countries, even though it is well documented in the literature that investors from developing and emerging economies have been playing an increasingly important role in providing finance and service delivery (see Table 1 for an overview of the literature). Furthermore, existing

² This could be partly, as Foster and Rana (2019; p.12) underscore, because “boards of private utilities enjoy almost complete decision-making autonomy, whereas those of public utilities have limited freedom on critical matters of finance and human resources—particularly with respect to raising capital and appointing the chief executive officer. Public utilities also suffer considerable interference in the appointment and removal of board members. Overall, public utilities tend to be less rigorous in staff hiring, with more limited use of standard good practices, such as advertising, shortlisting, interviewing, and checking of references.”

³ These often take the form of independent power producers, which are defined as: “power projects that are, in the main, privately developed, constructed, operated and owned; have a significant proportion of private finance; and have long-term power purchase agreements with a utility or another off-taker” (Eberhard *et al.*, 2017; p. 391). Yet, private finance also features prominently in publicly-owned companies, either through pure lending instruments or acquiring a stake in the public power project or company (e.g., public-private partnerships).

studies commonly do not distinguish between domestic⁴ and international investors when investigating the relative importance of risk factors. Yet, their risk preferences might differ due to the exposure and sensitivity to different risk classes. In terms of power sector segments, there is limited research investigating the differences between the different segments (generation, transmission, distribution, retail, off-grid, and mini-grid), even though there are likely differences between segments. With the increasing importance of index data to track power sector liberalization efforts, there is a growing need to ground-proof data and provide weighting of different factors (i.e., what is most important to actors in the power sector) (RISE, 2019). Lastly, there is a wide array of risk categories used across studies, increasing the need for a standardized risk assessment approach that can be easily replicated across different countries and regions.

This paper contributes to filling the existing gaps in the literature by first condensing the wide array of existing risk categories into a comprehensive and coherent framework. We then used this framework to survey 51 equity investors and lenders in the power sector in Sub-Saharan Africa between January and May 2019. We used a risk factor-based framework to structure the survey, which is described in detail in Section 3 (Waissein *et al.*, 2013). This framework distinguished 10 risk factors, grouped into three categories, to evaluate the attractiveness of investment environments in the power sector. The survey focused on three sets of questions: (1) How important are different risks when evaluating a new power sector investment? (2) How ready are different segments of the power sector for private solutions? (3) How are different countries in Sub-Saharan Africa perceived in terms of past investment experience and prospects for new investments?

This paper is organized as follows. After reviewing the existing literature in Section 2, in Section 3 we introduce the aforementioned framework, sample and survey methodology, and Section 4 presents the results. Section 6 then ‘reality-checks’ the existing, data based assessments of countries’ readiness for investment by comparing it to the results from the investor survey. Section 6 provides a summary and lessons for policy.

⁴ A further challenge is the definition of what constitutes a ‘domestic’ investor. For our purposes, we define domestic investors as those investors that are incorporated on the African continent.

2. Literature Review

2.1. What Are the Factors That Make a Sector Attractive for Private Solutions?

Existing studies emphasize several risk-factors that influence the provision of private sector solutions in the power sector. Table 1 provides an overview of the coverage, time frame, sector, methodological approach and main findings of the 16 reviewed studies, grouped by methodological choices (with each section presented in chronological order).

Most studies emphasize the importance of adequate **power sector policy and regulation**. For instance, Lamech and Saeed (2003) survey 48 international equity investors and find that the rule of law, a respect for the rights of investors, and a fair and transparent regulatory framework are the most important factors when investing in the power sector of a given country. High-level econometric studies point to similar factors. Banerjee, Oetzel and Ranganathan (2006) provide evidence from 40 developing economies in private participation in infrastructure that institutional quality and property rights are predictive of investment.

The literature also points out the importance of **the track record of the power sector** (such as past experience of the company, current size and growth prospects) and the wider **country-context**. For example, Singh (2007), investigating power sector policy and regulatory reforms in Argentina, Brazil, India, Mexico, China and Thailand, underscores that macro-economic stability played a key feature in the reform process and its ability to attract foreign investment. Similar findings emerge from studies on African countries, such as Ghana and Kenya (Pueyo, 2018).

This paper fills three gaps in the existing literature. First, relatively few studies focus on the peculiarities of countries at lower levels of income. Most existing studies that investigate the factors that allow countries to attract private capital into their power sector commonly focus on investors from industrialized countries, even though it is well documented in the literature that investors from developing and emerging economies are playing a greater role (Ettinger, Dellacha and Hahn, 2005). There is also hardly any research that distinguishes between domestic and international investors, even though their risk preferences might differ due to differing competitive advantages (i.e., domestic investors might be better placed to assess country risk). Second, there is little research investigating the differences between the different segments of the power sector, with most existing research focusing on power generation, even though there are likely differences between on-grid, off-grid and other segments. Third, with the increasing prominence of publicly available indices to track the power sector, there is a need to ground-proof the data and provide weighting of different factors (i.e., what is most important to actors in the power sector).

Table 1: Overview of Study, Coverage, Time, Sector, Methodological Approach and Main Findings of the Respective Studies

#	Study	Coverage	Time	Sector	Methodological approach	Main determinants of investment
1	Eberhard et al (2017)	Overview SSA and comparative evaluation of Kenya, Nigeria, South Africa, Tanzania, and Uganda	1994-2013	Power	Country case studies	<ul style="list-style-type: none"> ▪ Quality (not just existence) of independent regulator ▪ Adequate power sector expansion planning by an independent system administrator ▪ Risk mitigation against key risks (i.e., off-taker risk)
2	Singh (2007)	Comparative evaluation of policy and regulatory reforms in Argentina, Brazil, India, Mexico, China and Thailand.	1993-2003	Power	Country case studies	<ul style="list-style-type: none"> ▪ Macro-economic stability ▪ Pace and sequencing of reforms ▪ Independent regulator
3	Ahlborg and Hammar(2014)	National and international power sector actors in Tanzania and Mozambique	2011	Power	Country case study	<ul style="list-style-type: none"> ▪ Access to human capital ▪ Adequate planning ▪ Access to donor funding ▪ Low profitability deters greater private sector involvement
4	Pueyo (2018)	20 interviews with investors and other stakeholders in Kenya and Ghana	2015	Power	Country case studies	<p>Ghana</p> <ul style="list-style-type: none"> ▪ Off-taker risk ▪ Macroeconomic imbalances ▪ Quality of regulation ▪ Access to finance <p>Kenya</p> <ul style="list-style-type: none"> ▪ Power demand ▪ Quality of distribution and transmission infrastructure ▪ Social acceptance
6	Bhamidipati et al (2019)	31 interviews with government, private firms, and development actors	2017	Power	Country case study	<ul style="list-style-type: none"> ▪ Appropriate off-grid institutional framework ▪ New financing mechanisms (pay-as-you-go frameworks)

7	Banerjee, Oetzel and Ranganathan (2006)	40 developing economies across Latin America, Europe, Africa and Asia	1990-2000	Power, natural gas, telecommunications, transport, and water supply and sanitation	Econometrics (<i>Pooled OLS</i>)	<ul style="list-style-type: none"> Property rights Bureaucratic quality
8	Lüthi and Wüstenhagen (2012)	63 European photovoltaic developers investing in Europe and abroad	2008	Power	Econometrics (<i>Choice experiment</i>)	<ul style="list-style-type: none"> Duration of administrative process, Feed-in tariff level and price cap
9	Mengistu (2013)	PPI deals from 133 low- and middle-income countries	1995-2008	Power, telecommunications, water and sanitation	Econometrics (Cross-country panel)	<ul style="list-style-type: none"> Size of the service sector is most important predictor for PPI SSA countries with common law origins substantially more likely to get PPI (likely, due to more developed financial markets and property rights)
10	Lamech and Saeed (2003)	48 international equity investors from mainly industrialized countries investing in developing countries	2000-2003	Power	Survey	<ul style="list-style-type: none"> Overall regulatory quality (rule of law, respect for rights of investors and judicial processes free of political interference)
11	Noel and Brzeski (2005)	8 equity investors investing in Europe and Central Asia	2003-2004	Power, water and other local infrastructure (<i>not specified</i>)	Survey (<i>informal survey</i>)	<ul style="list-style-type: none"> Adequate cash flow Adequate contractual framework Policy risk Exit possibility for first-round equity investors
12	Akampurira, Root and Shakantu (2009)	28 responses (19 government entities, 9 private sector) in Uganda	2007	Power	Survey	<ul style="list-style-type: none"> Regulatory and legal framework Access to finance Swift approval process, Social acceptance
13	Bürer and Wüstenhagen (2009)	60 venture capital and private equity funds mainly from North America and Europe	2007	Power	Survey	<ul style="list-style-type: none"> Security of cash flow

14	Masini and Menichetti (2013)	93 European from various investor types (Venture Capitalists, Investment Funds etc.).	2009	Power	Survey	<ul style="list-style-type: none"> ▪ Technological risk
15	Kruger, Stritzke and Trotter (2019)	6 solar PV developers and investors in South Africa and Zambia	2017-2018	Power	Survey	<ul style="list-style-type: none"> ▪ Site-specific risks
16	Mahbub and Jongwanich (2019)	25 private companies conducting FDI in Bangladesh	2015-2016	Power	Survey	<ul style="list-style-type: none"> ▪ Regulatory quality

2.2. How Can Risk Factors Be Organized into Analytical Frameworks?

Several frameworks have been developed to synthesize various sources of investors' risk and their role in determining the attractiveness for private investment in the power sector. The risk frameworks analyzed in this study can be found in Table 2. The frameworks contain between 7-9 major risk categories, which in turn are divided into 13-27 underlying barriers.

Liebreich and Young (2005) use different stages of power project development to identify risks specific to the phase, ranging from planning to the eventual decommissioning of the project. This makes their framework particularly appropriate for project developers, but less applicable for wider power sector risks and actors not directly involved in developing projects (e.g., financiers). In turn, Waissbein et al. (2013) use different stakeholder groups, such as policy makers, end-users, and project developers to identify risks that are specific – and therefore, they argue, independent – to each of the stakeholder groups. This stands in contrast to other approaches, such as Akampurira, Root and Shakantu (2009) that feature overlapping and non-mutually exclusive risk categories. Yet, overlapping risk categories are particularly problematic if frameworks are used to survey participants, as strongly correlated risk categories undermine the frameworks' quantification process.

