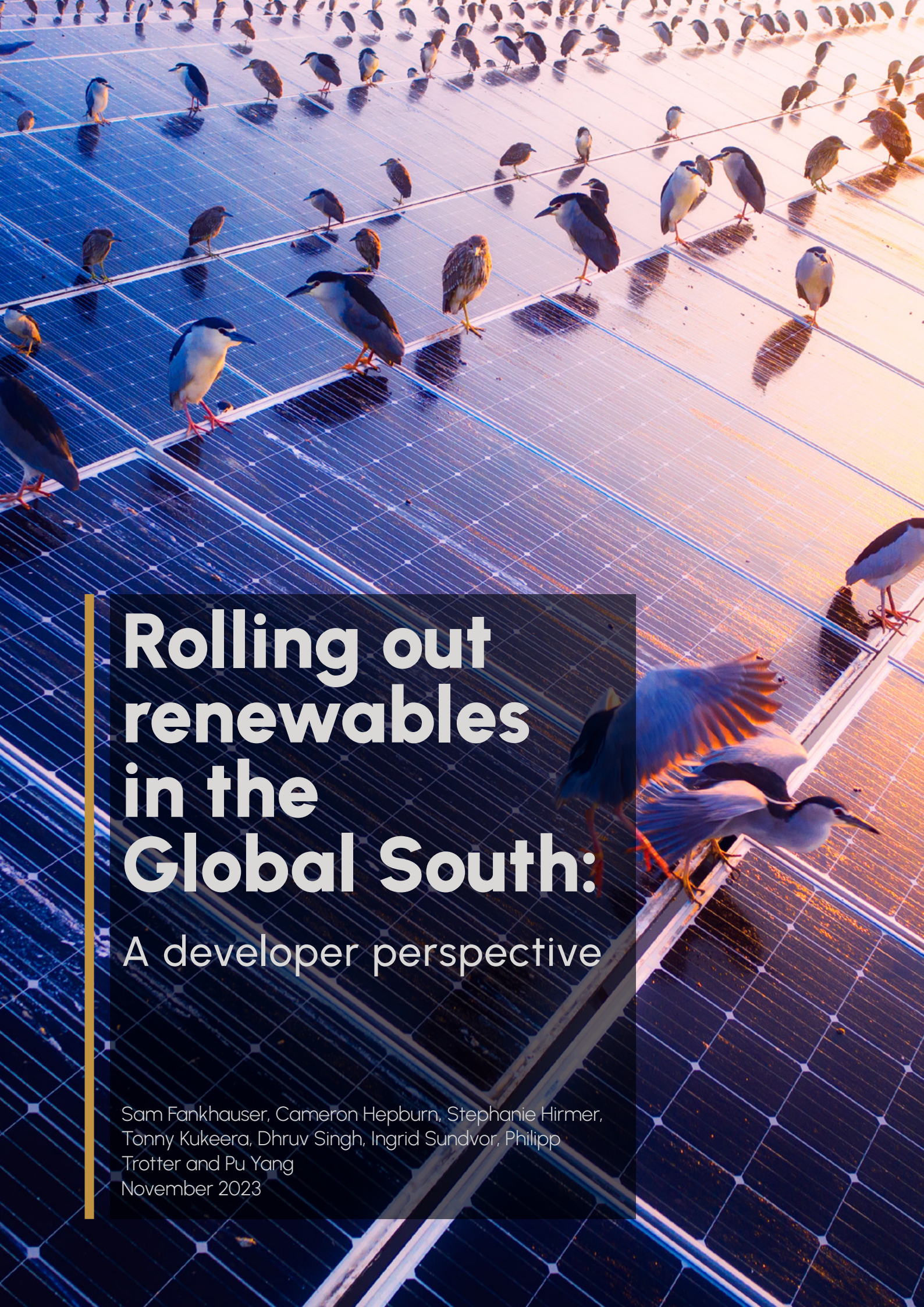

Rolling out renewables in the Global South:

A developer perspective

Sam Fankhauser, Cameron Hepburn, Stephanie Hirmer, Tonny Kukeera, Dhruv Singh, Ingrid Sundvor, Philipp Trotter and Pu Yang

November 2023

About the Oxford Smith School

The Smith School of Enterprise[1] and the Environment at the University of Oxford (SSEE) was established with a benefaction by the Smith family in 2008 to tackle major environmental challenges by bringing public and private enterprise together with world-leading teaching and research. Research at the Smith School shapes business practices, government policy and strategies to achieve net-zero emissions and sustainable development. We offer innovative evidence-based solutions to the environmental challenges facing humanity over the coming decades. We apply expertise in economics, finance, business and law to tackle environmental and social challenges in six areas: water, climate, energy, biodiversity, food and the circular economy.

About this report

This report is Part 1 of a three-year research project to consider clean energy investment in the Global South through a developer lens, complementing current thinking on both green finance and the just transition. The 2023 report establishes a baseline of the issues and tests developers' attitudes to achieving projects at scale. Following engagement at COP28 and beyond, the project will be guided by stakeholders to determine the next phase of work, forming practical proposals to create the next generation of clean energy champions.

The views expressed in this paper represent those of the authors and do not necessarily represent those of the participating institutions or funders. The paper is intended to promote discussion and to provide public access to results emerging from our research. It has been reviewed by internal and external referees before publication.

About partners and funders

Funding for this project was provided by SSE plc, a UK-listed business focussed on developing, building, operating and investing in the electricity infrastructure needed in the transition to net zero. SSE has a long-held vision to be a leading energy company in a net zero world. It understands that the achievement of a just energy transition in the developing world faces a set of challenges that are wholly different to those faced in its own developed world context. SSE hopes that this project will help aid understanding of those challenges and the associated solutions in order to accelerate the clean energy transition globally.

The project was also supported by Sustainable Energy for All (SEforALL), an international organisation that promotes faster action towards the achievement of Sustainable Development Goal 7. It was carried out in collaboration with the Climate-Compatible Growth (CCG) programme, which is sponsored by the UK Foreign, Commonwealth and Development Office.

Acknowledgements

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A woman installing solar panels on the roof in Bhutan. Credit: Asian Development Bank

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Key messages

The transition to renewable energy is ***a once-in-a-generation opportunity for inclusive and sustainable development.*** *The benefits are particularly pronounced in developing countries, where universal access to energy is essential for a just transition.*

Renewable energy is moving ***from pioneer projects to large-scale roll out.*** *Experts call for a tripling of renewable energy capacity and expect a 2.5-fold increase in sustainable infrastructure investment in the Global South by 2030.*

The global roll out requires, on a much larger scale, ***the expertise of project developers*** *from both the Global North and the Global South. Their ability to identify, structure, build and operate projects is key to unlocking finance and scaling up investment.*

The risk profile of renewable energy projects is shifting. *Concerns about the business environment (market, macroeconomic and governance risks) now dominate technology risks.*

Developing countries offer ***exceptional renewable energy prospects.*** *India, Chile and China have the lowest solar energy costs in the world. However, risks are substantial and stronger business enablers are needed to maximise deployment.*

Scaling renewable energy requires tenacity and effort. Informed by feedback from developers, we put forward ***10 concrete, actionable measures*** *which will help to accelerate the roll out of renewables.*

10 actionable measures to accelerate renewable energy deployment

1. **Engagement:** Establish strong cross-sectoral stakeholder relationships to enhance public acceptance and benefits to the local community. **Lead: Operators.**

2. **Localisation:** Expand and utilise local and regional supply chains, and strengthen local manufacturing capacity and skills as necessary. **Lead: Operators.**

3. **Planning regime:** Establish and enforce an effective, fair and transparent planning regime for the approval of renewables projects, for the benefit of both operators and communities. **Lead: Governments.**

4. **Finance:** To enhance energy affordability, establish credit lines with favourable terms for small businesses and low-income consumers. **Lead: Development agencies.**

5. **Auctions:** To stabilise revenues, implement regular auctions for renewable energy contracts (on-grid projects). **Lead: Governments.**

6. **Grid access:** Strengthen the capacity of transmission and distribution networks, and improve the institutional and regulatory arrangements for grid access (on-grid projects). **Lead: Governments, development agencies.**

7. **Service models:** Optimise revenue streams through vertical integration and the adoption of energy-as-a-service models (off-grid projects). **Lead: Off-grid operators.**

8. **Payment systems**: Introduce pay-as-you-go (PAYG) systems by leveraging mobile banking (off-grid projects). **Lead: Off-grid operators.**

9. **Sovereign risk mitigation:** Provide sovereign risk mitigation for international developers, for example through guarantees and risk-sharing structures. Lead: **Development agencies**.

10. **Currency risk mitigation:** Provide de-risking for exchange rate and currency convertibility risks, including currency hedges and local currency finance. Lead: **Development agencies, local banks.**

** *View the full table page 28*

Setting the Scene

Boy in the land of Lake Turkana Wind Power, Kenya. Credit-Maurizio Di Pietro / Climate Visuals Countdown

1. Introduction

The first Global Stocktake under the Paris Agreement stresses the urgency of scaling up renewable energy to achieve net zero carbon emissions.[2] The scale-up of clean electricity, and the use of that electricity to decarbonise other parts of the economy, is at the centre of all decarbonisation pathways.[3]

The renewable energy transition is not just an environmental imperative. It is also a unique opportunity to advance inclusive and sustainable development. Yet, how the inevitable transition to clean energy will unfold and whether its benefits will be shared equitably remains uncertain.

