ENERGIZING FINANCE
RESEARCH SERIES

SUSTAINABLE ENERGY FOR ALL

CLIMATE POLICY INITIATIVE

ENERGIZING FINANCE: UNDERSTANDING THE LANDSCAPE 2020

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FOREWORD

This decade has been labelled the Decade of Action on the Sustainable Development Goals (SDGs). There is widespread recognition that the clock is running out to achieve the SDGs and that the global community needs to move past problem dimensioning or consensus building, focusing instead on concrete measures that will enable the SDGs.

The organizations behind this report – Sustainable Energy for All (SEforALL) and Climate Policy Initiative (CPI) – often point out how all of the SDGs, including those related to climate, gender equality and health, hinge on access to affordable, reliable, sustainable and modern energy for all, as called for by SDG7. Energy access is needed by developing countries to grow their economies and improve people's livelihoods. And by ensuring the energy comes from clean sources, we can preserve people's health and the environment we all share.

This was true before 2020. Yet this year, COVID-19 has brought even greater attention to the importance of energy access. The outbreak of the pandemic has highlighted energy's pivotal role in powering infrastructure and healthcare services, including cold chains that will be required for an eventual vaccine.

With this fresh in our minds, a global recovery from COVID-19 and a Decade of Action on the SDGs must be underpinned by a decade of investment in sustainable energy.

Now in its fourth year of publication, *Energizing Finance: Understanding the Landscape 2020* identifies public and private finance commitments for energy in 20 developing countries – known as the high-impact countries (HICs) – that together are home to nearly 80 percent of those living without access to sustainable energy. This analysis highlights where critical investments are needed to achieve SDG7 and provides recommendations to overcome current barriers that are hindering financial flows to energy access.

Unfortunately, this year's report once again identifies chronic underinvestment in electricity and clean cooking access in the HICs. While it finds increased finance commitments compared to previous years, we are still nowhere close to the annual investment required to achieve universal electricity and clean cooking access, especially in Sub-Saharan Africa, which is home to the majority of the HICs. This year's research found that less than 20 percent of total energy finance commitments for the HICs was directed to Sub-Saharan Africa. In short, investment is not going to the countries that need it most.

Ahead of a pivotal COP26 and at a time when bold action is needed to address the climate emergency, we identified increases in fossil fuel finance for the year 2018. Fossil fuels accounted for the largest portion of electricity finance flows to HICs for the first time in at least six years. Meanwhile, financing for grid-connected renewables declined for the first time since 2013.

Even though *Energizing Finance: Understanding the Landscape 2020* is based on 2018 data, we pinpoint current signals that some countries are falling back on fossil fuels to support their COVID-19 recoveries. This is the opposite of what the world needs to fight the pandemic and to 'Recover Better.' Continued reliance on fossil fuels means forgoing the economic opportunity of localized, renewable energy systems, which create jobs and boost developing countries' GDP. Facilitating carbon emissions that will reduce air quality is also counterproductive when we know that the virus attacks people's respiratory systems. This report calls for an immediate end to the financing of fossil fuels.

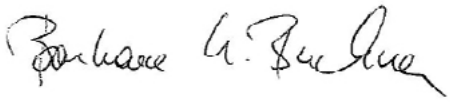
Importantly, *Energizing Finance: Understanding the Landscape 2020* highlights how countries can shift away from promoting fossil fuels to catalyse investment in technologies such as mini-grids and off-grid systems to support improved energy access. Rwanda is held up as an example of how smart policy choices, such as a robust national electrification plan and restructuring key energy agencies, can foster a surge in public and private investment for energy access.

Clean cooking access remains a pernicious problem affecting billions of people across the globe. Yet we show that of the little finance committed for clean cooking in 2018, it mostly benefitted just one country: Bangladesh. Accordingly, we offer a case study of clean cooking in Bangladesh to provide insights into how the country has attracted finance and the challenges it faces in converting finance into impact for its citizens.

The bottom-line underscored by *Energizing Finance: Understanding the Landscape 2020* is simple: we cannot continue to neglect investment in electricity and clean cooking access if we are to achieve SDG7 and deliver on the promise of the Paris Agreement, let alone respond to and recover from COVID-19.

In this Decade of Action, we need all energy stakeholders to recognize the urgency of the situation we face. The insights found in the coming pages and in SEforALL's *Energizing Finance: Missing the Mark 2020* report, which focuses on the disbursement of energy finance commitments, will give you the evidence you need to act. Both of our organizations invite you to collaborate with us so we can get finance flowing to the right places and solutions, and for the people who need it most, leaving no one behind.

DAMILOLA OGUNBIYI
CEO and Special Representative of the UN Secretary-General for Sustainable Energy for All and Co-Chair of UN-Energy



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EXECUTIVE SUMMARY

Despite significant advances over the last decade, electricity and clean cooking access continue to elude more than 789 million and 2.8[1] billion people, respectively, around the world. The COVID-19 pandemic has highlighted the severe implications that a lack of reliable energy access can have on healthcare systems, water and sanitation services, clean cooking, and communication and IT services. This has served as a wake-up call to accelerate action to achieve Sustainable Development Goal 7 (SDG7) — access to affordable, reliable, sustainable and modern energy for all — by 2030 to ensure that past progress is not reversed and that developing countries increase their resilience to future challenges.

The *Energizing Finance: Understanding the Landscape* report, developed by Sustainable Energy for All in partnership with Climate Policy Initiative and produced annually since 2017, provides a comprehensive analysis of commitments flowing to the two key areas of energy access: electrification and clean cooking. This fourth edition of the report tracks finance for electricity and clean cooking committed in 2018 to 20 Sub-Saharan African and Asian countries — known as the high-impact countries (HICs) — that together are home to more than 80 percent of people globally without energy access.