Table 2: Background, Composition, and Operationalization of Different Frameworks to Capture Investors' Risk

Framework background		Framework composition		Framework operationalization	
#	Source	Framework components	Specific risk categories	Survey method	Survey participants
1	Lamech and Saeed (2003) ⁵	9 major risk categories and 27 underlying barriers	<ol style="list-style-type: none"> 1. Government and legislative process 2. Economy 3. Sector's current status 4. Political economy 5. Investment process and support 6. Revenue factors 7. Operational factors 8. Regulatory factors 9. Government support and performance 	Rating (1-4)	48
2	Liebreich and Young (2005)	4 major risk categories and 14 underlying risks	<ol style="list-style-type: none"> 1. Planning and permitting 2. Construction 3. Operating 4. Decommissioning/Repowering 	NA ⁶	NA
3	Akampurira, Root and	23 underlying barriers	No specific aggregation of underlying barriers into risk categories	Rating (1-5)	28

⁵ First, firms were first asked to rank categories 1-5 in decision to invest in a developing country. Second, each firm was asked to rank categories 6-9 for best and worst investment experience. Each factor could be ranked from 1-4.

⁶ Merely conceptual article without empirical grounding.

	Shakantu (2009)				
4	Waissbein et al. (2013)	9 major risk categories and 20 underlying barriers	<ol style="list-style-type: none"> 1. Power market risk 2. Permit risk 3. Social acceptance risk 4. Resource and technology risk 5. Grid/transmission risk 6. Counterparty risk 7. Financial sector risk 8. Political risk 9. Currency macro-economic risk 	Rating (1-5)	35 ⁷
5	Gatzert and Kosub, (2016) ⁸	7 risk categories and 13 underlying barriers	<ol style="list-style-type: none"> 1. Strategic/business risk 2. Transport/construction/completion 3. Operation/maintenance 4. Liability/legal risks 5. Market/sales risk 6. Counterparty risk 7. Political, policy, regulatory risk 	NA	NA

In terms of the operationalization of the framework, some of the frameworks have been developed without directly using the structure of the framework to survey investors (denoted as NA in Table 2). For those frameworks that have been directly applied, all existing studies use rating methodologies, which allows the surveyed participants to rate each item from 1 to x (where x commonly is the highest possible ranking that can be given). Ranking survey methodologies stand in contrast to ranking methodologies, which presuppose an implicit order of importance between categories, which can be elicited. The average number of participants ranges from 28 – 48.

Section 3 combines relevant parts of the frameworks discussed above and develops a framework to evaluate different risk categories, while also containing non-overlapping categories that allow for a robust quantification of the framework.

⁷ The report by Waissbein et al. (2013) states that for the assessment of the risk environment 14 informal interviews and 21 structured interviews were conducted for four case studies used in the report to illustrate the framework.

⁸ Specific focus on risks in off-shore wind.

3. Framework to Evaluate Investment Environments in the Power Sector

We use a risk-based framework to approximate the factors that investors employ when making decisions. As many developing and emerging economies are constrained to take on more debt, and the financial situation of many utilities is troubling, understanding effective ways to mitigate risk is crucial (Waissbein *et al.*, 2013; Polzin *et al.*, 2019).

In order to arrive at a framework to survey the investors, we rely on a twofold strategy: top-down and bottom up. From the literature review in Section 2.1, we identify three main over-arching risk categories that are most commonly found in the literature. Through this top-down approach we settle on: 1) policy and regulatory framework, 2) power sector context risk, and 3) country-context risk. For the bottom-up approach, we collect all possible barriers to private sector investment and group them into 10 risk mutually exclusive and collectively exhaustive (MECE)⁹ risk factors. Then we allocate these 10 risk factors to three risk categories identified via the top-down approach.

⁹ We are of course aware that a completely MECE framework is difficult to achieve.

Figure 1: Framework of 10 Risk Factors, Grouped in Three Categories, to Capture the Attractiveness of Investment Environments

	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 factors	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 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

We therefore use a risk factor-based framework to structure the survey (Weissbein *et al.*, 2013). This framework distinguished 10 risk factors, grouped into three categories, to evaluate the attractiveness of investment environments in the power sector (Figure 1). First, policy and regulatory risk factors, including the ease of market entry and exit, the clarity of investment priorities, and the certainty of cash flows. Second, risk factors related to the wider sector context, including the sectoral track record of private solutions, sectoral growth (demand and supply), and the private investors' own track record in the sector. Third, country context risk factors that capture the wider governance and political environment, the macro-economic framework, general access to international finance, and the state of domestic banking and capital markets. The framework is shown in Figure 1.

The survey was issued to 70 entities that are active investors in the power sector of SSA. 51 surveys were completed by individuals at 48 of these entities, resulting in a response rate of 69%. It contains four sections: 1) Investor details: Participants provided contact details, their area of work within the power sector, and their favored segment of the supply chain. 2) Investor experience: Participants listed countries in which they have invested in the power sector, the segment of the supply chain they invested in, and their overall investment experience (positive, mixed, negative) in each case. 3) Investor perceptions: Participants rated the readiness of the regulatory arrangements of each segment of the supply chain in SSA and of countries in SSA (positive, mixed, negative). 4) Importance of risks to investors: For each risk category, participants ranked constraints according to how important they are when making an investment. They also ranked the three risk categories.

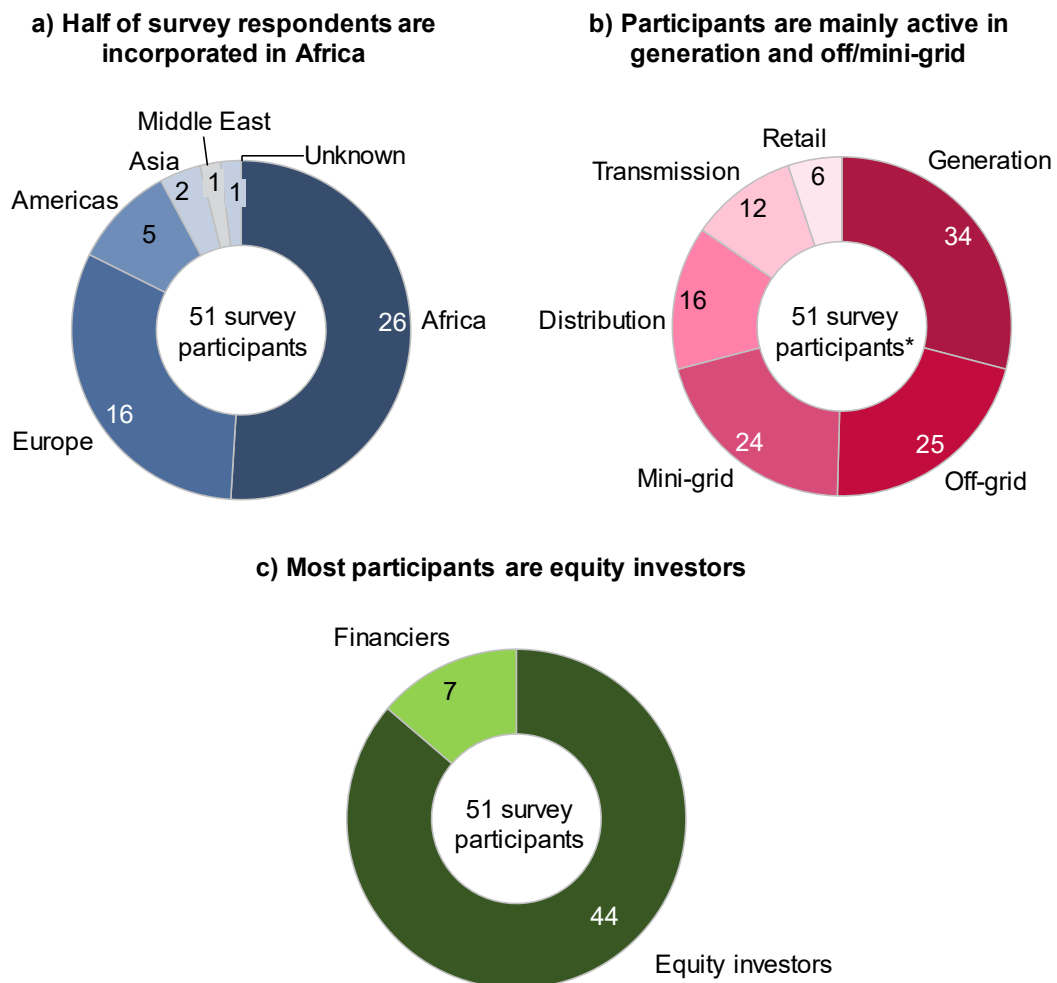
Aggregate data were collected from various public sources, including Aisenman et al's (2010), Kojima and Trimble's (2016) and the World Bank's *RISE* and *WDI* indicators. Data were also collected from internal World Bank documents. Using the survey data, we produce the following statistics on investors' priorities when making an investment decision: First: Overall risk category score (between 0-10) to answer the question whether – on the highest level of risk aggregation – policy and regulatory risk, power sector context risk, or country context risk is the most important risk category. Second: Risk factor scores – disaggregating the three risk categories into the 10 underlying risk factors – to further understand what drives the importance of risk category scores (e.g., whether the importance of the policy and regulatory environment to investors is driven by concerns around the ease of market entry, clarity of investment priorities or the certainty of cash flow). Third, risk constraints – on the lowest level of aggregation – which describe for each risk factor, the underlying investment constraints (e.g., are worries surrounding the certainty of cash flow driven by a lack of a government support mechanism or insufficient tariff-setting guidelines?). Hence, these three sets of statistics allow us to provide a high-level picture, while drilling into the driving factors behind each aggregate result.

Using the survey data, we produce the following statistics on investors' priorities when making an investment decision: 1) Constraint scores: Within each risk category of our framework, a score is allocated to each constraint for each survey participant (between 0 and 10, where 10 is the most important constraint to the investor). 2) Risk scores: Within each risk category, a score is allocated to each risk for each survey participant (between 0 and 10). 3) Risk-category scores: A score is allocated to each risk category for each survey participant (between 0 and 10). We then use the risk category score to weigh each risk and constraint score, as we assume that the relative importance of each risk and constraint score is determined by the overall importance of the specific risk category score.

The sample covered all segments of the power sector: power generation, transmission, distribution, off-grid and mini-grids and both international and local investors (see Figure 2). Half of the survey respondents are incorporated in Africa, which reflects the increasing importance of investors of developing and emerging economies in the power sector (Ettinger,

Dellacha and Hahn, 2005). The majority of surveyed investors are active in the generation and off/mini-grid sector, but around 25% were active in distribution, transmission and retail. As the majority of the literature has focused on equity investors (see Section 4), our research also includes debt providers. Yet, these constitute only 7 of 51 surveyed investors, as development finance institutions (DFIs)¹⁰ still provide a substantial part of financing for power projects in SSA (Eberhard *et al.*, 2017).

Figure 2: Overview of Characteristics of Participants



*Investors can be in multiple categories so total adds up to more than 51

In rating the readiness of each country and supply-chain segment, participants could choose which countries and segments to rate. The reasoning was that participants may be uninformed on the readiness of some countries or segments. While this ensures participants do not provide inaccurate data, there is a potential for selection bias. For example, participants might only provide their opinion for the most extreme cases. However, our

¹⁰ DFIs were not included in the survey as they are not fully commercial.

results indicate that the willingness of an investor to rate a country is not correlated with its perceived or experienced readiness.