The stakes are particularly high in developing countries in the Global South, where the need for modern energy provision is most urgent and the growth potential in energy demand is highest, but where business conditions can be challenging, including for renewables. The clean energy transition will not be successful, just or equitable unless it reaches all parts of the world.

This report introduces a developer lens to the debate. Much has been written about the need to attract climate finance flows to the Global South.[4] At the same time, capital providers often deplore the dearth of investible projects. Project developers are the missing piece of this puzzle. Their ability to identify, structure, build and operate successful projects is key to unlocking finance and scaling up clean energy investment.

Developing countries require strong domestic clean energy champions and the collaborative expertise of international project developers from both the Global North and the Global South.

This report is the first in a series, which thematise the practical nuts-and-bolts considerations which current and future clean energy developers in developing countries face, and how this relates to a just and inclusive transition. We want to identify concrete, practical and actionable measures that can help accelerate the clean energy transition, particularly in developing countries.

In this first report, we set the scene. Renewable energy is at an important juncture as it moves from pioneer projects, typically implemented with government support, to mass-roll out as the least-cost energy technology of choice. The International Energy Agency (IEA) is calling for a tripling of renewable energy capacity by 2030.[5]

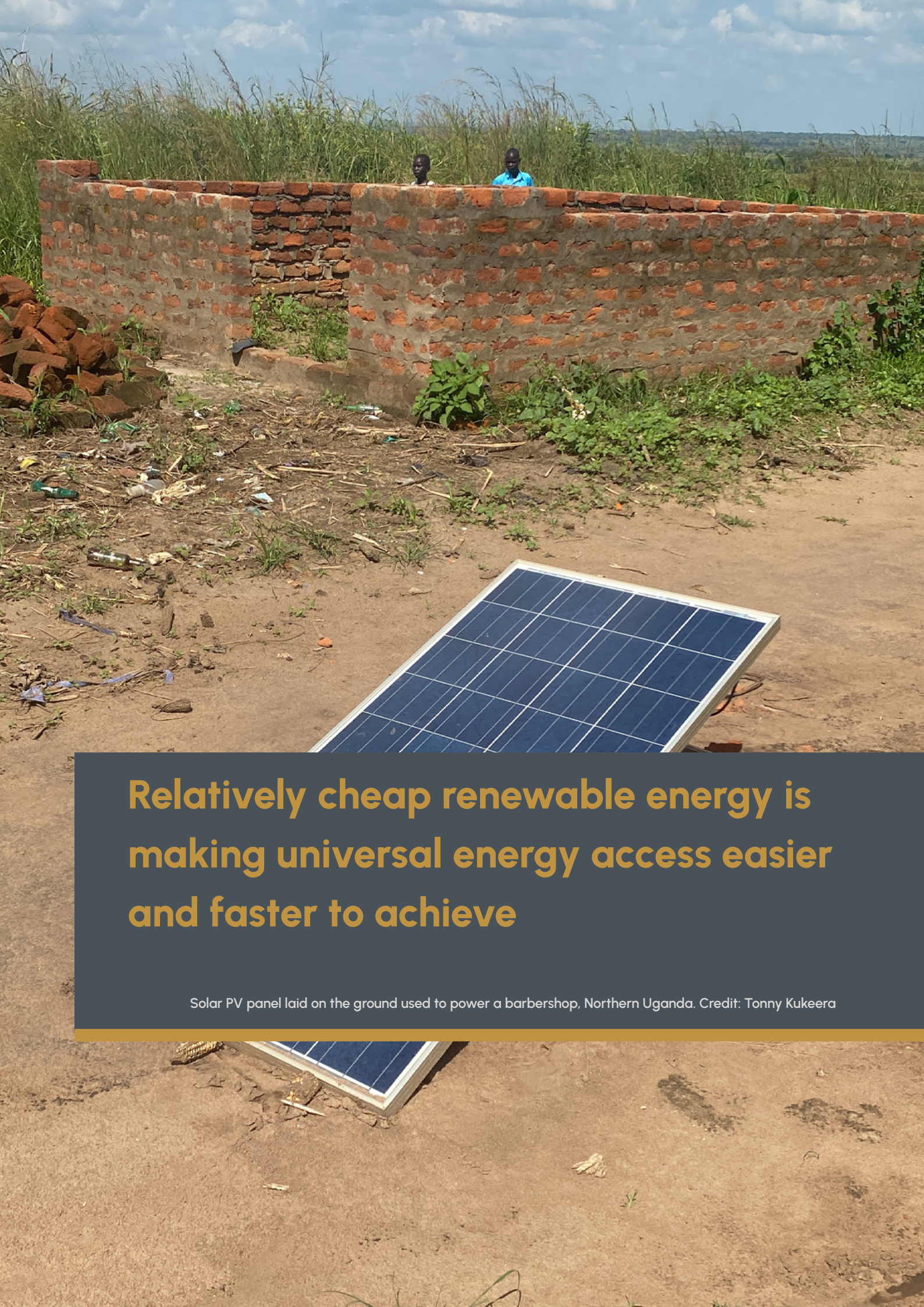
We revisit the prospects for renewable energy in developing countries, both on- and off-grid, with a series of pertinent indicators. They speak to the ubiquity of the opportunity, but also to the significant social, economic, environmental and commercial benefits of renewable energy.

As renewables move into global roll-out, their risk profile is evolving. A survey of 46 project developers, conducted for this report, shows how the attention of developers is shifting from technology and cost risks, which characterised early projects, to understanding the complex new business environments, and associated risks, to which they are now getting exposed.

The main message of the report is one of optimism. The renewable energy transition offers a unique opportunity for green prosperity and genuinely sustainable development. The practical risks associated with renewable energy in developing countries are multi-

faceted and real. However, the report shows how renewable energy companies are structuring projects to make them investible and adopting new business models to make them successful. We can see a pathway to developing countries creating a cohort of homegrown clean energy champions and attract international developers from both the Global North and the Global South.

We also issue an important challenge. Although the templates are in place to accelerate the clean energy transition, the global roll out of renewables has been too slow. We set out 10 concrete, actionable measures, which project developers, policy makers and development agencies should adopt as part of a wider strategy to accelerate the roll out of renewable energy.



Relatively cheap renewable energy is making universal energy access easier and faster to achieve

Solar PV panel laid on the ground used to power a barbershop, Northern Uganda. Credit: Tonny Kukeera

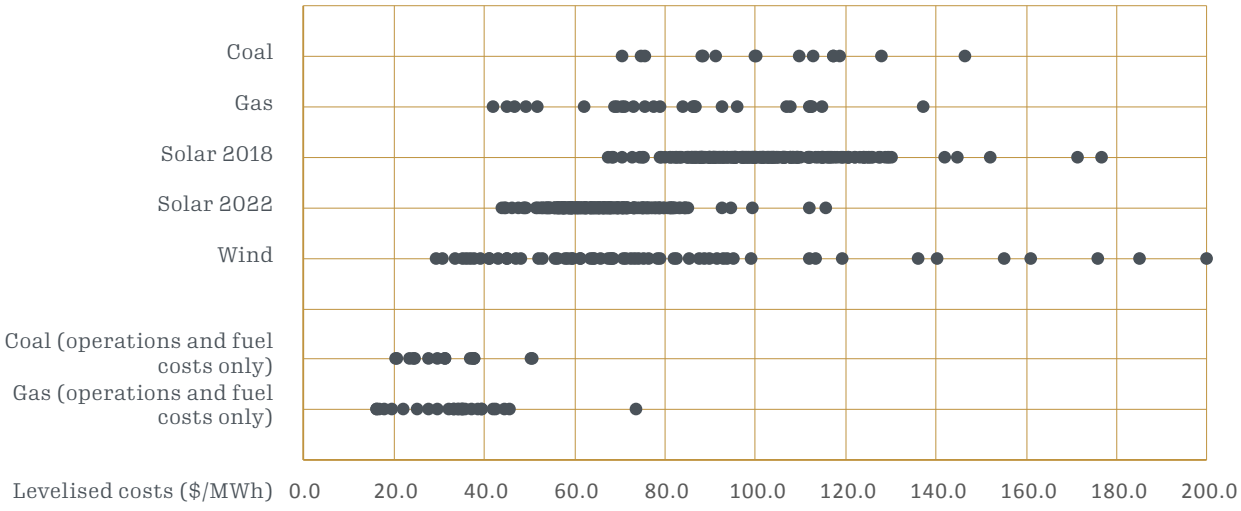
2. Renewable energy as a driver of prosperity

Much has been written about the transition to net zero emissions as the growth story of the 21st century.[V] Policy makers increasingly incorporate green growth and green competitiveness objectives into their climate change strategies. Columbia, Ethiopia, Fiji, Kazakhstan, Rwanda, Laos, South Korea, Uganda, the United Arab Emirates and Vietnam are among the countries that have adopted low-carbon growth plans.[6]

Renewable energy is at the core of these ambitions. Solar costs have fallen by some 90% over the past decade,[7] to the point where renewable energy is now the least-cost electric power solution in many situations (see Exhibit 1)[8 9]. Supply chain bottlenecks and general inflationary pressures could raise costs temporarily, but the secular trend toward cheaper renewables – driven by learning, scale and innovation effects – is likely to continue.