Year after year we continue to observe a widening cumulative gap between required and actual investment to achieve universal energy access in HICs, with finance not flowing to those most acutely in need. With less than a decade left to achieve universal energy access, we need to move far beyond a business-as-usual, incremental approach. This will require an unprecedented collaboration between donor and national governments, development finance institutions (DFIs) and private investors to align all financing for SDG7.

We need innovation in policies and regulatory frameworks, institutions and instruments, and business models to speed up efforts. National governments should commit to domestic policies that prioritize sustainable solutions to support green recovery while ensuring efficient use of limited public budgets. Donors and DFIs should deploy a wider range of instruments to manage, share and reduce risk, while working more closely with governments and the private sector to mobilize investment for energy access. It is especially crucial in the era of COVID-19, when public budgets and private investments are drying up, that donors fill the investment gaps rather than contribute to them.

While this report tracks the energy access financing landscape of 2018, its development has been influenced by the COVID-19 pandemic. The recommendations provided are intended to lay the foundations for long-term, green, resilient and inclusive growth. Many developing countries have achieved significant progress in recent years, and we must ensure that they continue to make similar advances despite current challenges.

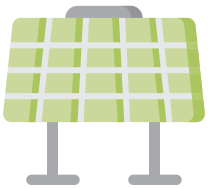
For instance, previous reports highlighted India's rapid progress towards universal electrification, driven by its ambitious policy target of 175GW of renewable energy generation by 2022 and the resulting increase in private sector investment. However, in response to COVID-19, the Government of India has commenced the commercial auctioning of more than 41 coal mines, aimed at making India 'self-reliant' and attracting USD 4.4 billion in private sector investment (Hindu 2020). We must prevent these types of policy reversals if we are to realize a long-term, green, resilient and inclusive economic recovery after COVID-19.

[1] This number grows to an estimated 4 billion people without access to modern energy cooking services (MECS) i.e. those who have met the standards of tier 4 or higher across all six measurement attributes of the World Bank's Multi-Tier Framework (MTF) (ESMAP 2020a).

KEY MESSAGES: ELECTRICITY AND CLEAN COOKING FINANCING

Finance for energy access remains far below the investment needed to achieve SDG7 by 2030: USD 41 billion of annual investment is required to achieve universal residential electrification, but only one third, or USD 16 billion, was tracked in the HICs[2] in 2018. Finance for clean cooking tripled from USD 48 million in 2017 to USD 131 million in 2018 but remains substantially below the estimated annual USD 4.5[3] billion required to achieve universal access by 2030. With only marginal year-on-year increases in commitments for energy, it is becoming increasingly clear that the financing community is failing to deliver on SDG7.

Investments are not going to the countries with the greatest need: In 2018, USD 3.3 billion of electricity access finance was committed to the 14 HICs in Sub-Saharan Africa (SSA) — less than 20 percent of total finance targeting residential access in the HICs — while SSA accounts for 70 percent of people in HICs without electricity access. The six HICs with the lowest electricity access rates, where more than 70 percent of the population does not have access to electricity — Burkina Faso, Chad, Congo (DR), Madagascar, Malawi and Niger — were all in the bottom half of the HICs in terms of finance for electricity committed. Similarly, for clean cooking, 18 countries (excluding Bangladesh and Kenya) that are home to over 2.2 billion people without access to clean cooking solutions attracted only 25 percent of the investment tracked. Countries like Congo (DR) and Ethiopia, where 95 percent of the population lacks access to clean cooking, attracted less than 1 percent of the annual investment they needed.



Investment is not flowing to the right energy solutions, which can jeopardize the attainment of other SDGs: Investment in fossil fuel generated electricity has increased, locking countries into decades of carbon emissions, import dependency and stranded asset risk. Fossil fuels accounted for the largest portion of electricity finance commitments to HICs for the first time in at least six years, driven largely by grid-connected fossil fuel projects in Bangladesh. Meanwhile, financing for grid-connected renewables declined for the first time since 2013. Also, finance for mini-grids and off-grid solutions remained at less than 1-1.5 percent of the total finance tracked for electricity. This limited volume of investment is unacceptable in light of the collateral damage: issues of gender equality, economic opportunity, climate change, and protection of land and forests are all suffering from this inertia.

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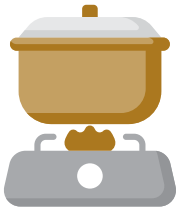
[2] The previous three editions of this report tracked only the top 20 energy-deficient countries taken from the Global Tracking Framework 2015 (IEA and the World Bank 2015). Due to the changes in the HICs in this edition, the report now tracks 20 electricity-deficient countries with two new additions: Chad and Pakistan. Afghanistan and the Philippines are no longer tracked because of their recent progress in electricity access. For clean cooking, apart from the old HICs, the report also tracks Ghana, while Nepal is no longer tracked.

[3] This number is estimated at USD 9.8 billion per annum to achieve modern clean cooking access, which corresponds to achieving at least tier 2 access (ESMAP 2020a). In contrast to the stated IEA required investment numbers, the ESMAP figure also includes public actors' expenditure such as that for fuel subsidies, which is not tracked in the report.

The overall energy access investment portfolio continues to be dominated by a few large projects and a handful of capital providers: This is particularly true of clean cooking investment, as it is dominated by public funding originating from a small number of institutions. For instance, Bangladesh alone accounted for 47 percent of total tracked clean cooking investment, arising mainly from two large projects financed by the World Bank Group and the Green Climate Fund.



Private sector investment remain elusive in the clean cooking sector: Private finance commitments increased only marginally to USD 32 million in 2018, from USD 21 million in 2017. However, unlike public finance that focuses mainly on improved cookstoves (ICS), private sector finance flowed to a range of modern or renewable fuels, such as ethanol, biogas and LPG. The overall lack of investment can be attributed to limited public finance to alleviate risk for private sector investors and to stimulate consumer demand.