4. Results

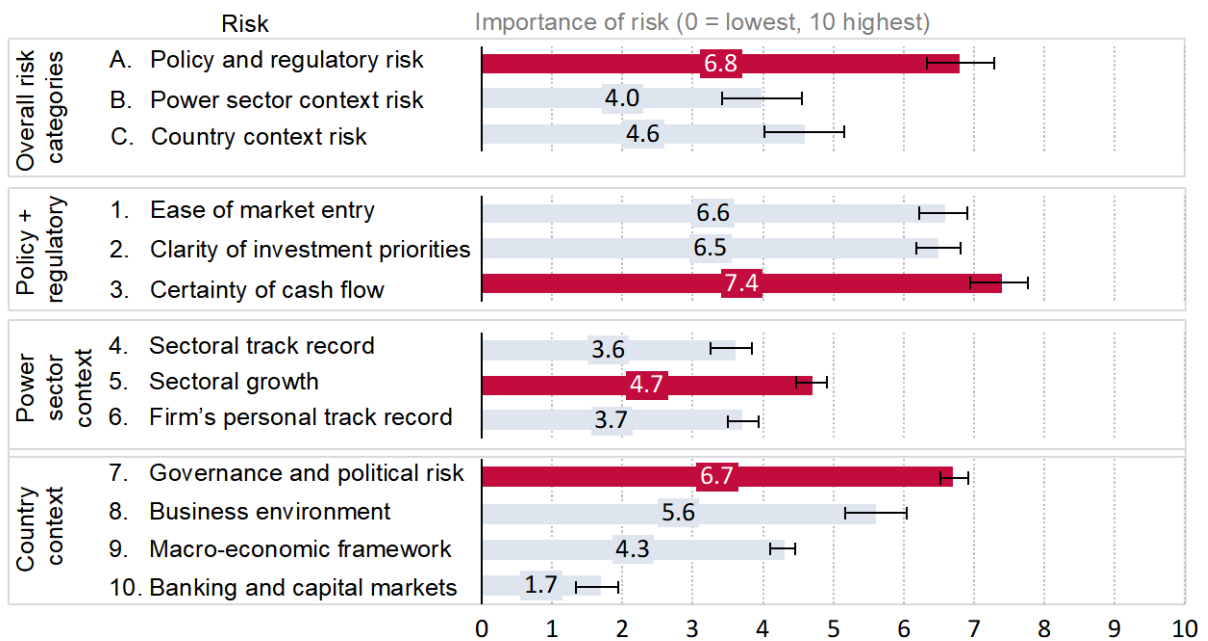
This section provides the main results from our investor survey. This section is structured along the three main research questions set out in the introduction. Section 4.1 therefore sets out the importance of different risk factors when evaluating power sector investments, whereas Section 4.2 gives an overview of the readiness of different segments of the power sector for private solutions. Section 4.3 then reviews the results in terms of the readiness of different countries.

4.1. Ranking of Risk Factors When Evaluating Power Sector Investments

Investors and financiers assign the greatest importance to policy and regulatory risks (average (avg.) 6.8), followed by country context risks (avg. 4.6) and risks related to the wider power sector context (avg. 4.0). Among power sector policy and regulatory risks, the certainty of cash flow (avg. 7.4) is the most important for investors, with ease of market entry (avg. 6.6) and clarity of investment priorities (avg. 6.5) following closely behind. In the category overall power sector context risks, investors see the sectoral growth potential as the most important (avg. 4.7), whereas neither the sectoral track record nor the investors' own track record are as important (avg. 3.6 and 3.7, respectively). In terms of country context risks, governance and political risks are the most critical for investors (avg. 6.7), followed by the general business environment (avg. 5.6), and the macro-economic framework (avg. 4.3). Risks related to domestic banking and capital markets are not considered important (avg. 1.7).

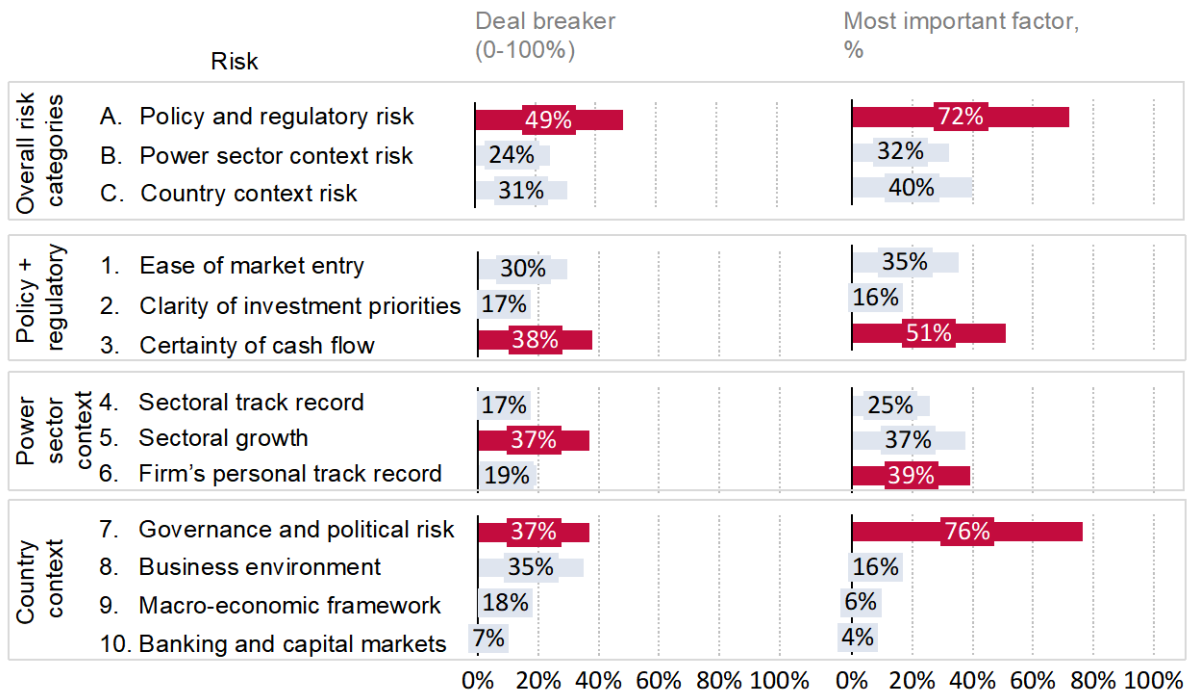
These results underscore that even in difficult country and sector contexts, policy makers have the power to attract private solutions, by putting in place policy and regulatory frameworks that make projects attractive for private solutions. By far the most important risk category score is the certainty of cash flow, which relates to the investors' ability to recover its costs and investment returns, enforce payment discipline of the off-taker or customer, and the kind of government and possibly multilateral support that is provided to secure investors' cash flows. Yet, governance and political risk also feature prominently for investors, likely because changes in that domain can have substantial consequences for the certainty of cash flow. Least importance to investors are domestic banking and capital markets, which suggest that investors largely rely on external sources of capital and there is still a long way to go for the development of local markets for infrastructure financing, which will certainly be needed as the market matures and scales up.

Figure 3: Average Importance of Risk Categories and Risk Scores across all 51 Surveyed Investors. Standard error as error bars.



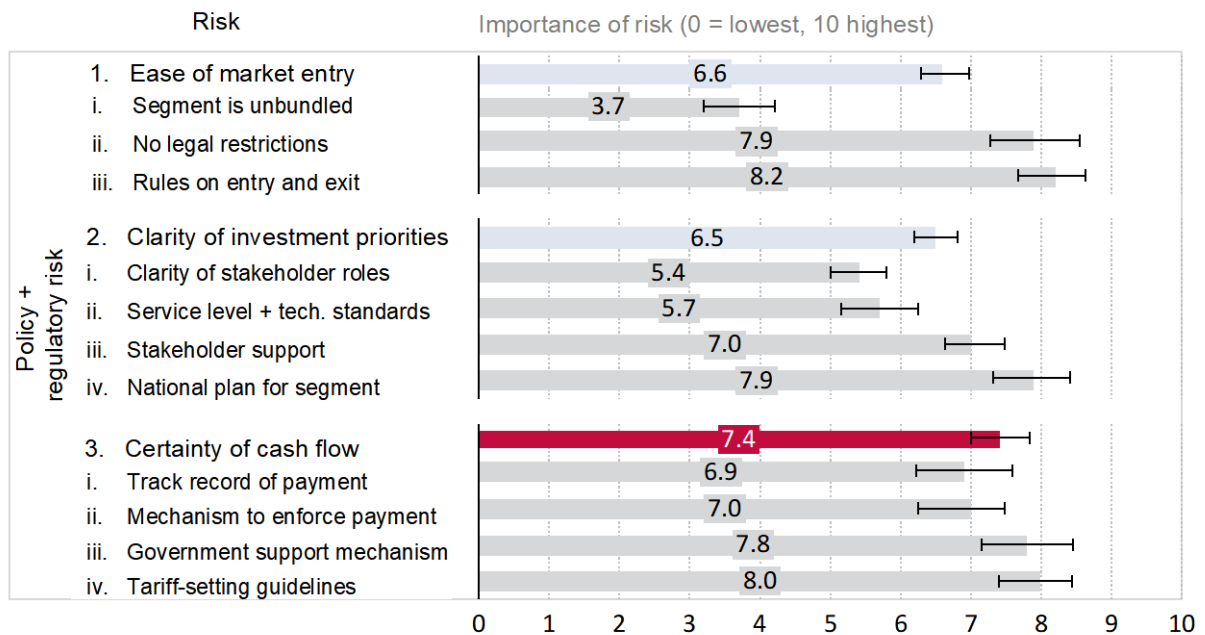
While Figure 3 provides evidence on the average risk assessment of surveyed investors, Figure 4 provides evidence on extreme cases – namely, which of the risk categories and risk category scores are considered deal breakers and which were the factors most often ranked as the ‘most important factor’. For both the ‘deal breaker’ and the ‘most important factor category’ those risks that received the highest average risk assessment were also commonly the most important deal breaker categories and most often named as the most important factor. Yet, it is important to note that while the business environment was ranked as the most important factor by only 16% of investors, 35% ranked it as a deal breaker, possibly because without access to international sources of financing a project will not materialize. In contrast, 39% of firms ranked the firm’s personal track record as the most important factor, but only 19% consider it a deal breaker. This might suggest that while firms prefer markets where they have a track record, 81% of surveyed participants would not consider it a deal breaker and therefore might consider venturing into new markets if fruitful opportunities arose.

Figure 4: Average importance of risk categories and risk scores across all 51 surveyed investors in terms of deal breaker and most important factor per category.