Analysts have identified the channels through which the transition to cheap renewables can advance economic prosperity. The first prosperity channel is **a boost to energy access.** Cheap and modular renewable energy is making universal energy access easier and faster to achieve. For instance, Vietnam managed to install almost 7 GW of solar in one month,[10] while large-scale coal plants can take a decade or more to get off the ground. Providing access to modern forms of energy is a critical sustainable development goal, with well-documented social and economic benefits.[11, 12]

Exhibit 1: The price competitiveness of solar and wind energy



Note: Each point denotes the levelised cost of the specified form of electricity in a particular country or context. The distribution therefore reflects the range of levelised costs across countries and contexts.
Source: see reference 8, 9

The second prosperity channel is the development of **new areas of comparative advantage.** Countries are starting to understand the economic benefits of renewable energy in terms of jobs, growth and economic opportunities. Globally, the renewable energy industry already employs close to 14 million people.[13] The abundant access that many developing countries have to excellent solar, wind and hydropower resources could form the basis of important comparative advantages in a world where products and production processes are increasingly electrified. There is excitement in many developing countries, for example, about the growth potential of green hydrogen driven by abundant renewables.[14]

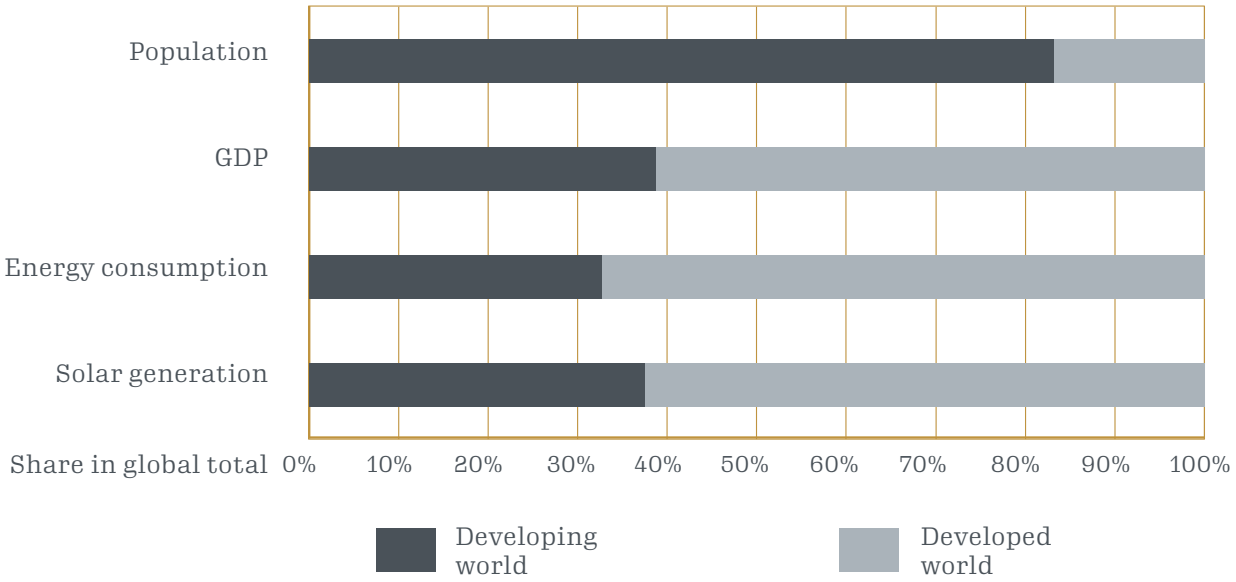
As a third prosperity boost, renewable energy offers wider economic and environmental advantages that can make modern economies **cleaner and more efficient.** The move into renewables and the electrification of services like heating and transport will radically cut air pollution, with massive benefits to human health. The prospect of reducing fossil fuel subsidies, which currently amount to US$ 7 trillion,[15] will generate important fiscal headroom and reduce economic inefficiencies, even if governments have to contribute to higher infrastructure investment needs.

Fourth, economic growth scholars emphasise the dynamic growth benefits of renewables, and clean innovation more broadly.[16] Just like earlier technological revolutions, the transition to clean energy can unleash **a virtuous cycle of innovation, investment and growth,** as innovative market entrants shake up product designs, business models and supply chains. Most developing countries are technology adopters, rather than innovators, but the scope for associated business model innovation is profound, as we will document in section 6 below.

Finally, the renewable energy transition provides **an investment stimulus to slow-growing economies.** At the height of the COVID-19 pandemic, and before that during the global financial crisis of 2008/09, economists pointed to the economic stimulus potential of renewable energy and other clean investments.[17] The rich pipeline of investment-ready renewable energy projects, with their high up-front capital and labour needs, but moderate subsequent operating costs, are seen as ideal interventions to kick-start ailing economies in a timely and targeted manner

These economy-wide benefits will accrue globally, but they are particularly pertinent for developing countries. Developing countries play an important role in the global scale-up of renewables. They account for only about a third of global solar energy at present (Exhibit 2), but this mostly reflects their modest energy use. As a share of total energy use, solar energy generation in developing countries is higher than that of developed economies. For example, China, India and Egypt host 8 of the world's 10 largest solar parks.[18]

Exhibit 2:Developing country share in population, GDP and energy



Note: Developed countries include all countries classified as high-income by the World Bank. Developing countries include middle and low-income countries.
Source: World Development Indicators.

Sustainable infrastructure investment, including in renewables, could rise 2.5-fold between now and 2030.

Off shore wind, Block Island. Credit: © Neil Ever Osborne / www.neileverosborne.com

3. Renewable energy as a business opportunity

While policy makers are excited about the sustainable development benefits of renewable energy, project developers – while increasingly putting sustainability at the core of their operations – also need to focus on the business opportunity. Rolling out renewables requires sustainable profitability.

Even on a purely commercial basis, the renewable energy transition is a remarkable opportunity. It offers attractive prospects for local clean energy champions and international project developers alike. Developing countries could be at the core of this trend. It has been estimated that sustainable infrastructure investment in developing countries outside China, with a prominent focus on renewables, will grow from around US$700 billion in 2019 to US$ 1.8 trillion in 2030.[19]

This 2.5-fold increase in infrastructure spending is driven by a series of energy demand accelerators, energy transition accelerators and investment moderators (Exhibit 3).

There are two energy demand accelerators. The first driver of future energy demand is **economic growth.** Most of the expected population growth until mid-century is expected in developing countries (excluding China). The same regions are expected to benefit from rapid income growth as their economies converge to the global average. In the absence of energy conservation measures, energy demand has an income elasticity of between 0.5 and 1.[20] This means that, if developing countries continue to grow at 5-6% per annum on average, they will, all else equal, demand 20-50% more energy in 2030 than today.

The second energy demand accelerator is **energy access.** Affordable and clean energy for the 700 million people who currently do not have access to modern energy is a critical component of a just and equitable energy transition.[21] Modular solar home systems with the combined capacity of just three conventional power stations would be sufficient to meet their basic energy needs.[22] Meeting this developmental imperative will require development cooperation and a blend of different forms of capital, but also private finance and expertise.

The next set of growth drivers concern clean energy transition accelerators. First, in addition to meeting new demand (see above), **existing fossil fuel power generating assets need to be replaced** with clean alternatives. Ideally, this will happen as they reach the end of their economic life. However, some longer-lived assets may have to be scrapped ahead of time or retrofitted with carbon abatement technology such as carbon capture and storage.