RECOMMENDATIONS

Coordinated action from DFIs and donor governments is needed in SSA. Year after year, countries, particularly in SSA, receive low or zero energy access finance from donor governments and DFIs. These countries also face significant governance and sovereign credit challenges, limiting their ability to mobilize private finance. It is critical for donor governments and DFIs to: (1) systematically expand their energy access investment portfolios in these economies by incorporating co-benefits and interlinkages of these investments to meet several SDGs simultaneously; (2) scale up support through risk mitigation instruments and processes, including currency risk management solutions, guarantees and project preparation support, to alleviate risk and mobilize private sector investment; and (3) move from the current lumpy and unstructured financing of single energy projects to a more holistic approach to financing energy access at country level, grounded in efficient, modern and sustainable energy solutions.

Investment in renewable energy and transmission and distribution infrastructure should be accelerated to achieve energy access while maximizing synergies with the SDGs. Renewable energy investments offer three key benefits: (1) progress towards a number of SDGs, including climate action and improved health and living conditions in poor societies; (2) they contribute to green economic recovery and long-term economic and social relief; and (3) they move countries towards achieving their Nationally Determined Contributions (NDCs).

Financing of fossil fuel projects as a means of closing the energy access gap should be terminated. A large portion of finance tracked in this report supported fossil fuel projects, mostly heavily polluting coal power plants. Countries like China — whose majority of international financing was directed to fossil fuel projects — need to align their international financing activities with their domestic narratives. China's recent commitment to national carbon neutrality before 2060 (NYT 2020) and an emissions peak in the next decade are critical steps, which should also be reflected in its international policy, replacing financing for fossil fuel projects overseas with strong support for renewable energy projects. Also, India's pursuit of a fossil-fuel based economic recovery post COVID-19 could be counterproductive in the long run, with severe health and economic implications (Livemint 2020).

Policy reform and the adoption of sustainable and innovative business models and financial instruments are important to accelerate deployment of mini-grids and off-grid solutions. These investments face common barriers across the HICs analysed, such as unsupportive policies and regulatory environments, small investment ticket sizes, limited access to expansion

capital, de-risking instruments and local currency finance (CPI 2020). As seen in the Rwanda case study (Chapter 3), clear policies for mini-grid developers, which include licensing requirements, tariff regulations, provisions for grid arrival and risk mitigation facilities, have increased private sector participation in Rwanda's electricity sector.

National governments are instrumental in expanding clean cooking access through targeted subsidies and policy support. Countries like India and Indonesia have shown rapid progress in access as a result of ambitious domestic programmes, especially for urban populations. Clean cooking access in Indonesia increased from 41 percent in 2016 to 80 percent in 2018, with levels of 91 percent for urban and 68 percent for rural access, mainly supported by a government-led kerosene-to-LPG fuel conversion programme. There is a pressing need for governments to: (1) design and implement cost-effective, sustainable and cross-ministerial programmes targeting vulnerable populations; (2) remove barriers that prevent small and medium-size enterprises (SMEs) and other innovators from accessing finance; (3) provide strong enabling environments by phasing out subsidies for polluting fuels like kerosene and removing taxes on clean cooking stoves and technologies; and (4) promote market transformation strategies with coordinated commitments from multiple donors and national governments.

There is an urgent need to expand innovative clean cooking business models and financing mechanisms to a larger group of technologies. ICS are dominating the clean cooking investment market while investments in more innovative solutions like ethanol, solar and electric cooking remain sluggish. It is important to adapt and scale those models that have successfully supported emerging technologies in countries around the world to new contexts, ensuring that public finance is used in similar ways to de-risk private sector investment in nascent technologies and fuels. Carbon offset mechanisms, for instance, could be instrumental to move the needle for energy access investments, provided that negotiations around Article 6 of the Paris Agreement conclude successfully.

In addition to capturing finance commitments for energy access, *Energizing Finance: Understanding the Landscape 2020* provides deep-dive analyses of Rwanda and Bangladesh and proposes a framework to improve the accuracy and consistency of reporting finance for projects with gender equality objectives.

IMPACT OF POLICIES ON ELECTRICITY FINANCING IN RWANDA[4]

With smart policy choices, Rwanda has witnessed a significant transformation of its energy sector in recent years. It managed to attract additional financial resources and improve its energy access situation, increasing access from 10 percent of the population in 2010 to 35 percent in 2018.

Rwanda was one of the top three fast movers globally in electricity access between 2010 and 2017, scoring higher than the average of other low-income SSA countries in 20 out of 28 indicators captured in the World Bank's Regulatory Indicators for Sustainable Energy (RISE) index.

Expansion of the national electrification plan to encompass off-grid solutions, implementation of a cost-reflective tariff structure while ensuring electricity is affordable to poor households, and restructuring its key energy sector agencies were instrumental changes that Rwanda enacted in the period 2013-2016 and that mobilized public and private investment to levels that were three to five times higher than those of other low-income countries in SSA.

Despite this substantial progress, this report identifies other areas where improvement and action are possible, such as prioritizing energy efficiency, mainstreaming gender considerations into all policies and programmes, and including informally-settled people in electrification plans to provide an integrated approach to electricity access and the energy sector.

[4] Rwanda is not one of the 20 HICs tracked in the current edition of the report.

CLEAN COOKING IN BANGLADESH

Bangladesh was the global hotspot for clean cooking financing in 2018, accounting for 47 percent of total investment and 78 percent of all public finance tracked. Finance commitments were dominated by a few large projects targeting access through ICS, biogas digestors and LPG. Despite several public sector led programmes over the last years, the percentage of people with access to clean cooking in Bangladesh increased only marginally, with more than 130 million people still without access to clean cooking alternatives in both rural and urban areas. Affordability issues, lack of awareness of health benefits and alternative technologies, and other socio-cultural reasons continue to limit the spread of clean cooking solutions.