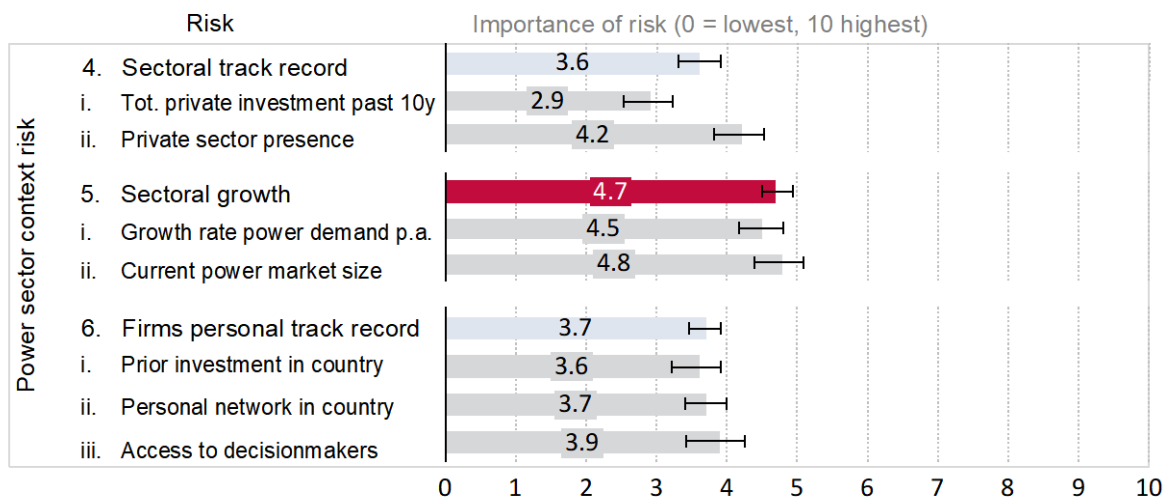
We further differentiate the risk categories and risk categories scores into the underlying constraints in Figure 5-7. We will discuss the risk categories by order of appearance in our Framework. **Policy and regulatory risk** is composed of three risk scores, namely ease of market entry (avg. 6.6), clarity of investment priorities (avg. 6.5) and certainty of cash flow (avg. 7.4). Further disaggregating in the underlying constraint scores shows that rules on entry and exit is the most important constraint score (avg. 8.2), followed by tariff setting guidelines (avg. 8.0) and national plan for the respective power sector segment the investor is interested in (avg. 7.9). The three major constraints are distributed evenly across the three risk scores, even though the risk categories have different aggregate scores. By far the least important factor is whether the segment of interest is unbundled. It appears that it is much more important whether the government has clear rules on entry and exit, a predictable plan for the expansion within the power sector segment and transparent rules on setting prices.

Figure 5: Average importance of policy and regulatory risk categories and risk scores across all 51 surveyed investors. Standard error as error bars.



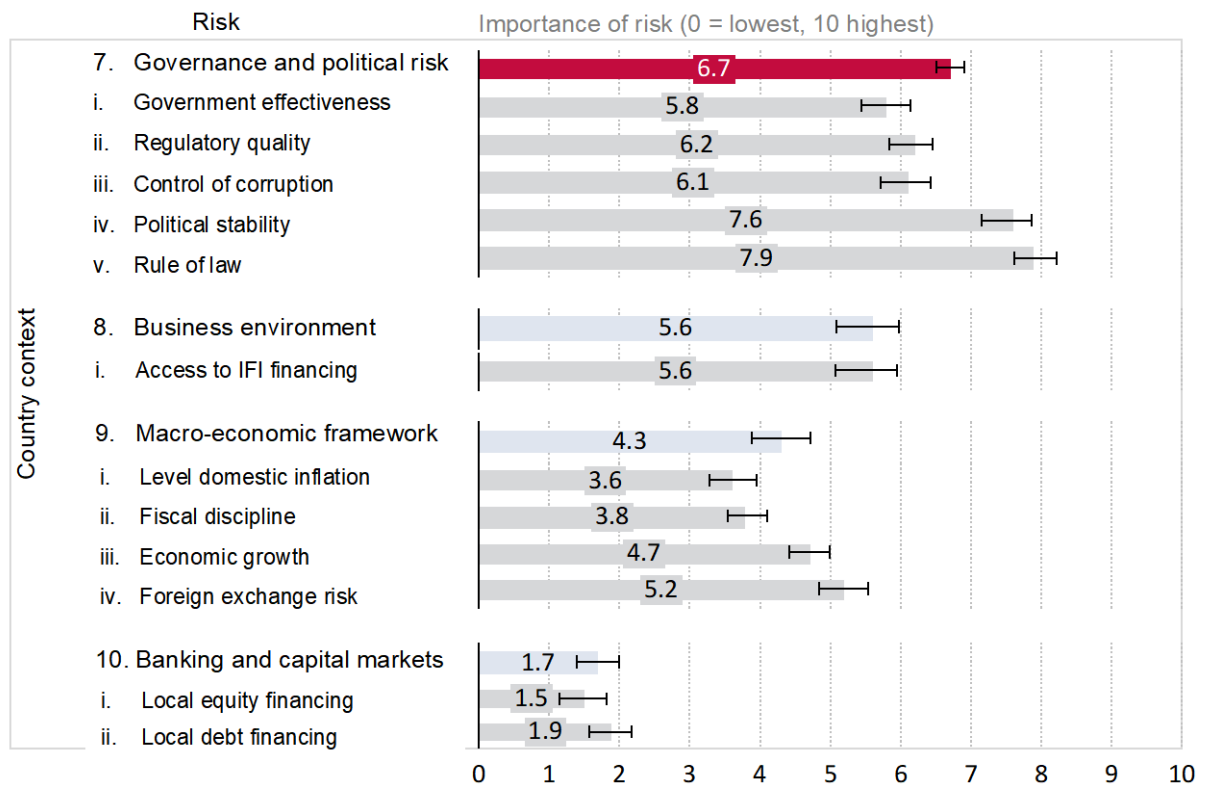
The least important overall risk category is power sector context risk (avg. 4.0), which is composed of the sectoral track record (avg. 3.6), sectoral growth (avg. 4.7) and the firm's personal track record (avg. 3.7) (Figure 6). Not surprisingly, the future growth potential of the sector is the most important risk score in this risk category, because it determines the potential future earnings potential. Yet, further disaggregating the risk scores into the respective constraints shows that private sector presence (avg. 4.2), access to decision makers (avg. 3.9) and the personal network in the country (avg. 3.7) are also important factors. Yet, all of these factors are less important than those determining the sectoral growth potential. These findings suggest that the average investor is forward-looking as neither the track record of the power sector nor the firm's personal track record are as important as the growth potential in the market.

Figure 6: Average importance of power sector context risk categories and risk scores across all 51 surveyed investors. Standard error as error bars.



The second most important overall risk category score is the country context (avg. 4.6). We further differentiate that overall risk category into governance and political risk (avg. 6.7), the business environment (avg. 5.6), the macro-economic framework (avg. 4.3), and banking and equity markets (avg. 1.7). Within the overall risk category, the three most important constraints are all concentrated in governance and political risk. Specifically, important to investors where the rule of law (avg. 7.9), political stability (avg. 7.6) and control of corruption (avg. 6.1). Level of domestic inflation appears not to be a major concern as many countries denominate the power purchase agreements in USD. Yet, this can pose a burden to the off-taker if the domestic currency depreciates relative to the USD increasing the cost to the off-taker, increasing the likelihood of default. This can, in turn, affect the certainty of cash flow, which is the most important overall risk score (avg. 7.4). The least important factor is domestic debt (avg. 1.9) and equity markets (avg. 1.5), probably because many investors rely on international financing institutions (avg. 5.6) for funds and equity.

Figure 7: Average importance of country context risk categories and risk scores across all 51 surveyed investors. Standard error as error bars.

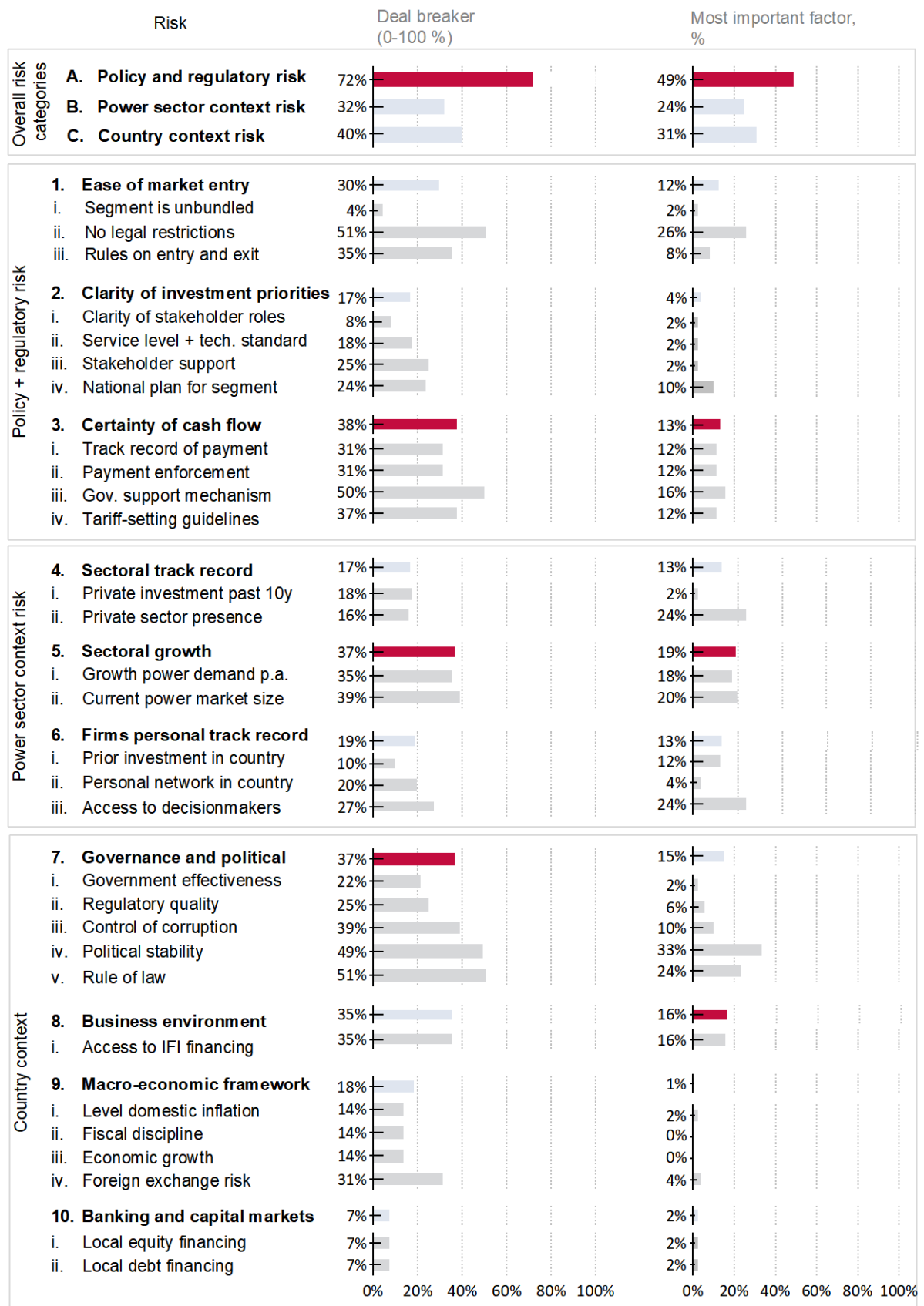


Disaggregating the average numbers in Figure 5-7 again to analyze extreme cases, namely deal breaker categories and the most important factors, Figure 8 provides an overview of the results. This shows that while the constraint rules on entry and exit received the highest aggregate score (avg. 8.2), only 8% of investors considered it the most important category and only 35% a deal breaker. In contrast, ‘no legal restrictions’ received a lower aggregate score (avg. 7.9), 51% of investors considered it a deal breaker and 26% the most important category – both scores the highest in the risk category ‘policy and regulatory risk’. A similar picture emerges for the risk category score certainty of cash flow. While tariff-setting guidelines received the highest average score in this category (avg. 8.0), only 37% ranked it as a deal breaker and 12% as the most important category. In contrast, a government support mechanism to recover cost or cover tariff shortfall received a lower average score (avg. 7.8), but 50% of investors considered it a deal breaker and 16% as the most important constraint. Another interesting fact is that while surveyed participants did not consider access to decision makers particularly important, yet access to decision makers actually ranks relatively high as a deal breaker (which is not necessarily a good sign for governance).