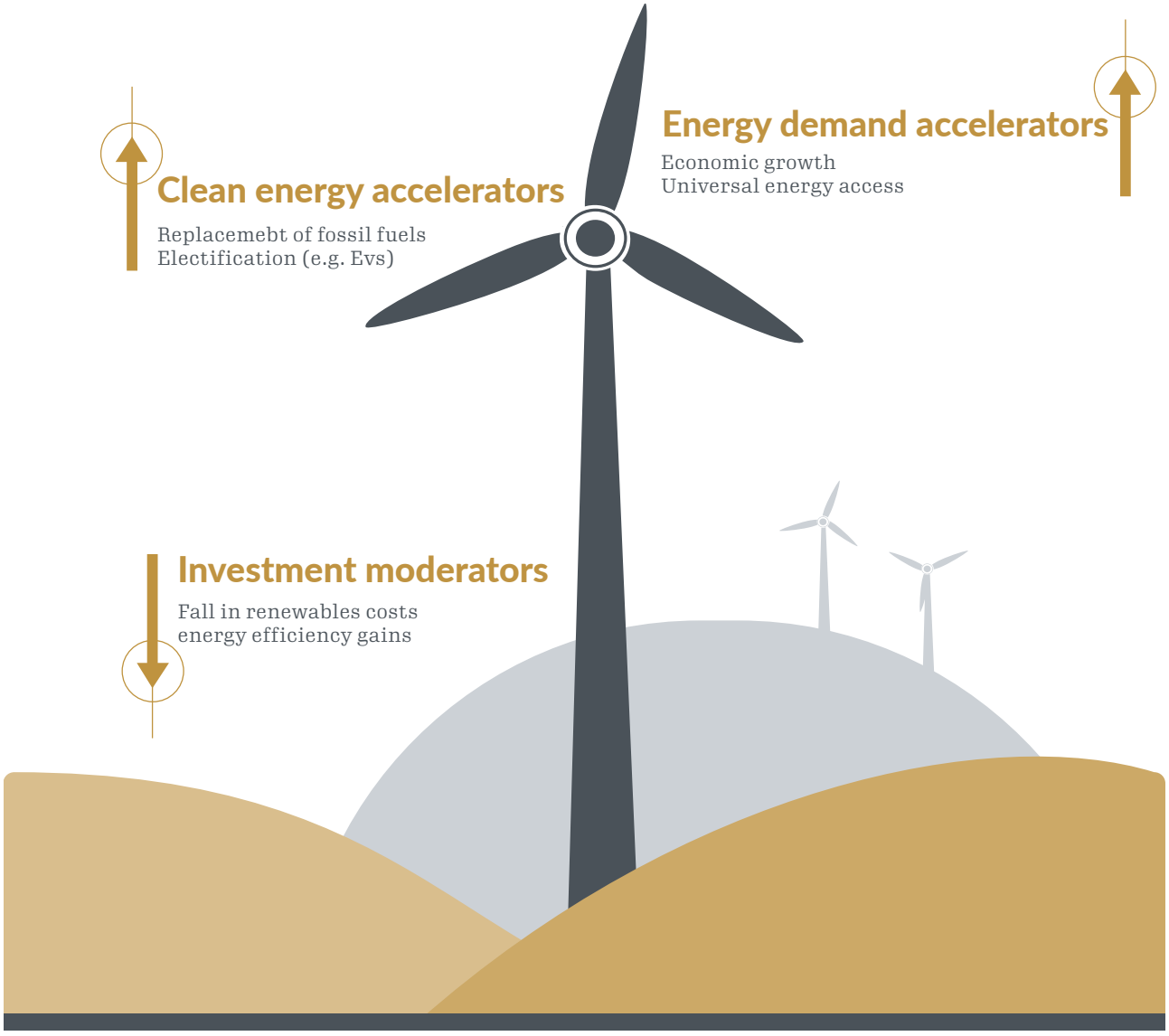
The second energy transition accelerator relates to the central role of clean electricity in decarbonisation strategies. At the heart of decarbonisation plans is the rapid decarbonisation and expansion of electric power generation and the **use of clean electricity to decarbonise other parts of the economy,** such as surface transport (through electric vehicles), buildings (through heat pumps) and parts of industry (through green hydrogen). The result is a rapid rise in electricity demand. In the energy scenarios of the International Energy Agency, global demand for electricity grows by 80–100% by 2050, while total energy consumption either flat-lines or falls.[23]

Counterbalancing the effect of these

growth accelerators are two investment moderators. The first moderator is the sharp **decline in the costs of renewable energy.** While lower costs stimulate demand, they also mean the capital needed to deliver a given amount of generation capacity is less. It has been estimated that a timely transition into renewables could save the world as much as US$12 trillion in energy costs over the next 30 years.[24]

Another factor in reducing spending needs is the ongoing scope for **energy efficiency improvements.** Global energy intensity (that is, energy use per GDP) has historically fallen by about 1-2% a year. Experts believe that with concerted regulatory efforts, this rate can be doubled going forward.[25] Sustained over 15 years, this would reduce global energy demand by one-third and potentially as much as 50%.

Exhibit 3: Drivers of renewable energy investment growth



Source: Authors.

Market risks, in particular tariff levels, are seen as the most important issue for renewable energy projects.

Solar farm in Maasai Mara, Kenya Credit: Elly Kevin Oriko

4. The evolving nature of renewable energy risks

The risk profile of renewable energy projects is changing. In the early days of the renewable energy transition, developers and investors were concerned primarily with the difficulty of pushing their nascent technologies from pilot applications to commercial success. They needed to generate scale to move down the learning curve. They faced technology risks, some real, some the perceptions of a sceptical market. They relied heavily on generous government subsidies to compete with entrenched incumbent technologies.

These early risks are receding. Technology development is still rapid and government support remains critically important. But renewables are no longer an unproven technology. The sector is mature, and its features are well understood by project developers, strategic investors, energy planners and policy makers.

As renewable energy moves from pioneer applications to global roll out, different risk profiles are emerging. Compared to the early investments, which were predominantly in developed countries, energy projects in developing countries are confronted with different business cultures, weaker institutions, lower purchasing power, less well-developed regulatory frameworks, shallower financial sectors and more pronounced macroeconomic risks.

These issues have been encountered by conventional energy projects for years,[26] and local project developers, in particular, understand the challenges of their home markets. However, a riskier business environment implies higher costs of capital, which affect renewable energy projects particularly severely.

Business environment risks interact with the specific characteristics of renewable energy. Compared with conventional power generation investments, solar and wind energy projects can be modular as well as potentially more dispersed and geographically remote. They can function as isolated solutions (e.g., solar home systems) or mini-grids. If they are connected to the grid, they are likely to entail access costs and system integration issues. The intermittent nature of renewables creates a distinct energy balancing challenge, which makes balancing services and the development of flexible low-carbon assets an essential component of grid development.

To unpack the risk appetite of project developers, we conducted a survey of experienced market participants, encompassing local and international project developers who are active across the world, but with a particular focus on Africa (see Annex 1). Out of the 46 respondents, some 60% occupy executive or senior management positions. The remaining respondents are technical staff, policy or strategy experts with eight years of relevant experience on average.

The findings show how issues of technology risks are giving way to business environment and implementation concerns (Exhibit 4)[27 28 29]. The main risks facing project developers were grouped into five broad categories – market, social / environmental, technological, governance and reputational. Participants were asked to rank these in order of importance, and within each risk category identify the most salient risk aspects.

The most important concerns of survey participants were market and

Exhibit 4: Risk perceptions and risk appetite

Risk categories (ordered by importance)	*Risk aspects within categories (frequency of mentions)*
1. Market risks **35%** of survey responded ranked this as the top risk **57%** of survey respondents ranked this as a top-two risk	**70%** tariff levels **54%** grid access and integration (on-grid projects) **37%** market competition **26%** counterparty risks (on-grid projects)
2. Macroeconomic risks **28%** of survey responded ranked this as the top risk **61%** of survey respondents ranked this as a top-two risk	**63%** exchange rate risks **52%** energy affordability **50%** currency convertibility / capital controls **33%** labour market risks, e.g. skill levels
3. Governance risks **20%** of survey responded ranked this as the top risk **37%** of survey respondents ranked this as a top-two risk	**70%** administrative barriers, e.g. licensing **52%** political stability **26%** rule of law, legal stability **26%** access to land, land title
4. Social/environmental risks **9%** of survey responded ranked this as the top risk **15%** of survey respondents ranked this as a top-two risk	**43%** public acceptability **39%** impact on local environment **37%** impact on local communities **37%** health and safety breaches
5. Technology risks **7%** of survey responded ranked this as the top risk **24%** of survey respondents ranked this as a top-two risk	**78%** supply chain issues **52%** operational risk / technical performance **43%** construction risks **37%** site security
6. Reputation risks **2%** of survey responded ranked this as the top risk **7%** of survey respondents ranked this as a top-two risk	**50%** government relationship, e.g. corruption allegations **48%** consumer dissatisfaction **48%** credibility of partners **26%** worker relationships

Note: Risk types and categories are based on the pertinent literature (see references see references 27, 28, 29) and practitioner conversations. Survey respondents were asked to rank risk categories by importance and identify the top two risks for each category. See Annex 1 for details. Source: Survey.

macroeconomic risks, which were identified as the most significant risk by 35% (16 out of 46) and 28% (13 out of 46) of respondents, respectively. Some 60% of respondents see them as one of their top two risks.

Within these general categories, tariff levels (n=32) and grid access and integration (n=25) are the most highlighted aspects of market risks, while affordability (n=24) and currency issues (exchange rate risks, n=29, and currency convertibility, n=23) are the most prominent macroeconomic concerns.

The many aspects of governance (or sovereign) risk were ranked highest by 20% (9 out of 46) of respondents, with administrative barriers, such as permits and licensing (n=32), and political stability (n=24) as the main concerns. Project developers are noticeably less concerned about technology risk, which was ranked as the top risk in only 7% of cases (3 respondents), although it was a top-two risk for 24% of respondents (11 out of 46). The reliability of the supply chain (n=36) is the most notable concern, well ahead of technical performance risks (n=24).