With Bangladesh currently working on its revised National Action Plan for Clean Cooking, there is a clear need to provide more incentives for the private sector to invest in alternative technologies and fuels, such as ethanol, pellet-based ICS and biogas. Also, there is potential to explore adoption and scale-up of digital innovations across the clean cooking value chain, including innovative business and financing models to reduce distribution costs and increase affordability. Even traditional financing mechanisms, such as microfinance, a relatively mature finance sub-sector in Bangladesh, do not have many scaled examples of lending for ICS purchases.

FINANCE FOR GENDER-FOCUSED ENERGY ACCESS

Finance for energy access with a specific gender focus has increased over the last decade, but it remains a small share (2–11 percent) of total official development assistance (ODA) in the energy sector, and it is highly concentrated amongst a few donors – 93 percent of total finance reported is from only 10 agencies.

Interviews with experts suggested that there is a lack of clear guidance and definition for how the concept of "gender equality" should be applied to the energy sector. Also, data aggregators have limited capacity to independently verify information from reporting institutions, which has led to inconsistencies in reporting projects' gender outcomes.

To move towards resolving those inconsistencies, this report proposes a novel three-step methodology that project implementers can adopt to enhance the tracking of finance to energy access projects with a gender equality objective: (1) set out the context of gender inequality in the sub-sector and region where the project will be implemented, referencing types of inequalities; (2) establish and state the project's intent to address the identified gender inequality; and (3) demonstrate a direct link and/or outcome between the identified gender inequality context and the financed activities. It is critical that donors direct sufficient financial resources and human expertise to ensure project managers and other project personnel have the capacity to accurately report against gender equality markers.

CHAPTER 1

INTRODUCTION

Photo by: Asian Development Bank

CURRENT ENERGY ACCESS SITUATION

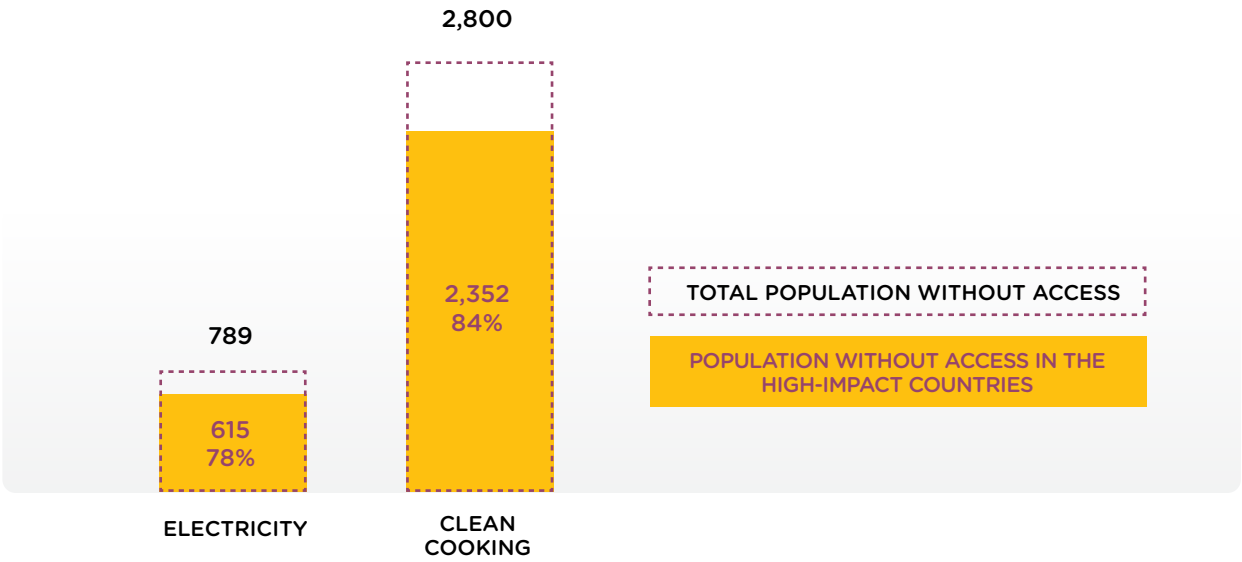
The COVID-19 pandemic is a stark reminder of the pivotal role energy access plays in addressing some of the world's major challenges – healthcare, gender inequality, climate change and poverty. According to World Bank estimates, COVID-19 is expected to push close to 180[5] million people into extreme poverty in 2020 and 2021, which will exacerbate existing levels of energy poverty in South Asia and Sub-Saharan Africa (SSA) (Mahler et al 2020).

In recent years, several countries have shown progress in improving electricity access, with the number of people without access decreasing from 1.2 billion in 2010 to 789 million in 2018. However, the clean cooking access situation remains dire, with more than 2.8[6] billion people without access to modern clean cooking solutions. With current policies and financing levels, projections show that by 2030, 620 million people could remain without access to electricity and 2.3 billion without clean cooking solutions.

It is "SOS" time for energy access: Speed, Outcomes, and Scale to not only 'leave no one behind' but also ensure a 'secure, resilient and sustainable future for all'.

This report analyses finance directed to countries with the largest energy access deficits in the world (more details on the high-impact countries (HICs) are provided in Box 1). These countries represent more than 78 percent and 84 percent of the global electricity and clean cooking access shortfall, respectively (see Figure 1).

FIGURE 1
Total population in the high-impact countries without energy access tracked in this report (millions)



Source: IEA, IRENA, UNSD, World Bank, WHO 2020. Tracking SDG 7: The Energy Progress Report. World Bank and CPI's own estimates using the World Bank's indicators on population and access levels in 2018.