These findings indicate that the risk factors can be put into three categories – analogous to findings from psychology¹¹ – which are: ‘hygiene factors’ that investors require to consider a market place – such as no legal restrictions on private sector involvement in the power sector – but once in place, the attention of investors shift to other risk factors such as certainty of cash flow. The latter category is ‘motivating factors’, which propel investors to actually enter a marketplace. There are other risk factors for the surveyed investors – that might be considered ‘non-factors’ in the current market set-up – such as domestic debt and equity markets, which only 7% of investors consider to be a deal breaker (the second lowest scores, only after segment is unbundled, which 4% of investors consider a deal breaker) and only 2% ranked as the most important factor (likely those that do not have international sources of financing).

¹¹ Herzberg’s motivation-hygiene theory proposes that there are certain factors in the workplace, which cause satisfaction (so-called ‘motivators’) and those that cause dissatisfaction (so-called ‘hygiene’ factors). While hygiene factors need to be in place, they are not sufficient by itself.

Figure 8: Risk categories, risk category scores and constraint scores across all 51 surveyed investors for the categories: deal breaker and most important factor.



Yet, as noted in the literature review, it is important to further disaggregate risk preference by investor types as the exposure and sensitivity towards different risks may vary between investor types (Figure 9). We distinguish lenders and sponsors, off-grid and grid investors, as well as domestic and international investors. Investigating the importance of risk across investor classes, we see that for all investors (apart from on-grid) policy and regulatory risk is the most important risk category. For on-grid investors, in turn, power sector context risk is the most important risk category, potentially because the future expansion of the power sector determines to a large extent the investment opportunities that arise and retroactive changes to expansion these plans may pose a substantial risk. For instance, the recent change in the South African Integrated Resource Plan – the central policy document determining the future expansion of generation capacity – shifted much of the envisaged power generation expansion from 2020-2025 to 2025-2030, which creates a five-year delay for many investors.

Figure 9: Risk categories, risk category scores and constraint scores for different investor classes

Importance of risk (0 = lowest, 10 highest)

Risk		Lender	Sponsor	On-Grid	Off-Grid	Domestic	Internat.
Overall risk categories	A. Policy and regulatory risk	6.5	6.6	5.6*	7.5	7.5	6.2
	B. Power sector context risk	5.0	3.6	6.2***	2.8	4.0	4.0
	C. Country context risk	4.0	5.3	4.1	4.8	3.8	5.4
Policy + regulatory	1. Ease of market entry	6.0	6.5	6.0	7.1	7.0	6.2
	2. Clarity of investment priorities	4.6**	6.4	5.1**	7.8	7.3	5.7
	3. Certainty of cash flow	8.9*	6.9	5.7	7.5	8.3	6.7
Power sect. context	4. Sectoral track record	6.0	2.9	4.9	2.7	3.9	3.2
	5. Sectoral growth	4.6	4.2	7.3	3.2	4.6	4.8
	6. Firm's personal track record	8.9	3.7	6.3	2.5	3.6	4.0
Country context	7. Governance and political risk	7.4**	7.1	5.5	7.5	5.7	7.7
	8. Business environment	3.9	6.8	5.7***	5.3	4.2	7.0
	9. Macro-economic framework	3.5**	5.2	4.1	4.6	3.7	5.1
	10. Banking and capital markets	1.2	2.1	1.2	2.0	1.6	1.8

Statistical significance of difference in means between two groups calculated using a two-tailed t-test: ***p < 0.01, **p < 0.05, *p < 0.1. Comparison between lenders and sponsors, off-grid and on-grid, and domestic vs. international. For the sake of readability, the stars are only shown for one of the groups, although the star show the result of the test whether the difference in means between two groups (e.g., the importance of the power sector context risk between on-grid and off-grid) is statistically different.

In order to further delve into differences between international and domestic investors, we analyze to what extent international vs. domestic¹² lenders, sponsors, on-grid and off-grid investors have different risk presences. We find that overall domestic lenders attribute much

¹² We consider investors 'domestic' if the company has been incorporated on the African continent. The majority of domestic companies surveyed are not subsidiaries of European, US or Chinese firms, but were founded in an African country.

more importance to policy and regulatory risk than international lenders. The latter investor category is more concerned about the power-sector context risk and the country-context risk. It should be noted, however, that only two respondents fall into the international lender category,¹³ so the results should be considered with care. Domestic sponsors show largely the same risk preferences, although international sponsors also attribute more importance to the country risk, possibly because they are at a disadvantage to domestic investors in terms of local expertise. On-grid investors do not differ substantially between domestic and international lenders, possibly because the on-grid sector is tightly regulated and requires careful planning. For international off-grid investors, the country context is also substantially more important than domestic off-grid investors, possibly because government policy (e.g., expansion of the grid) has a substantial influence on the business model – and as for the other international investors – off-grid international investors might lack country-specific knowledge. Hence, it appears while overall the policy and regulatory risk category was most salient for the average investor, for international investors the power-sector context and the country-context play an important role. Yet, please note the statistical significance associated with the differences in group means, which are most pronounced between off-grid and on-grid investors.

Figure 10: Differences in risk preferences between domestic and international lenders, sponsors, on-grid investors, and off-grid investors

Overall risk categories	Risk	Lender		Sponsor		On-Grid		Off-Grid	
		Dom.	Int.	Dom.	Int.	Dom.	Int.	Dom.	Int.
A.	Policy and regulatory risk	7.5	2.5	7.1	6.3	5.0	5.8	8.2	6.5
B.	Power sector context risk	4.4	7.5	3.8	3.5	6.0	6.3	3.4	1.9
C.	Country context risk	3.8	5.0	4.2	6.0	4.0	4.2	3.7	6.5

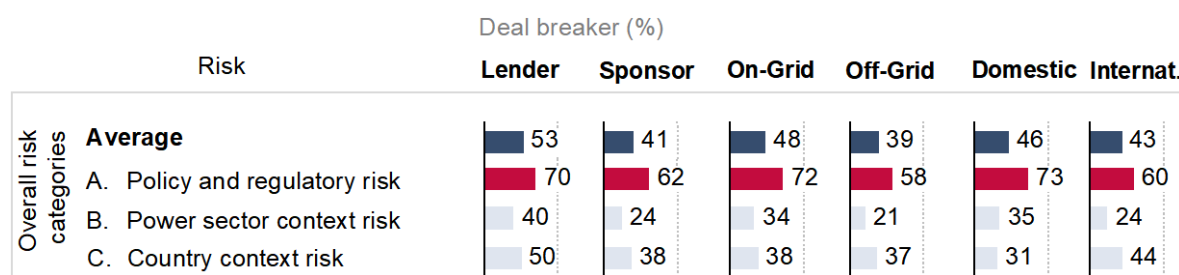
In the policy and regulatory risk category, certainty of cash flow is the most important risk score for lenders, sponsors, domestic and international investors. Yet, for on-grid the ease of market entry is most important, whereas for off-grid investors the clarity of investment priorities. For on-grid investors the entry into power markets in SSA, often dominated by a vertically-integrated utility, is often a challenge. For instance, in South Africa delays to interconnection done by the utility substantially dampened investors’ confidence. For off-grid investors, waning support to off-grid programs in Tanzania can be seen as a reason that the clarity of investment priorities is most pronounced.

In terms of power context risk, for all investors (apart from lenders), sectoral growth is the most important category. In turn, for lenders, their firms’ personal track record in the country is the most important factor, potentially due to the importance of accurately performing a due diligence, which may rely substantially on their own experience in a given country.

¹³ Please note that we refer to ‘lenders’ as debt providers and not equity providers.

In terms of country context risk, the governance and political risk is most prominent across investor classes. Yet, for on-grid investors the business environment – and particularly access to international finance institutions – is the most important risk category, potentially because raising sufficiently large amounts of capital for on-grid generation plants is an important determinant in the financial viability of investment projects, whereas the capital intensity of off-grid projects is lower. Generally, lenders report the highest proportion of deal breaker categories (around 53%), whereas off-grid investors the lowest (39%). While lenders are the first in line to recoup their investment in terms of default, they also commonly provide around 70-80% of the capital needed for projects to materialize.¹⁴ Off-grid investors may have a higher tolerance for risk, because they often operate in remote areas, with less predictable future cash flow. The most important risk category – in terms of the proportion of investors considering it a ‘deal breaker’ – remains policy and regulatory risk. The country context risk is the most important deal breaker category after policy and regulatory risk for all investor classes, apart from domestic investors. For domestic investors power sector context risk is more important than country context risk, possibly due to a more substantive domestic network and more detailed knowledge of domestic risks.

Figure 11: Deal breaker by investor class



4.2. Readiness of Different Countries and Segments

We used two ways to evaluate the readiness of power sector in Sub-Saharan Africa for private solutions: We asked investors to rate their past investment experience in different segments of the power sector (Figure 12a) as well as their perception of prospective investment readiness in the next three years (Figure 12b).