Survey participants are most comfortable with social / environmental risks and risks to their company's reputation. These were ranked as one of the two least concerning risks by 48% and 76% of respondents, respectively. (Note that these data are not shown in Exhibit 4). Their standing among stakeholders, including consumers, workers, government and local communities, is an important issue for project operators. However, they feel they have effective strategies in place to reduce the likelihood and impact of these risk events.

We will return to the strategies, which project developers are adopting to manage the evolving risk profile of renewables in section 6.

India, Chile and China have the world's lowest solar energy costs.

Jaisalmer Wind Park India. Credit: Antoine Taveneaux Wikimedia Commons

5. A global snapshot of renewables risks and opportunities

To share the benefits of renewables more widely, it is important to extend the investible market and generate attractive business propositions across the developing world. Leading renewables markets such as China, India, Brazil, Chile and Vietnam already attract significant clean energy investment. But elsewhere, renewable energy capacity is still low. Renewables have a modest market share in what are still small energy markets.

To develop a sense of how different renewables markets compare, we have developed a set of indicators on clean energy risks and opportunities in selected countries of the Global South. Compared to other indicator sets, we offer a more focused and forward-looking. We are not just interested in the market today but in emerging opportunities over the next decade.

We assess the medium-term renewable energy opportunities of 64 developing countries, for which the data are available, along five key indicators (see Annex 2 for methodological notes):

- **Market growth:** Developing countries as a group are forecast to grow rapidly over the coming decades, and with a growing economy electricity demand will also increase (see Exhibit 3 above). We measure the likely growth in clean energy demand by looking at short-term forecasts of GDP growth by the World Bank.

- **Development needs:** The currently low energy consumption of many developing countries could be associated with potential catch-up demand if relevant sustainable development targets are to be met. We capture development needs by looking at current electricity use per capita.

- **Price competitiveness:** In many contexts, renewable energy is now the default technology of choice for new power generation investments. However, price levels differ (see Exhibit 1 above) and the pace at which renewable energy replaces fossil fuel-based power will depend on the relative costs of the two options. We estimate the competitiveness of renewables by looking at the levelised cost of solar power.

- **Country context:** Sovereign risk and governance factors such as political stability and administrative efficiency are key concerns for developers (see Exhibit 4 above). We use information from the World Bank, which compiles a suite of governance indicators that capture the breadth of contextual factors that matter to project developers. The indicator set has six components: voice and accountability, political stability / absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. We aggregate these dimensions into a single score, using the World Bank tools to do so.

- **Business enablers:** The attractiveness of clean energy investments depends on a vast number of specific market and policy features that constitute the investment climate for renewable

energy in a country. This includes factors such as renewables support measures, energy tariff levels, market design and regulatory arrangements. We take this information from *ClimateScope,* using the 2023 scores for "power sector fundamentals", the relevant subset of the ClimateScope dashboard.

Exhibit 5 displays selected results for 24 countries across all world regions. The full set of 64 country scores is provided in Annex 2.

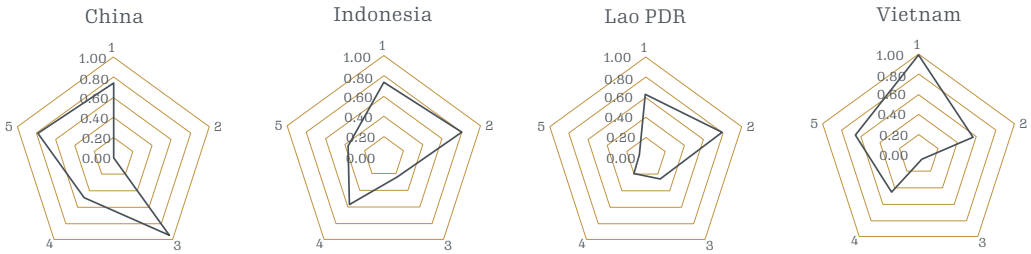
Our snapshot speaks to the diversity and complexity of developing country markets, but also to the ubiquity of attractive prospects. Each market poses trade-offs, but all offer some opportunities.

India, Chile and China have the world's lowest solar energy costs, in all three cases supported by strong business enablers. Chile also offers an attractive country context, but only modest market growth. Vietnam, one of the leading renewables markets, offers good business enablers and strong market growth but has surprisingly high solar costs.

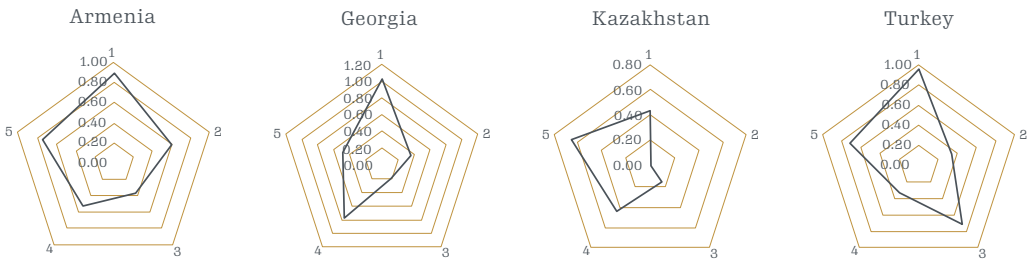
Low-income countries, particularly in Africa and South Asia, have the highest development needs, meaning renewables can offer strong social benefits in terms of energy access, jobs and growth. However, these countries are held back by difficult country contexts and weak business enablers, emphasising the critical importance of development aid and concessional finance in a just transition.

Exhibit 5: Renewable energy profiles of selected countries

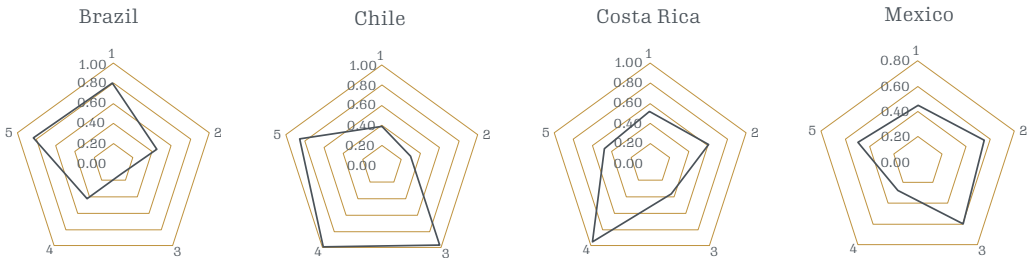
East Asia and Pacific



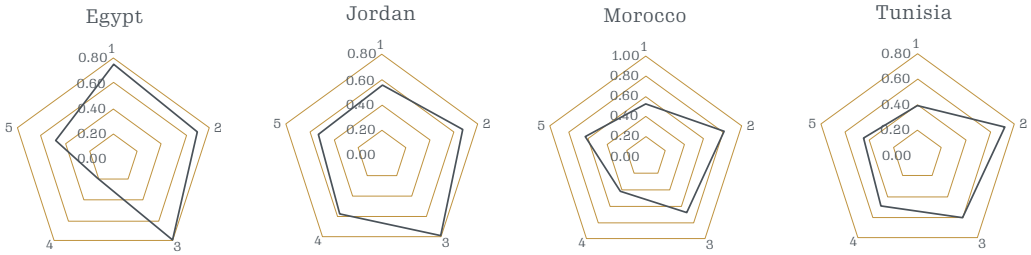
Europe and Central Asia



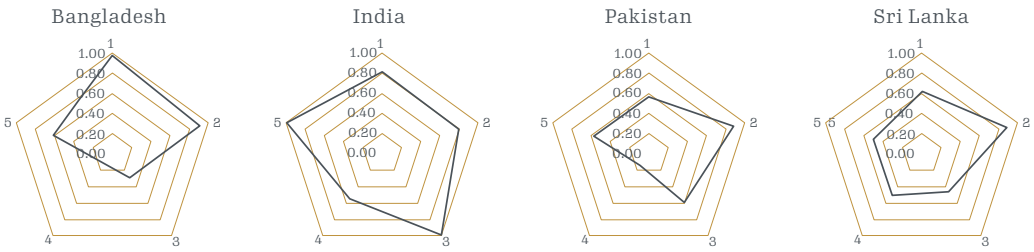
Latin America and Caribbean



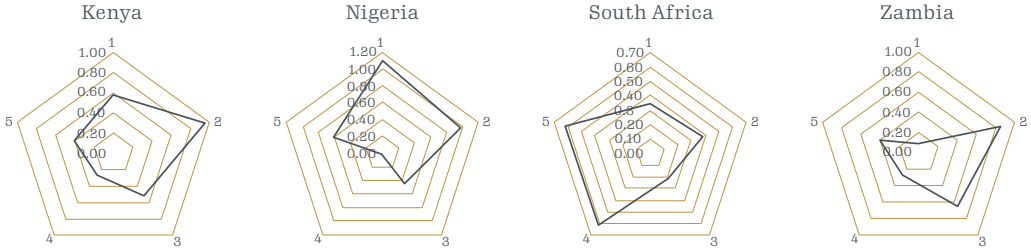
Middle East and North Africa



South Asia



Sub-Saharan Africa



Legend:
1. Market growth
2. Development needs
3. Price competitiveness
4. Country context
5. Business enablers

See Annex 2 for data sources and methodological details.