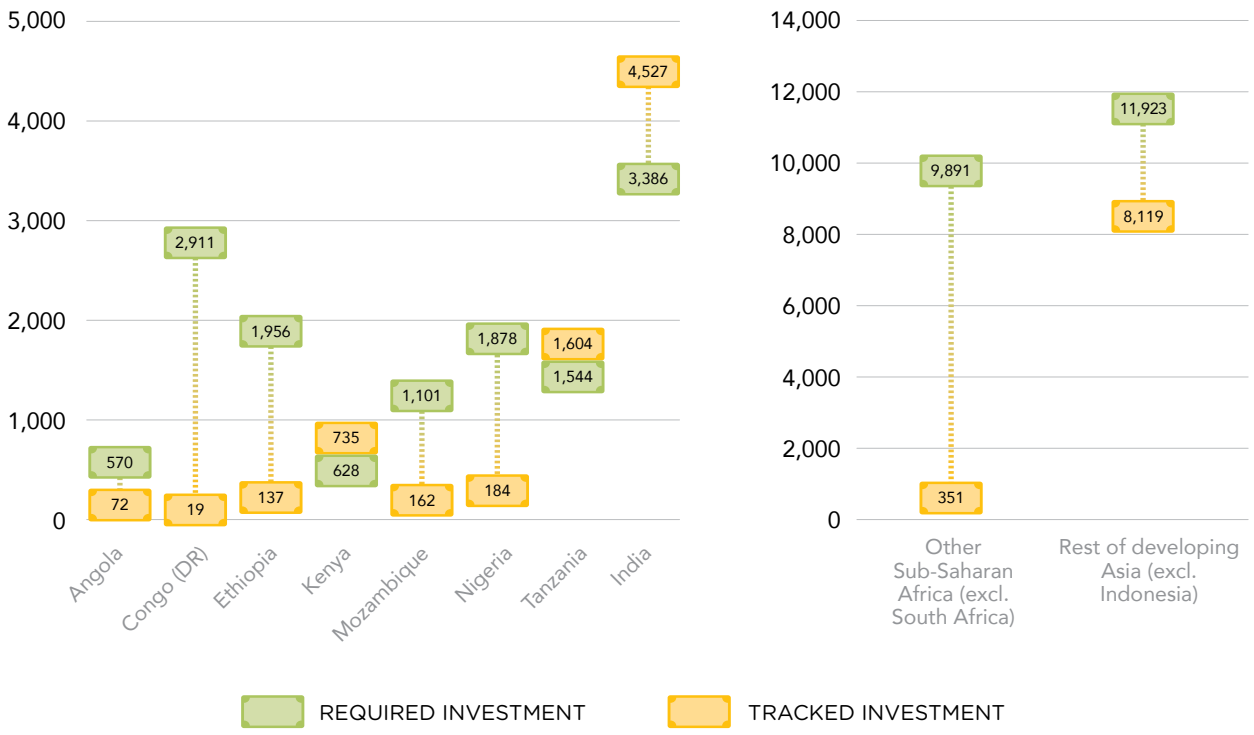
[5] This range of 71-176 million is based on estimates using the international poverty line of USD 1.90 and 3.20 USD per day, respectively.
[6] This number is estimated at 4 billion for people without access to modern energy cooking services, i.e. those who have met the standards of Tier 4 or higher across all six measurement attributes of the World Bank's Multi-Tier Framework (ESMAP 2020a)

To achieve universal electricity access by 2030, SSA needs an estimated USD 20.5 billion[7] per year in investment, while South Asia needs USD 15.3 billion (IEA[8] 2019a). For clean cooking access, the need in SSA is USD 2.4 billion per year and in South Asia USD 2.1 billion per year. However, with a few exceptions, including India, Kenya and Tanzania, most countries continue to see severe underinvestment (Figure 2). Indeed, seven of the 14 SSA countries tracked for this report received less than USD 100 million for residential electricity access in 2018 – a small fraction of the required investment per annum (Figure 2). A step change is needed to accelerate investment to cover financing gaps that have accumulated over previous years and to meet current needs.

The situation is worse for the clean cooking sector where countries such as the Congo (DR) and Ethiopia, with nearly 95 percent of their populations without access to clean cooking fuels and technologies, received negligible finance commitments (Figure 3).

FIGURE 2

Electricity – Required investment and tracked electricity access investment (USD million, per annum)



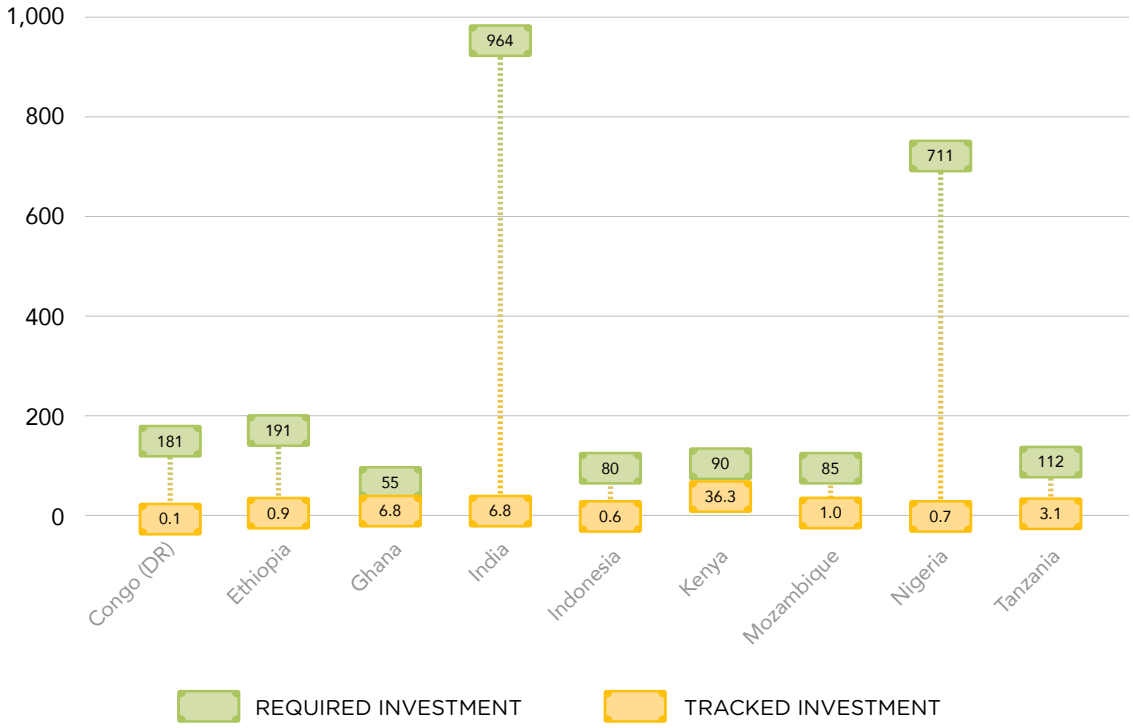
Note: The tracked investment numbers for "Other Sub-Saharan Africa (excl. South Africa)" include estimates for Burkina Faso, Madagascar, Malawi, Mali, Niger, Sudan and Uganda. The required investments numbers for "Other Sub-Saharan Africa (excl. South Africa)" include all SSA economies except South Africa. The "Rest of developing Asia" includes Bangladesh, Myanmar and Pakistan.