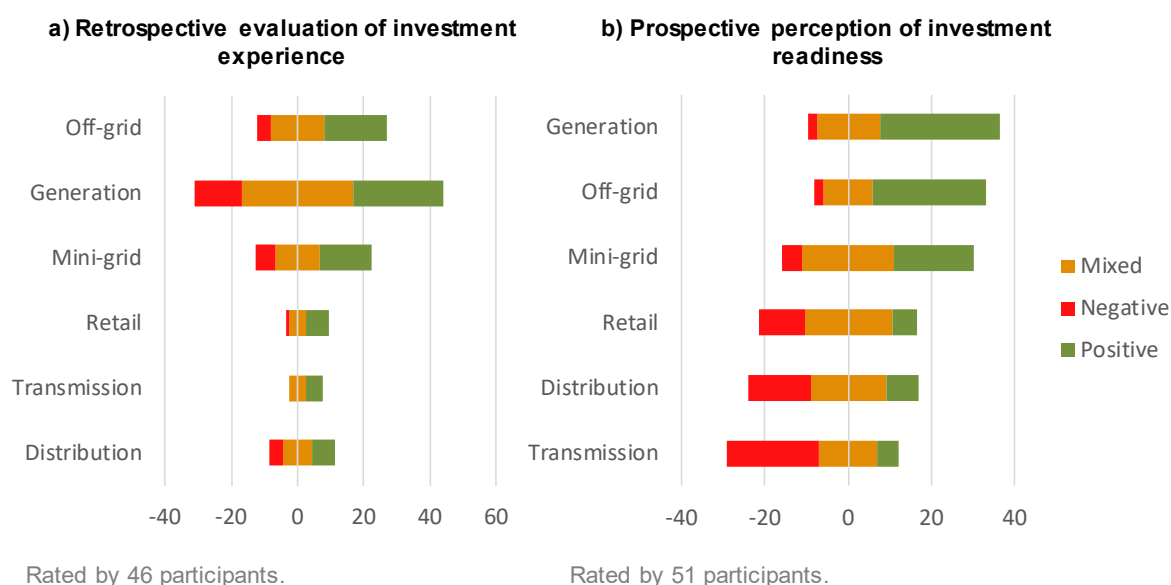
The survey results suggest that, on average, investors’ and financiers’ experience in the power sector in Sub-Saharan Africa has been relatively positive. When asked to evaluate prior investments, 42 percent of equity investors and financiers evaluate their investment experiences in the power sector in Sub-Saharan Africa as positive, compared to 15 percent who report negative experiences (43 percent reported ‘mixed’ experience; Figure 12a). Most respondents indicate past investment experience in the off-grid, mini-grid and generation

¹⁴ For smaller projects – such as mini-grids – equity commonly plays a more important role.

segments, while only few report experiences in transmission, distribution, or retail supply, but there is no substantial difference in the evaluation of the different segments (Figure 12a). In fact, the highest share of positive assessments of past experiences are recorded in distribution and retail supply (54 percent positive), transmission (50 percent), and off-grid (49 percent). However, it should be underscored that survey responses for distribution and retail supply and transmission are limited as only few investors have experience in these sectors (Figure 12a), likely due to their low perceived readiness (Figure 12b).

Looking forward, the survey suggests that the ‘readiness’ for private sector solution in the power sector differs substantially between power sector segments. Grid generation, off-grid, and mini-grids are rated more ‘ready’ than retail supply, distribution and transmission (see Figure 9b). It should be noted that the positive prospective perception may partly be driven by the retrospective evaluation of the investment, and it is therefore likely biased upwards (except for transmission and distribution).

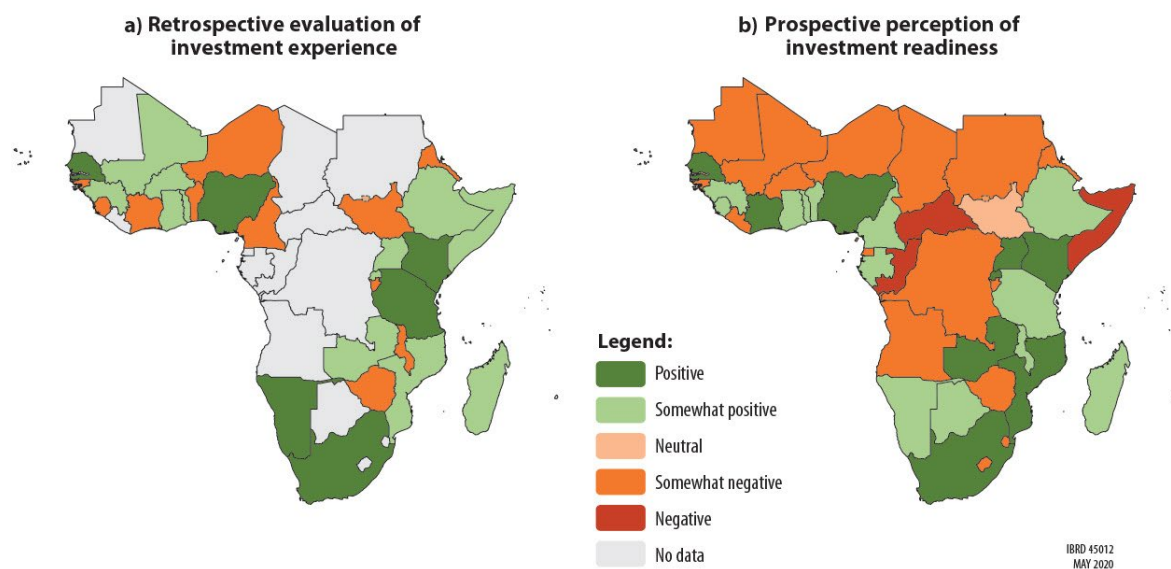
Figure 12: Readiness for Investment of Different Power Sector Segments in Sub-Saharan Africa in terms of a) retrospective evaluation of investment experience, and b) prospective perception of investment readiness



Yet, the assessment can further be refined: Over the last decade, several countries in Sub-Saharan Africa have attracted substantial private investments in their power sector. We asked investors to evaluate their experiences in countries they have invested in. Respondents report ‘positive’ or ‘very positive’ experiences in six countries: Kenya, Namibia, Nigeria, Senegal, South Africa, and Tanzania (Figure 13a). In the power-sector policy and regulatory framework, investors called for better de-facto regulatory independence (e.g. end arbitrary regulatory decisions in Sierra Leone), improvements to government support mechanisms and payment enforcement mechanisms (e.g. in Zambia and Tanzania), and improvements to entry and exit (e.g. speed up the regulatory process in Kenya and South Africa, improve license

terms in Nigeria, ensure mini-grid licenses available in Ethiopia, and prevent improper termination of contracts and licenses in Tanzania).

Figure 13: Retrospective Investment Experience and Prospective Readiness in Sub-Saharan Africa

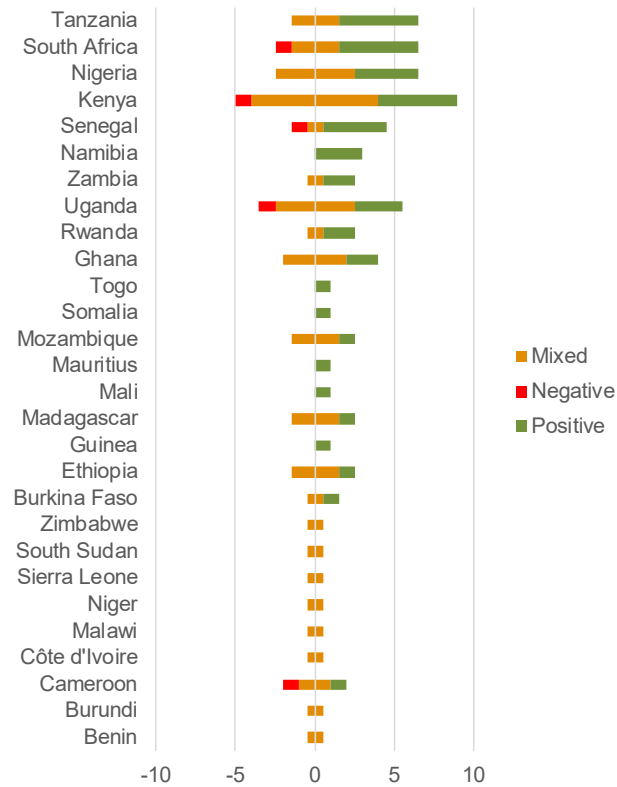


Many of the surveyed equity investors and financiers plan to invest in the region in the next three years. When asked about the most attractive markets for investments over a three-year time horizon, respondents ranked nine countries as ‘positive’ on average: Côte d’Ivoire, Kenya, Mozambique, Nigeria, Rwanda, Senegal, South Africa, Uganda, and Zambia¹⁵ (Figure 12b and 14b). Most of these countries have seen substantial power sector reform efforts, often over a decade or more, to provide adequate policy and regulatory frameworks for investment. Yet, many others have compensated for insufficient progress on power sector reforms by efforts to ‘ring-fence’ individual investments from the wider power sector policy and regulatory framework, for example through sovereign guarantees and external credit enhancement from international financial institutions—e.g., recently in the cases of Mozambique or Zambia (such guarantees and credit enhancement can mitigate risks during periods of policy and regulatory transition, but should not be seen as replacement for reforms). Figure 14 provides an overview of the retrospective and prospective readiness for each country in SSA.

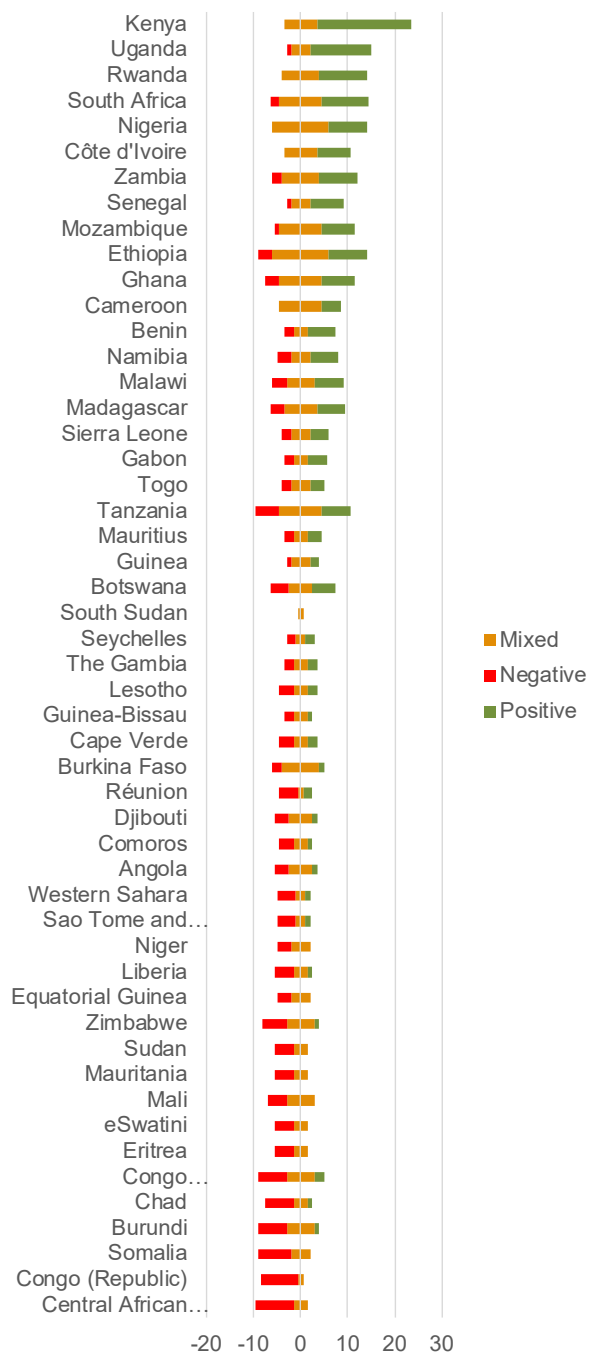
¹⁵ Please note that as the survey was conducted between January and May 2019, it does not include recent changes in these countries, which may have substantially improved or deteriorated the investment conditions.