Local operators are adapting their business models to meet the challenges of their markets.

Solar panel inspection, Adobe stock

6. Strategies to scale up deployment

Renewable energy developers have considerable experience in financing, building and operating renewables projects in developing countries. Policy makers and development agencies have the tools to create a supportive business environment. There are tested structures to mitigate pertinent risks and innovative new business models to realise latent revenue streams. This expertise must now be scaled as part of a broader drive to create an enabling environment for renewable energy.

We set out 10 concrete, actionable measures, which local and international project developers, governments and development agencies can take to accelerate the deployment of renewables (Exhibit 6). They draw on the survey of project developers and address the key risks they identified (Exhibit 7).

A supportive business environment

Although renewable energy costs are now are now broadly at parity with fossil fuel costs (Exhibit 1), projects still rely on supportive public policy. Early deployment support had the purpose of promoting a nascent technology and bringing down costs. The role of public policy now is to ensure equitable outcomes, provide a supportive business environment and create a level playing field with other forms of energy.

Survey respondents emphasised the critical nature of continued government support. A clear renewable energy strategy, combined with pro-renewables regulation, is seen as essential to stabilise revenues and reduce capital costs. Less often articulated, but equally important, is the role of public policy in dismantling current, carbon-intensive energy systems that rely on fossil fuels.[30] This crucially but not only includes removing subsidies and other preferential treatment for the production and use of fossil fuels. As one respondent noted, governments also need to support the migration of skills from the fossil fuel sector to the renewables sector to ensure a just and equitable transition.

The policy tool kit to support renewables is well-established and tested. Most policies have been designed for the socio-economic contexts of high-income countries. However, it is increasingly understood how they translate into a developing country context, where energy needs are pressing (precluding expensive price adjustments), financial markets are thin (impeding access to finance), the fiscal headroom is tight (limiting the scope for expansive subsidies) and regulatory capacity is limited (precluding administratively complex interventions).

Arguably the most important public policy intervention, and a frequent request from survey participants, are demand-pull measures to improve the market outlook and stabilise revenues. While feed-in tariffs remain popular, the most successful such intervention, at least in countries with sufficient administrative capacity, are **renewable energy auctions.** Contractual off-take agreements provide additional (although not perfect) legal protection to operators in business environments where policy-making and tariff-setting are often erratic. This brings down capital costs. Open, competitive auctions also facilitate participation and market entry by both local and international developers.

Credit lines by local banks, typically facilitated by development finance

Exhibit 6: Ten actionable measures to accelerate renewable energy deployment

Measure	Lead entity	Beneficiaries	What it does
Engagement: Establish strong cross-sectoral stakeholder relationships to enhance public acceptance and benefits to the local community	All operators	All operators Local communities	Provide a social license to operate, improve public acceptance and ensure the effective use of renewables
Localisation: Expand and utilise local and regional supply chains, and strengthen local manufacturing capacity and skills as necessary	All operators	All operators Local communities	Improve resilience to external shocks and generate local growth benefits
Planning regime: Establish and enforce an effective, fair and transparent planning regime for the approval of renewables projects, for the benefit of both operators and communities	Governments	All operators Local communities	Speed up planning process, make it fair and predictable, and enhance community community benefits
Finance: To enhance energy affordability, establish credit lines with favourable terms for small businesses and low-income consumers	Development agencies	Primarily off-grid operators Local communities	Remove financing constraints and enhance equitable access to renewables
Auctions: To stabilise revenues, implement regular auctions for renewable energy contracts	Governments	Primarily on-grid operators	Provide market clarity and contractual certainty about tariffs and terms
Grid access: Strengthen the capacity of transmission and distribution networks, while also improving the institutional and regulatory arrangements for grid access	Development agencies Governments	On-grid operators	Remove physical bottlenecks and institutional barriers for fast and non-discriminatory grid access
Service models: Optimise revenue streams through vertical integration and the adoption of energy-as-a-service models	Off-grid operators	Off-grid operators	Improve project economics and unlock new value propositions
Payment systems: Introduce pay-as-you-go (PAYG) systems by leveraging mobile banking	Off-grid operators	Off-grid operators	Facilitate access through efficient payment mechanisms
Sovereign risk: Provide sovereign risk mitigation, for example through guarantees and risk-sharing structures	Development agencies	International developers	Remove critical risk barrier for international developers
Currency risk: Provide de-risking for exchange rate and currency convertibility risks, including currency hedges and local currency finance	Development agencies Local banks	Primarily international developers	Remove critical risk barrier for international developers but also local operators

Source: Authors based on survey results.

Exhibit 7: Risks addressed by the 10 measures

Measure	Risks addressed
Engagement	• public acceptability • impact on local environment • impact on local communities
Localisation	• supply chain issues • impact on local communities • exchange rate risks
Planning regime	• access to land / land title • impact on local communities • impact on local environment
Finance	• energy affordability
Auctions	• tariff levels • market competition • counterparty risks
Grid access	• grid access / integration
Service models	• energy affordability • market competition
Payment systems	• energy affordability
Sovereign risk mitigation	• political stability • rule of law, legal stability • administrative barriers • counterparty risks • climate policy risks
Currency risk mitigation	• exchange rate risk • currency convertibility / capital controls

Source: Authors.

institutions on blended terms, have proven successful in facilitating access to finance for low-income households and small and medium-sized enterprises. The high upfront costs of renewables (followed by low operating costs) remain a barrier to the wider adoption of off-grid energy solutions. Blended finance facilities can ease access-to-finance constraints on terms that are affordable, but non-distortive to the wider market.

Other measures highlighted in the survey include effective and effectively enforced planning and grid access rules, perhaps in dedicated solar parks.[31] Slow, cumbersome and non-transparent **planning and licensing rules,** including land titling, are seen as a critical barrier to project development (see Exhibit 4). A robust, properly enforced planning process, underpinned by robust and transparent stakeholder engagement, including of vulnerable and indigenous groups, is also essential to ensure fair outcomes for, and the buy-in of, host communities.

Equally, fast and non-discriminatory **access to the power grid** for utility-scale renewables requires investment not just into physical transmission and distribution capacity, but also in the institutional and regulatory arrangements for grid access.[32]

De-risking strategies

Careful risk management is key to business success. Survey respondents have put forward important risk management strategies related to financial practices, business models and supply chain management.

A key issue highlighted by several respondents is the importance of strong **cross-sectoral stakeholder** relationships and close communication with local communities. Although reputation risks were not ranked as highly as other risks in our survey (Exhibit 4), developers are keenly aware that their social license to operate depends on the buy-in of local stakeholders. Involving the local population in the design of projects, for example on land use and grid routes, can reduce resistance, improve acceptance and ensure the effective utilisation of renewable technologies, as one respondent explained. The issue is critical to both local and international developers.

International developers, including those from the Global South, often have heightened awareness of local business environment risks. Collaboration with a local partner and engagement with national policy makers and local communities can help mitigate social and political risks.

However, international developers also look to development finance institutions, particularly those with a private sector focus, and export credit agencies to help de-risk renewable energy projects. Two sets of de-risking measures are particularly important to unlock international project development (Exhibits 4).

The first set of measures concerns the **mitigation of sovereign risks**, related to political stability, the rule of law, government effectiveness or default on off-take agreements. In the case of utility-scale renewables, this also includes coverage for counterparty risk. Export credit agencies and some development agencies offer explicit risk insurance or first-loss guarantees, but development finance institutions can also share risks through co-financing, perhaps on subordinated terms**.**

The second set of measures concerns the mitigation of currency risks. International developers in particular are concerned about exchange rate fluctuations and currency convertibility (Exhibit 4). Hedging products are available from organisations such as TCX,[33] while the Multilateral Investment Guarantee Agency, an arm of the World Bank, can cover convertibility risks and transfer restrictions. However, the hedging of more volatile currencies can be expensive, and operators increasingly try to tap into local capital pools or share

currency risks with development finance partners, some of which offer local currency financing.

Business model innovation

Renewable energy providers are actively innovating and adapting their business models to meet the context-specific challenges of their markets. This is particularly the case for local project operators. These pioneering business practices offer attractive blueprints for the wider roll out of renewable energy (see Box 1)[34] [35] [36].

Business models describe how firms create value. They combine a firm's value proposition (i.e., which type of value it creates for customers), value capture (i.e., how it monetises its solution), and value networks (i.e., the partnerships needed to deliver the value proposition).

One of the most well-known business model innovations has been the **pay-as-you-go (PAYG) approach** in the off-grid energy sector.[37] This model allows household consumers without reliable grid access to pay for their solar home systems through regular remote payments over a multi-year period. This approach transfers credit risks to the company and allows the deployment of renewable energy systems despite significant finance constraints by end customers. Increasingly, PAYG offerings include the solar home system itself alongside small appliances such as LED lights, phone chargers, a TV and a radio.