[7] IEA estimates of required investments refer to generating assets and new transmission and distribution networks with a focus on household access. These include centralized power plants (e.g. coal, natural gas, hydro, solar photovoltaic, biogas, wind), mini-grid, and standalone systems and exclude pico solar products, mainly solar lanterns as they are considered to be below the minimum threshold to count as access by a household.

[8] The country-level annual investments needed for African countries are based on IEA's African Outlook from 2019 to 2030 to reach full access by 2030. The India and other estimates are based on annual investments needed to reach full access in IEA's Sustainable Development Scenario. The required investment estimates are available for only a few countries and not all the HICs.

FIGURE 3

Clean cooking - Required investment and tracked investments (USD million, per annum)



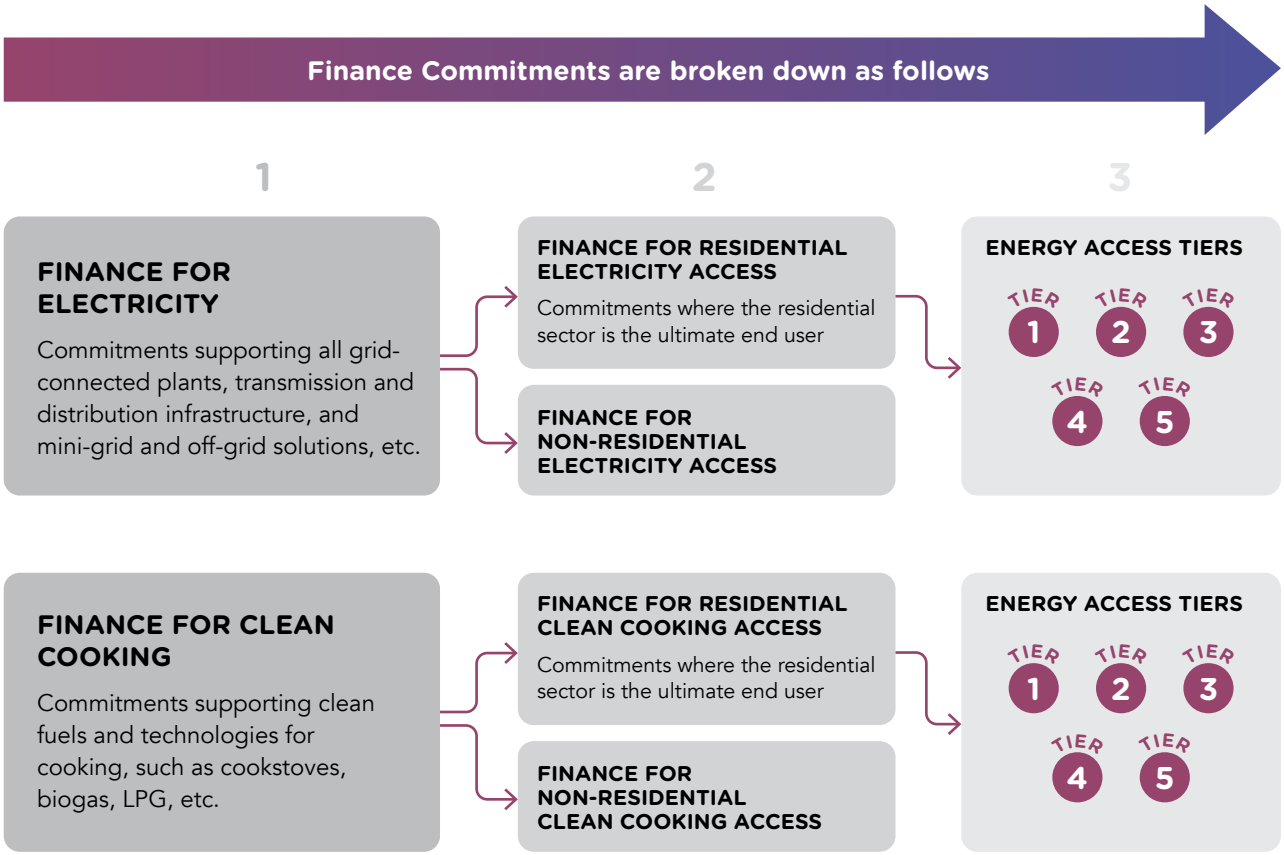
SUMMARY OF METHODOLOGY

This report follows a three-step approach to provide a comprehensive overview of finance for energy access:

1. **Identify financial commitments to the energy sector:** The report tracks financial commitments, i.e. transactions, that reached financial close, or were backed by the necessary funds, flowing to the electricity and clean cooking sectors in 2018. SEforALL's *Energizing Finance: Missing the Mark reports* (SEforALL and AfDB 2017 and forthcoming 2020 edition) assess the gaps between finance commitments and actual disbursements.
2. **Allocate tracked commitments to the residential and non-residential sectors:** After identifying the total finance commitments relevant to clean cooking and electricity access in the HICs, the report allocates them to residential and non-residential consumption, using assumptions about the relative shares of power consumption in each country, available in the IEA's World Energy Balances 2020. Following the IEA's definition, this report considers energy access as 'household access,' which excludes access for businesses, public buildings, etc.
3. **Attribute residential access commitments to energy access tiers:** As the final step, the report allocates the residential element of the finance commitment to the appropriate energy access tier using the World Bank's Multi-Tier Framework (MTF). This allows it to consider energy access as a continuum, accounting for availability, reliability, quality, and affordability of service, instead of access being a binary measure (i.e. a household having or not having access).

The detailed methodology is available in the Annexes.

FIGURE 4
Tracking methodology



STRUCTURE OF THE REPORT

Chapters 2 and 4 analyse international and domestic finance commitments in 2018 for electricity and clean cooking access, respectively, in the tracked HICs. Chapter 3 looks at the impact of polices on renewable energy sector financing in Rwanda using the World Bank's Regulatory Indicators for Sustainable Energy (RISE) index. Chapter 5 analyses clean cooking finance in Bangladesh. Chapter 6 provides an update on the volume of public finance for energy access projects that target women and girls and proposes a methodological framework to improve the accuracy and consistency of reporting such finance.

CHANGES TO THE HIGH-IMPACT COUNTRIES (HICS)

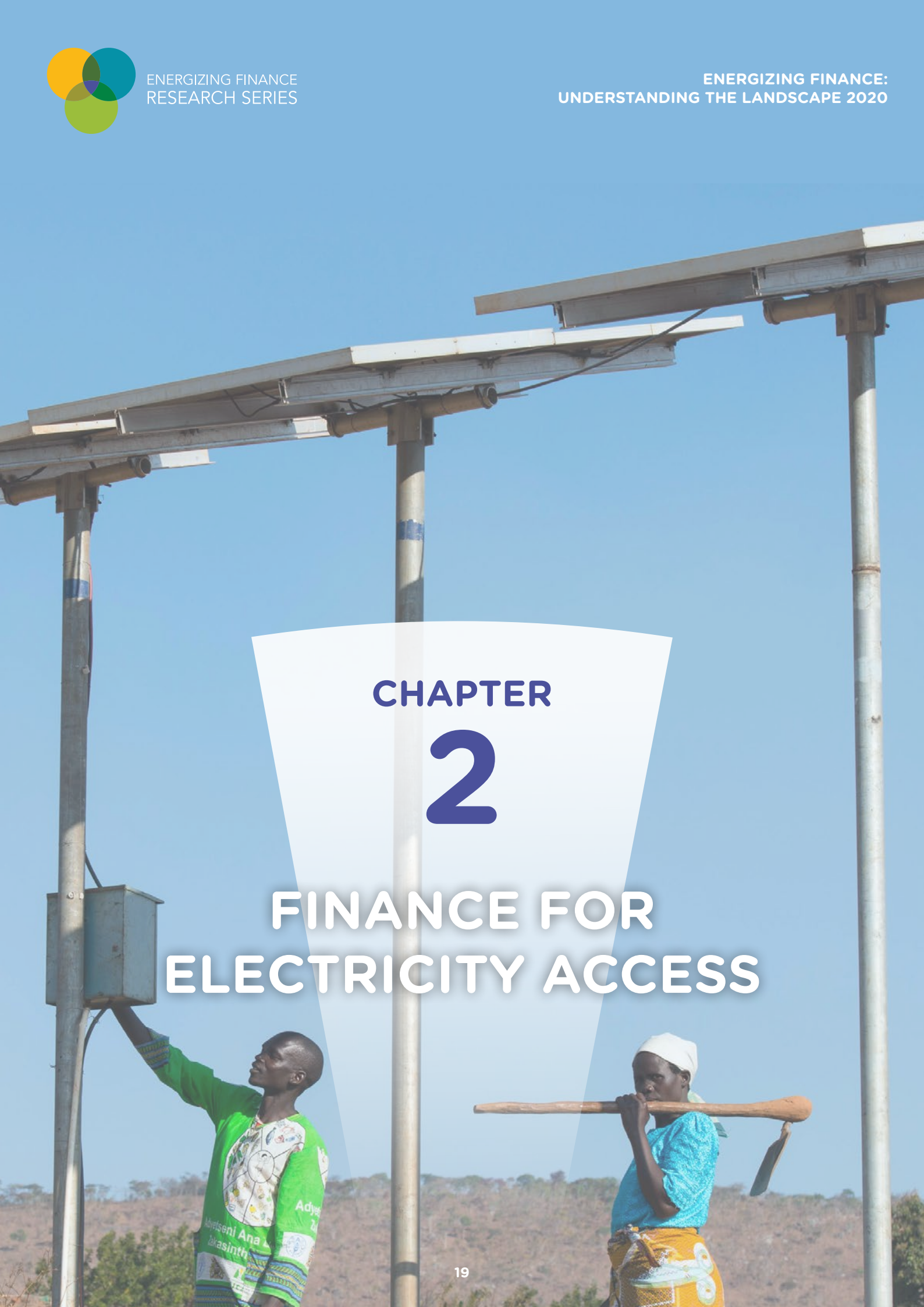
Much has changed since the first edition of this report. This is particularly true in Afghanistan and the Philippines, where substantial progress in electricity access has been achieved, thus moving both countries out of the HIC category. In contrast, in Pakistan the total population without energy access increased from 15 million in 2013 (SEforALL 2013) to 61 million in 2018 (IEA 2019b)[9]. The HICs tracked in the previous three editions of the report were taken from the Global Tracking Framework 2015 (IEA and the World Bank 2015), which provides the most up-to-date list of 20 top energy deficient countries.