Figure 14: Retrospective Investment Experience and Prospective Readiness in Sub-Saharan Africa

a) Retrospective evaluation of investment experience



b) Prospective perception of investment readiness



5. How Well Do Survey Results Correspond to Data-Based Assessments?

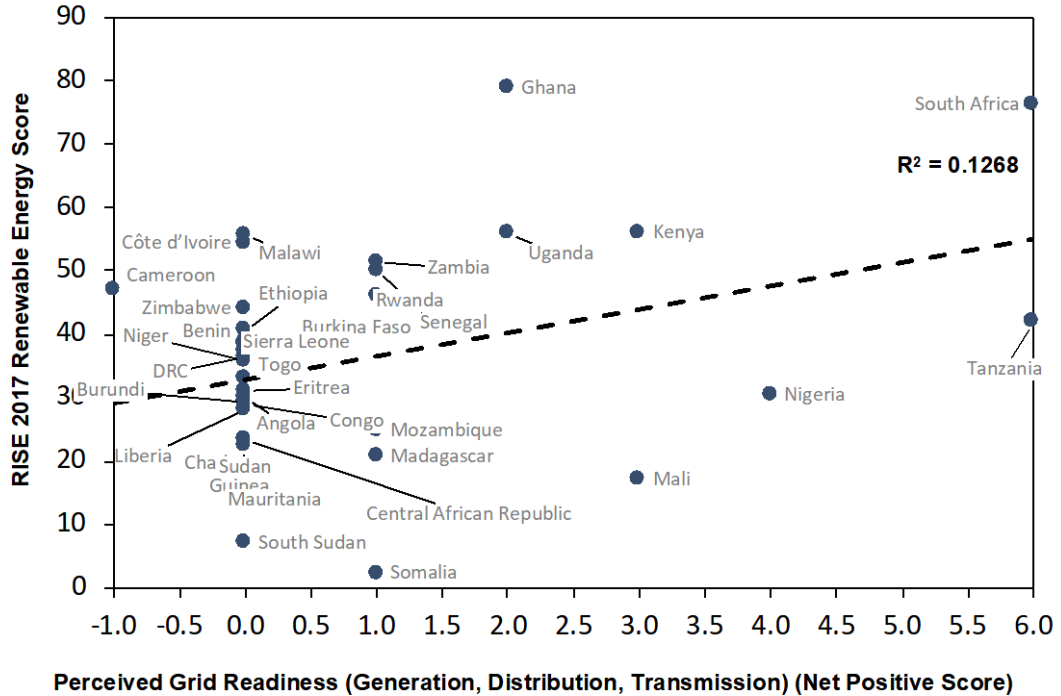
Besides understanding investors' and financiers' risk perception, a second motivation for the survey was to 'reality-check' existing, data-based assessments of countries' readiness for investment. Figure 13a below shows that survey respondents' perception of countries' readiness correlates very well with Regulatory Indicators for Sustainable Energy¹⁶ (RISE) 2017 scores (R^2 of 0.47 for a sample of 35 countries). Ghana, South Africa, and Zimbabwe score much better on the RISE index than their perception is by investors, while the opposite is true for Madagascar, Mozambique, and Nigeria. But these are outliers, and overall, the strong correlation suggests that the RISE framework corresponds well with the private sector's priorities. The Power Sector Reform Index (PSRI) also shows a substantial correlation with the survey data, albeit the correlation is slightly lower (R^2 of 0.37 for a sample of 35 countries). It should be noted that RISE is intended to be a normative index of investment readiness, whereas the PSRI is a descriptive index that shows the extent to which the 1990s reform model has been adopted within a jurisdiction. Hence, it is therefore not surprising that overall, the RISE index shows a higher correlation with our survey results.

¹⁶ The Regulatory Indicators for Sustainable Energy (RISE) index measures countries' regulatory readiness for Sustainable Energy across three different domains: 1) Renewable Energy, 2) Energy Efficiency, and 3) Energy Access. We therefore disaggregate the RISE index to more closely correlate it with the sub-components that are relevant to our survey data.

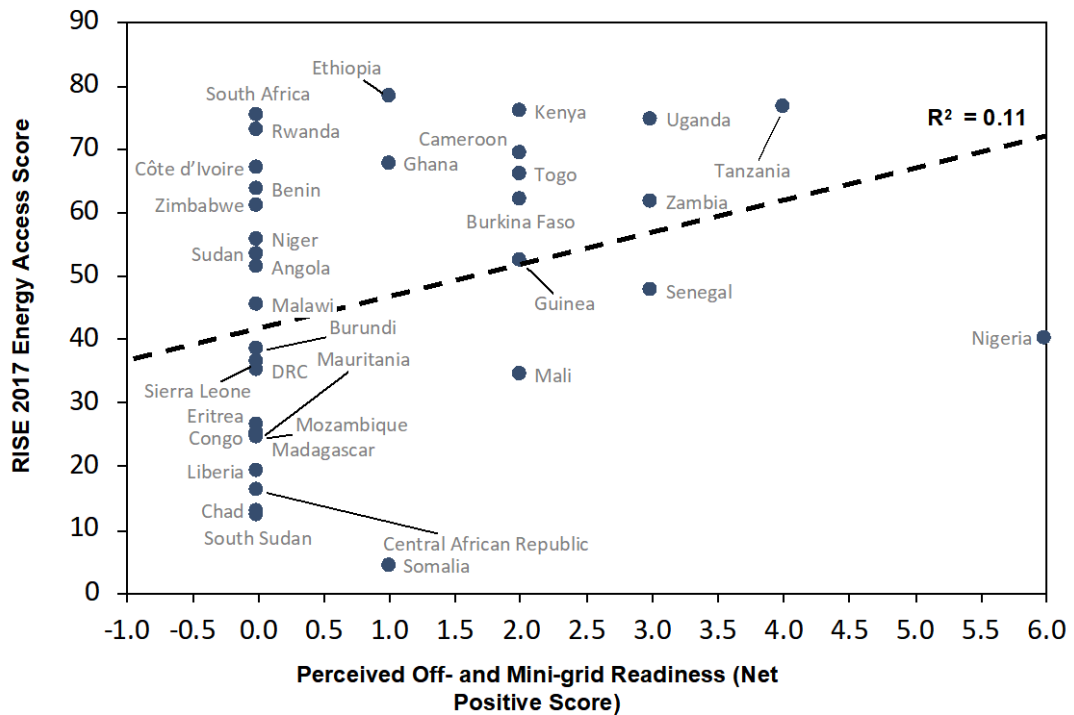
The RISE data can further be disaggregated into renewable energy (mostly on-grid) and energy access. We therefore correlate these two measures with investors that are active in the respective aforementioned sector. It should be mentioned that for some countries there are few data points, which reduces the overall correlation coefficient. Figure 16a shows that there is a positive correlation between the assessment of the grid investors and the RISE renewable energy data (R^2 of 0.13 for a sample of 35 countries). For countries with data points the assessment of the investor is spread around the trend line on both sides in equal fashion, indicating that overall, the index is correlated well the investors' perception. The off-grid RISE data tend to be more positive about countries than the investors' perception (as many countries are above the trend line) and also exhibit slightly lower correlation (R^2 of 0.11 for a sample of 35 countries).

Figure 16: Correlation of the a) RISE 2017 Renewable Energy and Perceived Readiness of Grid Investors from Survey Data, and b) Correlation of Power Sector Reform Index and Perceived Readiness from Survey Data

a) Correlation of RISE Renewable Energy and Perceived Grid Readiness from Survey Data



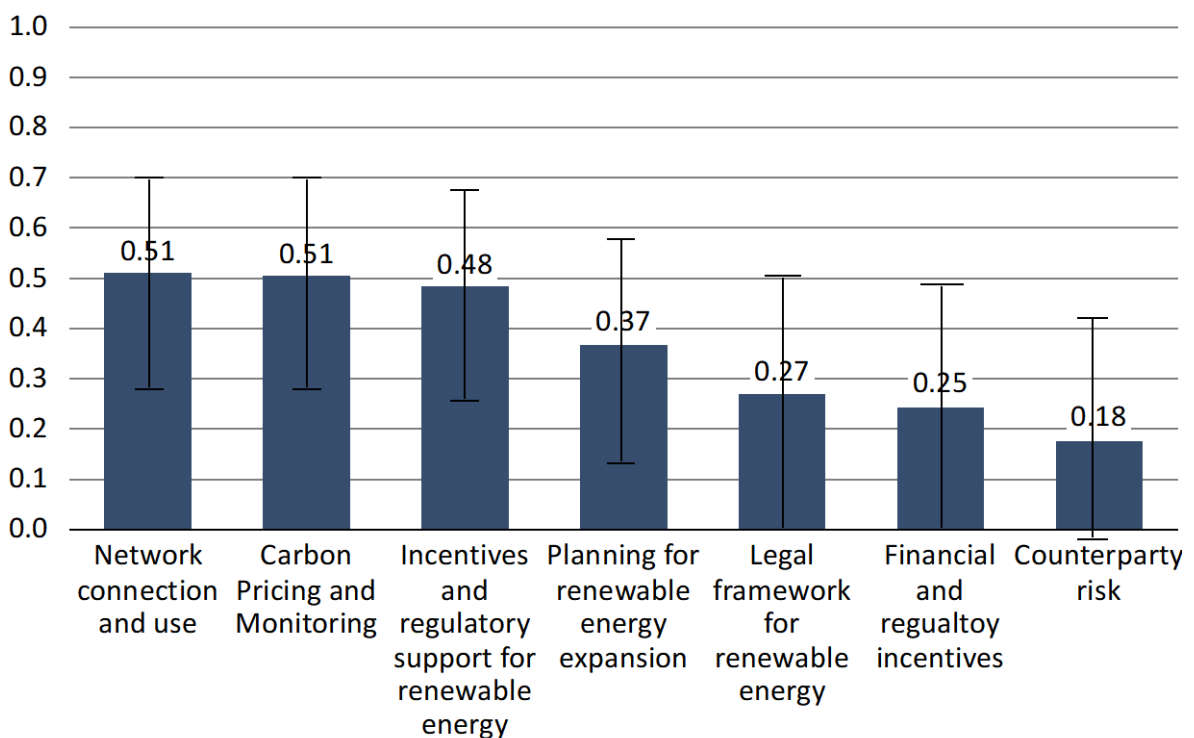
b) Correlation of RISE Off-Grid and Perceived Off-Grid Readiness from Survey Data



In order to provide inputs on fine-tuning the existing indices, we analyze which parts of the respective index – RISE and PSRI – is best correlated with investor sentiment. Further disaggregating the RISE scores in Figure 17 and 18 into its grid and off-grid components shows that they also correlate well with the assessment of the respective investor classes. Particularly the following components of the index show a high correlation with the subjective experience: For grid-connected renewable energy particularly clear network connection procedures, carbon pricing and regulatory support for renewable energy are well correlated with the perception of investors (correlation coefficient of 0.48-0.51, where 1 indicates perfect correlation). For off-grid investors the following three indicators are best correlated with the subjective experience of investors: existence of an electrification plan, consumer affordability of electricity, and the existence of a framework for stand-alone systems (correlation coefficient of 0.36-0.43).