An increasing number of mini-grid developers are going beyond simply selling electricity to households. Instead, they vertically integrate their business model by **selling higher-margin energy services,** such as food cooling, milling, electric brick making or egg incubation.[38] Firms like Koolbox, a French-African provider of integrated cooling, lighting and energy services, are putting forward a new value proposition that directly increases productivity in local value chains.[39] The idea is again to take on the credit risk of the associated assets and sell energy-enabled services by the hour or by the kilogram, instead of only by the kWh. The associated per-unit productivity gains are often higher than the levelised cost of the asset investment, implying better economics for developers and rural communities (see Box 1). New models, for instance, ones that combine mini-grids with electric transport (e.g., charging retrofitted electric two-wheelers and electric fishing boats) are being piloted.

Another strategy to retain value added in the local economy is **shortening and regionalising supply chains.** Localising production can reduce both foreign currency exposure and business continuity risks. The approach was pioneered during the COVID-19 pandemic in East Africa, when renewables operators had difficulty sourcing equipment on the international market.[40]

To maximise its benefit, the regionalisation of supply chains has to go hand-in-hand with measures, aligned with a just transition, to strengthen and upskill the local manufacturing base.[41] Building local capacity does not only reduce supply chain risks, it also empowers local communities, including marginalised groups and women. For example, the artisanal mining for lithium, graphite and cobalt in East Africa is predominantly performed by women and children.[42]

Other, mostly nascent business model innovations with significant growth potential in the Global South include:[43] (1) peer-to-peer electricity trading which allows customers to buy and sell electricity directly to each other to increase the flexibility of the electricity market; (2) innovative ancillary services which provide frequency regulation and voltage control services to the electricity grid to improve reliability and stability; and (3) increasing time and space granularity in electricity markets which allows customers to buy and sell electricity in smaller increments of time and space to increase the granularity of electricity markets. All of these business models share a need for greater

collaboration between stakeholders and countries to make scaling renewables a reality.

Box 1: New business models for off-grid energy in Uganda

Uganda has witnessed a remarkable increase in electricity access. According to the Ministry of Energy and Mineral Development, electricity access has surged from 5% in 2002 to 58% in 2023. A significant portion of this growth in electrification rates can be attributed to the adoption of off-grid renewable technologies like solar home systems and mini-grids.

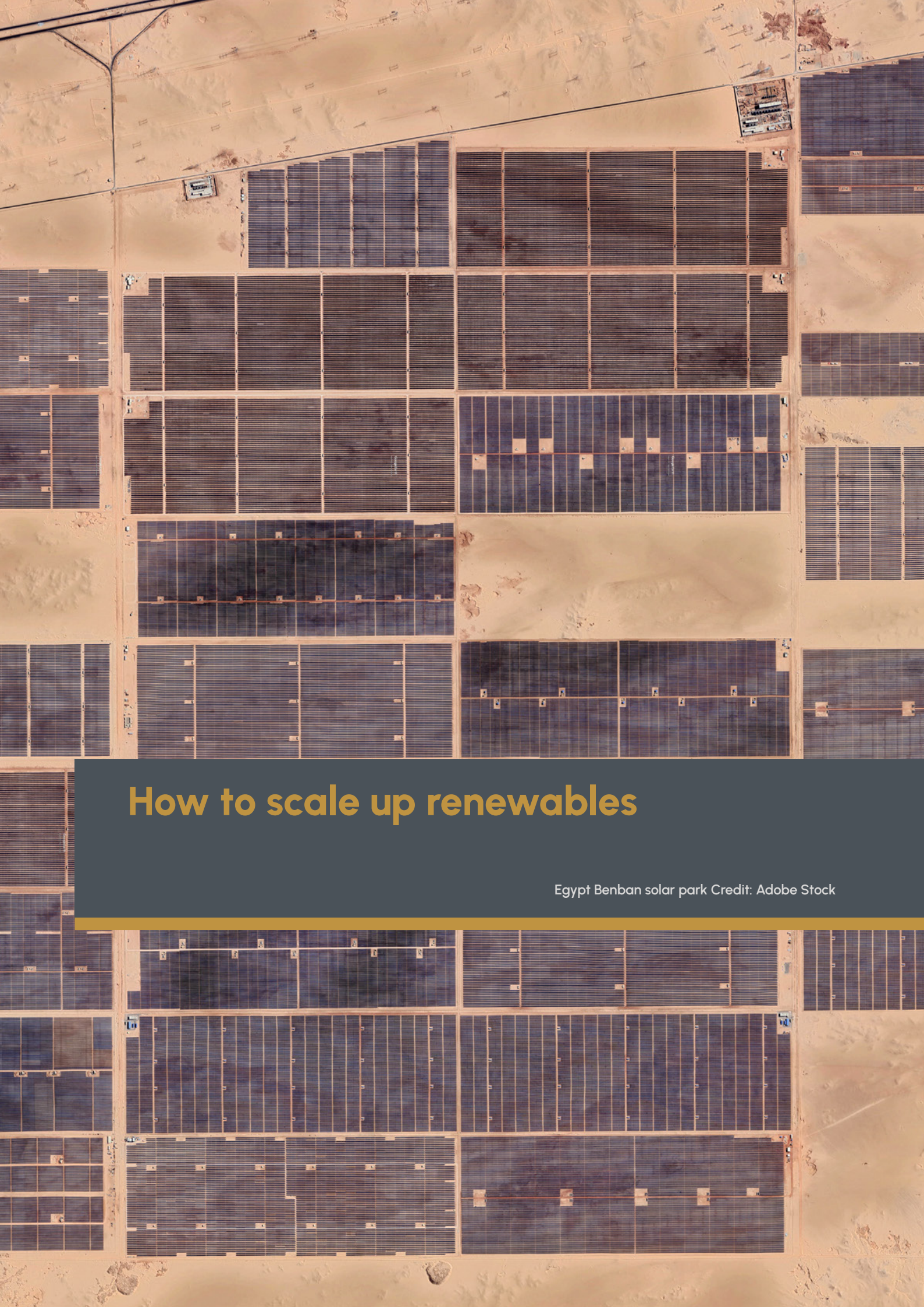
Business model innovation has played a fundamental role in the success of Uganda's off-grid energy sector. Smith School research since 2018 has been documenting how mini-grid companies have adapted their business practices, including through energy-as-a-service models.

Mini-grid developers have discovered that offering energy-enabled productive services, such as cooling in fish supply chains, not only has the potential to drive development in communities but also improves the economics of mini-grids (see table). One entrepreneur the Smith School team spoke to aptly summarised the new approach: "The innovation to the business model we bring reflects a truly holistic approach. We are no longer merely an energy distributor, but an effective participant in the economic development ecosystem, particularly centred around agribusiness processing."

Mini grid returns with and without an ice plant for fish cooling

	30 kW solar mini-grid	30 kW solar mini-grid + ice plant for fish cooling
CAPEX	260,000 US$	280,000 US$
OPEX p.a.	12,000 US$	14,000 US$
Max. generation for energy sales p.a.	71 MWh	56 MWh
Max. generation for cooling p.a.	-	15 MWh
Max. revenue from direct sales p.a.	18,300 US$	15,700 US$
Max. revenue from cooling p.a.	-	14,500 US$
Total revenue p.a.	18,300 US$	30,200 US$
Payback period (without subsidies, US$0.28/kWh tariff)	CAPEX hard to recover	<20 years

Source: Smith School research. See references 34, 35, 36



How to scale up renewables

Egypt Benban solar park Credit: Adobe Stock

7. Conclusions

The dearth of climate finance flows into developing countries – whether public or private, concessional or commercial – is a critical concern of international climate diplomacy. But as this report shows, scaling up renewable energy depends on developer appetite as much as on the availability of finance. The ability of local and international project developers to identify, structure, build and operate successful projects is key to unlocking finance and bringing renewable energy to the Global South.

The renewable energy transition needs private initiative — private finance to fund it and private sector expertise to help manage it. Scaling up this expertise will require tenacity and effort. Fortunately, there is a growing understanding of how to develop renewables projects in developing countries, with promising new business models and risk management strategies.

The growing experience in structuring and running successful renewables projects is a necessary but not a sufficient condition to scale up renewables. Renewable energy operators, whether on-grid or off-grid, are looking to host governments to create a reliable business environment that is conducive to renewable energy. International firms are also looking to development agencies, and export credit agencies to share risks and offer risk mitigation. Here too there are concrete, actionable measures that can be deployed to support project development.

The reward for deploying these tools is enormous. Renewable energy, chiefly solar and wind, is now the cheapest form of electricity in many countries. This, alongside progress in system operations and energy storage means renewables can effectively and simultaneously address the environmental, development and security of supply objectives of energy planners.

The indicator set we present for 64 countries makes clear that notable business opportunities exist across the developing world, driven not just by market growth and catch-up demand, but also by abundant renewable energy resources and the favourable economics of renewables in the local context. Renewable energy is the best strategy yet for bringing affordable energy to the hundreds of millions of people still lack access.

The stage is set for an effective, rapid roll out of renewable energy across the Global South. However, to fully realise this opportunity, local and international project developers must now step up their efforts. They need the support of policy makers and development agencies to close affordability gaps and mitigate market, governance and macroeconomic risks.

To advance this process, we put forward 10 concrete, actionable measures, identified by project developers, which the renewables sector must adopt to accelerate deployment.

Three-wheeler electric powered vehicle, Northern Uganda . Credit: Tonny Kukeera

Annex 1: Background on the survey

Survey Strategy

We conducted a short survey to gather practical insights from developers and operators of renewable energy projects. We were interested in particular in salient risks and risk perceptions about operating in the Global South, as well as prominent risk mitigation strategies.

Respondents were recruited in a targeted way through the SSE and SEforALL networks, as well as open-ended through LinkedIn. We were targeting local and international renewables operators and project developers that are either already active in the Global South or would consider becoming active. Respondents had to have at least one year of relevant work experience.

The survey was conducted online from September 2023 to October 2023. To ensure the study's integrity, a risk and ethics assessment was completed and approved by the Medical Sciences Interdivisional Research Ethics Committee at the University of Oxford in accordance with the procedures laid down by the University for ethical approval for all research involving human participants (reference: R74082/RE001).

Below, we present the profile of the 46 participants engaged in the survey and their background characteristics.

Respondent's position and experience

A majority of respondents (61%) held positions at the executive or senior management levels. The average years of work experience for participants in executive or senior management positions was 8.4 years, with three participants having worked in the field for more than 20 years. Eight participants (17%) had a background in business development, strategy, or policy analysis with an average work experience of 8.1 years. Ten participants (22%) came from an engineering or technical background with an average of 3.8 years of work experience.

For participants recruited from LinkedIn, we posed an additional question: 'How confident are you in your responses?' This allowed us to filter survey participants and ensure the quality of responses. On the four-point scale (ranging from high, somewhat, low, to not confident), of the 19 respondents, 9 expressed high confidence, while 10 indicated they were somewhat confident in their responses. A clear correlation emerged between years of work experience and self-assessed confidence: respondents who expressed high confidence typically had more than 3 years of work experience, whereas those who were somewhat confident averaged 2.3 years of experience.

Company affiliation

Most respondents (72%) are associated with multi-functional firms that offer a range of services. These services encompass energy generation, energy storage and distribution, project development and construction, operations and maintenance, energy efficiency and management, research and development, energy retail and trading, consulting and advisory services, investment and finance, and manufacturing and supply chains. Among these services, 65% of respondents are involved in energy

generation, 61% in energy storage and distribution, and 50% in project development and construction.

Project involvement

In terms of geographic focus, 57% of respondents identify as local developers, concentrating solely on renewable projects in a single country. The other 43% manage projects across multiple countries and are categorised as international developers for this study. A significant majority (63%) have projects or investments in the Global South. Additionally, 22% are considering future project development or investment in the region. Among the seven respondents not currently active in the Global South, four are receptive to future opportunities there, while three would contemplate involvement if perceived risks are addressed.

Concerning the type of energy projects, 39% are engaged in both on-grid and off-grid operations. Among those who focus on a singular type of project, 37% are specifically involved in off-grid operations, while the remaining 20% are exclusively engaged in on-grid initiatives.

Most respondents (78%) are involved in solar projects, followed by 35% in wind projects and 20% in bioenergy projects. One respondent specializes in hydro projects, whereas two others are engaged in the battery industry.

Annex 2: Renewable energy opportunities by country

Country	Region	Market growth	Development needs	Price competitiveness	Country context	Business enablers
Cambodia	East Asia & Pacific	0.74	0.88	0.39	0.15	0.51
China		0.74	0.00	0.95	0.49	0.79
Indonesia		0.74	0.81	0.24	0.57	0.37
Lao PDR		0.64	0.80	0.26	0.20	0.06
Malaysia		0.73	0.13	0.21	0.81	0.80
Mongolia		0.70	0.56	0.61	0.54	0.64
Philippines		0.71	0.84	0.29	0.39	0.75
Thailand		0.61	0.50	0.37	0.48	0.63
Vietnam		1.00	0.58	0.05	0.45	0.66
Armenia	Europe & Central Asia	0.89	0.60	0.37	0.52	0.75
Azerbaijan		0.29	0.60	0.26	0.27	0.31
Bosnia and Herzegovina		0.62	0.35	0.11	0.30	0.54
Georgia		1.00	0.36	0.18	0.78	0.49
Kazakhstan		0.44	0.00	0.16	0.45	0.66
Moldova		0.78	0.45	0.05	0.46	0.71
North Macedonia		0.69	0.36	0.26	0.63	0.88
Serbia		0.84	0.12	0.08	0.53	0.39
Turkey		0.95	0.34	0.74	0.33	0.71
Argentina	Latin America & Caribbean	0.37	0.45	0.29	0.45	0.77
Bolivia		0.66	0.86	0.63	0.14	0.46
Brazil		0.80	0.46	0.13	0.43	0.83
Chile		0.40	0.30	0.97	1.00	0.86
Colombia		0.60	0.74	0.34	0.47	0.91
Costa Rica		0.52	0.62	0.37	0.95	0.47
Dominican Republic		0.70	0.74	0.55	0.59	0.71
Ecuador		0.26	0.71	0.00	0.39	0.50
El Salvador		0.39	0.81	0.66	0.36	0.57
Guatemala		0.45	0.87	0.47	0.18	0.63
Honduras		0.46	0.81	0.45	0.13	0.41

Country	Region	Market growth	Development needs	Price competitiveness	Country context	Business enablers
Jamaica	Latin America & Caribbean	0.67	0.74	0.50	0.73	0.46
Mexico		0.45	0.55	0.61	0.27	0.50
Nicaragua		0.27	0.86	0.37	0.01	0.46
Paraguay		0.52	0.70	0.45	0.35	0.10
Peru		0.48	0.71	0.63	0.43	0.66
Algeria	Middle East & North Africa	0.00	0.71	0.66	0.10	0.60
Egypt		0.75	0.69	0.79	0.20	0.48
Jordan		0.56	0.67	0.79	0.58	0.54
Morocco		0.52	0.81	0.68	0.43	0.63
Tunisia		0.39	0.72	0.61	0.49	0.44
Bangladesh	South Asia	0.98	0.92	0.29	0.13	0.61
India		0.81	0.80	1.00	0.55	1.00
Nepal		0.75	0.95	0.34	0.29	0.44
Pakistan		0.57	0.89	0.61	0.14	0.58
Sri Lanka		0.63	0.88	0.45	0.50	0.51
Benin	Sub-Saharan Africa	0.66	0.99	0.42	0.40	0.52
Botswana		0.54	0.74	0.74	0.95	0.07
Ghana		0.48	0.90	0.34	0.60	0.35
Guinea		0.49	0.97	0.53	0.00	0.05
Ivory Coast		0.60	0.94	0.32	0.29	0.42
Kenya		0.58	0.97	0.53	0.27	0.41
Lesotho		0.50	0.93	0.74	0.33	0.14
Madagascar		0.56	0.99	0.61	0.11	0.43
Malawi		0.21	0.99	0.58	0.39	0.50
Mauritania		0.16	0.93	0.63	0.12	0.00
Namibia		0.26	0.75	0.82	0.77	0.43
Nigeria		1.00	0.98	0.45	0.02	0.61
Rwanda		0.71	0.99	0.37	0.65	0.37
Senegal		0.80	0.94	0.58	0.57	0.53
Sierra Leone		0.19	1.00	0.37	0.22	0.27
South Africa		0.35	0.38	0.21	0.61	0.62
Tanzania		0.42	0.98	0.53	0.28	0.54
Togo		0.63	0.98	0.39	0.18	0.36
Uganda		0.54	0.99	0.53	0.21	0.31
Zambia		0.09	0.86	0.66	0.27	0.41

Data sources

The indicator for market growth is measured using short-term GDP growth forecasts from the International Monetary Fund.[44]

The indicator for development needs is measured using World Bank data on current electricity consumption per capita. [45]

Price competitiveness reflects the long-run costs of solar electricity (LCOE) in a country, taken from Global Solar Atlas. [46]

The country context ranking reflects countries' average score over the six World Bank Governance indicators. They include (i) Rule of Law, (ii) Control of Corruption, (iii) Voice and Accountability, (iv) Regulatory Quality, (v) Political Stability and Absence of Violence/Terrorism, and (vi) Government Effectiveness. [47]

The ranking for sector enablers reflects a country's score on Power Sector Fundamentals in BNEF's *ClimateScope.*[48]

Methodology

Indicators were normalised to yield scores between 0 and 1, where 1 reflects the best performance in the sample and 0 the worst performance.

For indicators where a higher score signifies better performance (e.g., market growth) the normalisation followed the formula (gi-gmin)/(gmax-gmin), where gi. refers to the score of country i for indicator g. The variables gmin and gmax refer, respectively, to the worst and highest-scoring countries for indicator g.

For indicators where lower scores are better (e.g., solar costs) the normalisation followed the formula (1- (gi-gmin))/(gmax-gmin), so that a higher score signifies better performance.

The normalisations ensure that the best-performing country has a score of 1 (since gi=gmax) and the worst-performing country has a score of 0 (since gi=gmin). In series with significant outliers, results were capped at the third highest / lowest score, that is, more than one country may obtain the minimum or maximum score.

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