Figure 17: Correlation of perceived grid readiness with RISE 2017 renewable energy indicators

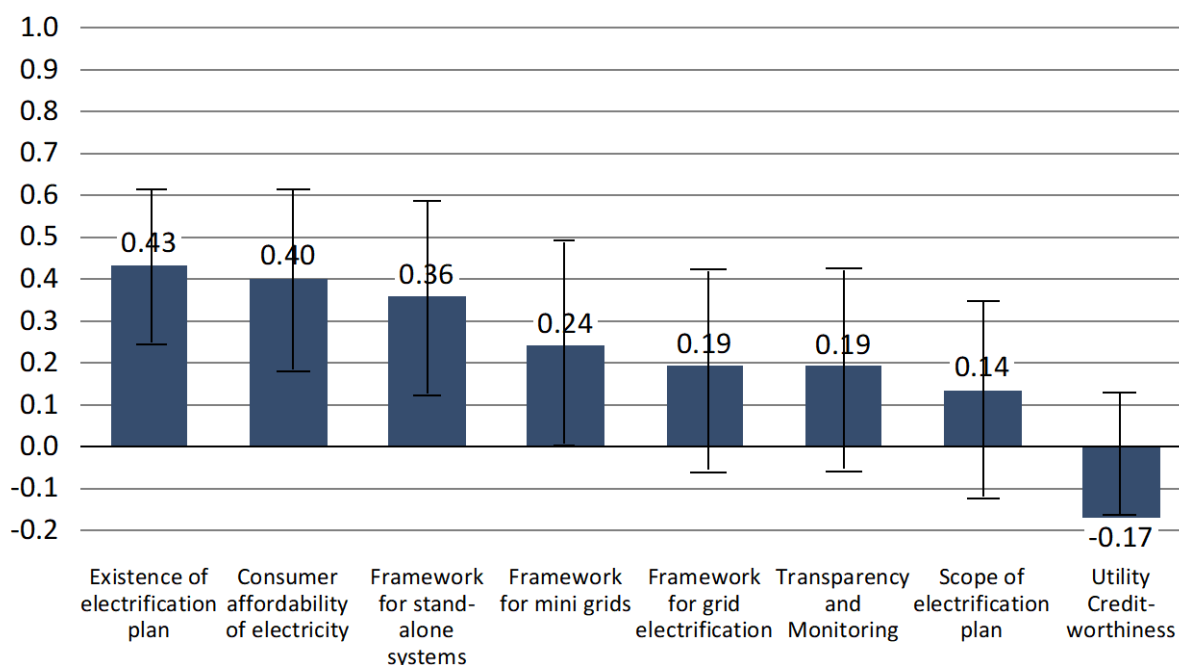
Correlation of perceived grid readiness* with RISE 2017 renewable energy indicators, Correlation coefficient (where -1 is perfectly inversely correlated and 1 perfectly correlated)



*Note: Grid readiness summarises the investors' assessment of all grid-related investments, which include grid-connected generation assets, and investments in the distribution and generation network (n = 51). 95% confidence interval calculated using Fisher transformation.

Figure 18: Correlation of perceived off-grid readiness with RISE 2017 renewable energy access indicators

Correlation of perceived off-grid readiness* with RISE 2017 energy access indicators, Correlation coefficient (where -1 is perfectly inversely correlated and 1 perfectly correlated)

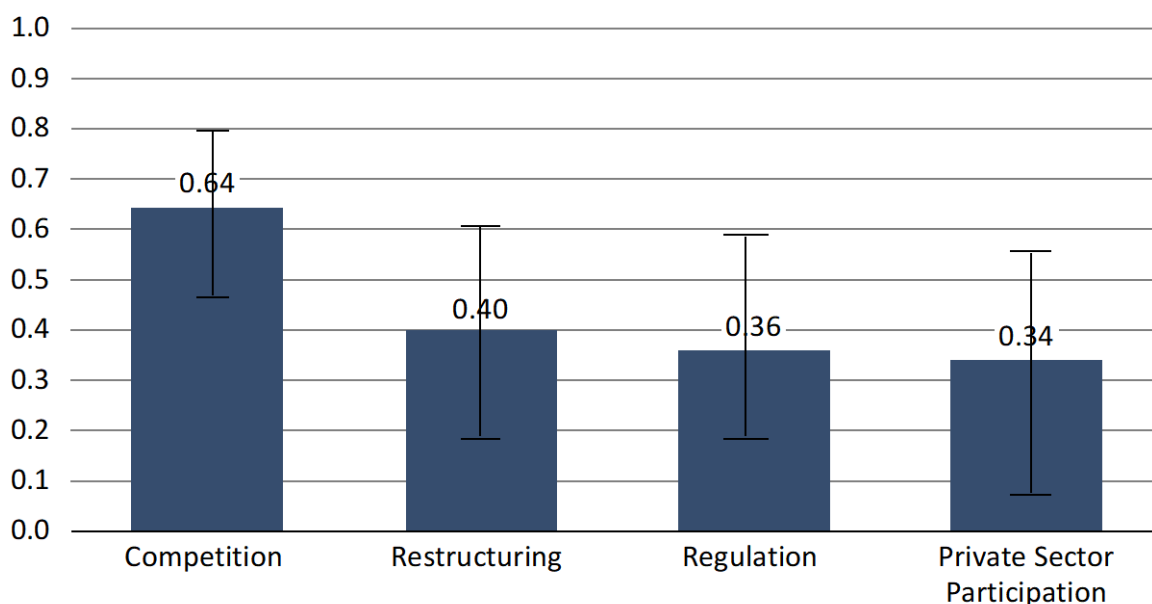


*Note: Off-grid readiness summarises the investors' assessment of all off-grid related investments (n = 51). 95% confidence interval calculated using Fisher transformation.

The PSRI shows that particularly the competition index is well correlated with the perceived readiness of investors (correlation coefficient of 0.64), whereas all other components are less strongly correlated (e.g., regulation, restructuring, and private sector participation). It should be noted that the strong correlation with the PSRI competition component may be partly spurious, because the competition index records whether IPPs are allowed by governments, which likely correlates with the positive assessment of IPPs of the readiness of certain countries. Yet, it should be noted that the perceived overall readiness score goes far beyond whether IPPs are allowed and – as described in detail in Section 3 – includes other regulatory, power-sector and country-context factors.

Figure 19: Correlation of perceived overall readiness with Power Sector Reform Index 2017

Correlation of perceived overall readiness* with Power Sector Reform Index 2017, Correlation coefficient (where -1 is perfectly inversely correlated and 1 perfectly correlated)



*Note: Overall readiness summarises the investors' assessment of all off-grid and grid-related investments (n = 51). 95% confidence interval calculated using Fisher transformation.

6. Conclusion

Sub-Saharan Africa faces investment needs in the hundreds of billions to achieve affordable, reliable, sustainable, and modern energy for all by 2030. It is clear that government debt, tax revenue and development finance are unlikely to be sufficient to close this investment gap, and rising concerns about debt distress in the developing world limit the scope to take on more public debt (Gaspar et al., 2019). Hence, private solutions can contribute to filling the resulting investment gap. However, the risk return profile of many countries in Sub-Saharan Africa limits the attractiveness to potential private investors. This paper therefore first developed a framework to adequately conceptualize different risks and then surveyed 51 private investors and financiers in the power sector in Sub-Saharan Africa to better understand what can be done to attract private solutions. The key conclusions emerging from the paper are as follows.

First, that the average investor assigns more weight to power-sector policy and regulatory framework risks than to power-sector context and country-context risk. Among power sector policy and regulatory risks, the certainty of cash flow is the most important for investors. The most important constraint for investors to determine the certainty of cash flow is whether there is a government support mechanism, which is credible and reliable, such as guarantees in case the off-taker runs into financial problems.

Second, important differences exist between investor types. For all investor classes – apart from on-grid – policy and regulatory risk is the most important risk category. For on-grid investors, in turn, power sector context risk is the most important risk category, potentially because the future expansion of the power sector determines to a large extent the investment opportunities that arise and retroactive changes to expansion plans may pose a substantial risk. International investors assign more weight to country-context risk than domestic investors, potentially due to better local connections.

Third, there are striking differences between segments of the power sector. Investors perceive three segments as ‘ready’ for private solutions in Sub-Saharan Africa: power generation, off-grid electrification, and mini-grids. And when asked about the most attractive markets for investments over a three-year time horizon, respondents ranked nine countries as ‘positive’ on average: Côte d’Ivoire, Kenya, Mozambique, Nigeria, Rwanda, Senegal, South Africa, Uganda, and Zambia.

Fourth, besides understanding investors’ and financiers’ risk perception, a central motivation for the survey was to ‘reality-check’ existing, data-based assessments of countries’ readiness for investment. We find that survey respondents’ perception of countries’ readiness correlates very well with RISE 2017 scores (R2 of 0.47 for a sample of 35 countries). A similar picture emerges for the Power Sector Reform Index (R2 of 0.37 for a sample of 35 countries). Further disaggregating the RISE scores into its grid and off-grid components shows that they also correlate well with the assessment of the respective investor classes. Particularly the following components of the index show a high correlation with the subjective experience of off-grid investors: existence of an electrification plan, consumer affordability of electricity, and the existence of a framework for stand-alone systems. For grid-connected renewable energy particularly clear network connection procedures, carbon pricing and regulatory support for renewable energy are well correlated with the perception of investors.

In sum, despite many challenges, the survey underscores that past experience of power sector investments in Sub-Saharan Africa has been more positive than negative, and many of the surveyed equity investors and financiers plan to invest in the region in the next three years. Addressing the key concerns of investors – such as the certainty of cash flow, ease of entry and exit of the market, and clear investment priorities – can substantially increase the readiness of countries. Investors particularly assess positively those countries that have seen substantial power sector reform efforts, often over a decade or more, to provide adequate policy and regulatory frameworks for investment.

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