To reflect these evolving realities of the energy access landscape, this year's report has changed the tracked HICs, adding the countries noted below as reported in the *Tracking SDG7: The Energy Progress Report 2020* (IEA et al 2020).

Access Type	Countries	New Additions	Exclusions
Electricity (20)	Angola, Bangladesh, Burkina Faso, Chad, Democratic People's Republic of Korea, Congo (DR), Ethiopia, India, Kenya, Madagascar, Malawi, Mozambique, Myanmar, Niger, Nigeria, Pakistan, Sudan, Uganda, United Republic of Tanzania, Yemen	Chad, Pakistan	Afghanistan, Philippines
Clean Cooking (20)	Afghanistan, Bangladesh, China, Democratic People's Republic of Korea, Congo (DR), Ethiopia, Ghana, India, Indonesia, Kenya, Madagascar, Mozambique, Myanmar, Nigeria, Pakistan, Philippines, Sudan, Uganda, United Republic of Tanzania, Vietnam	Ghana	Nepal

The changes in the HICs tracked in this year's report lead to comparability issues with previous editions.

[9] While Pakistan has undertaken significant efforts in recent years to expand electricity generation capacity and stabilize supply, significant challenges remain, associated with inefficiencies and uneven reform progress in the sector. The cash shortfall across the power supply chain in Pakistan has also increased over recent years to more than USD 10 billion and is a chronic issue ailing the country's power sector.

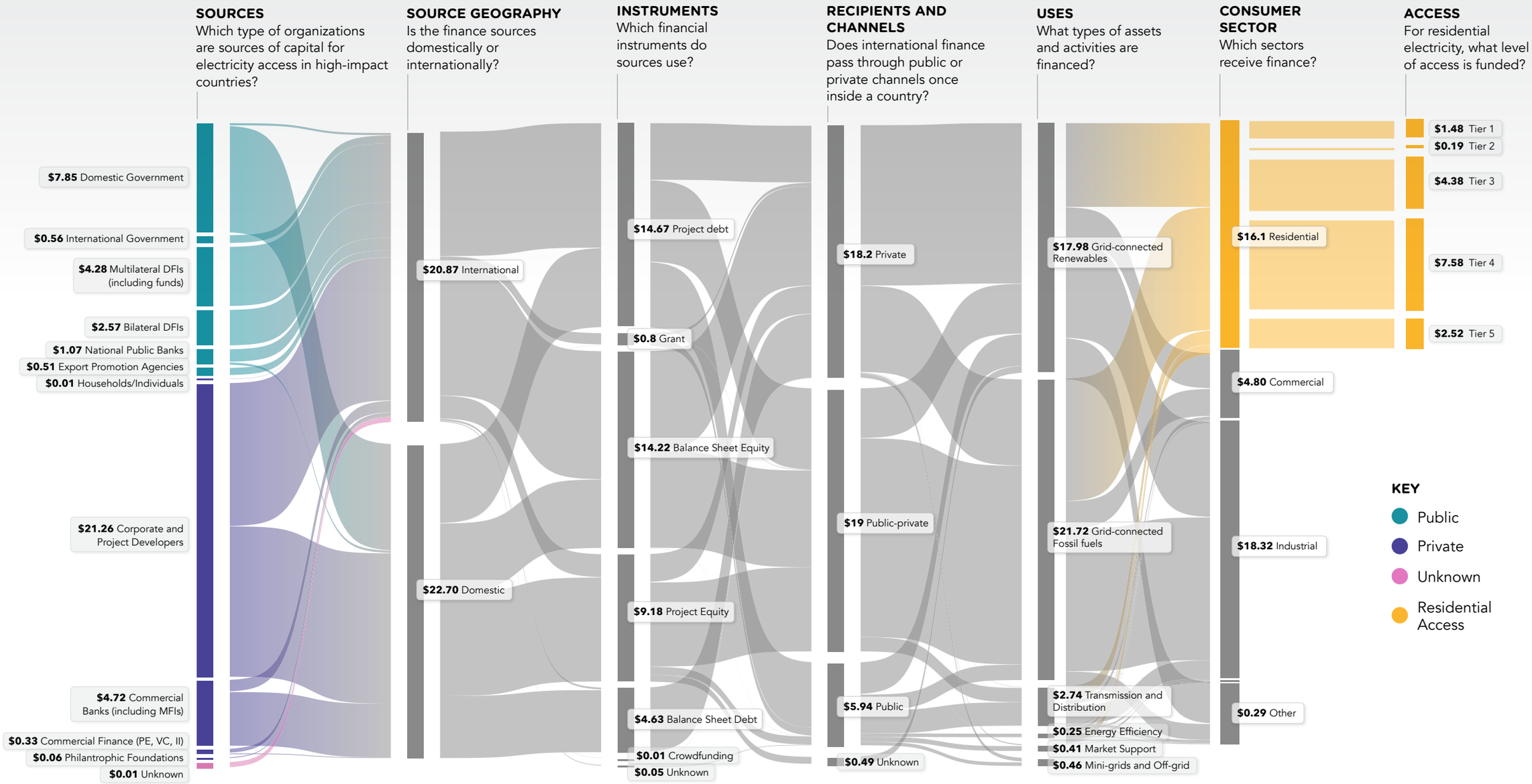


CHAPTER

2

FINANCE FOR ELECTRICITY ACCESS

TRACKED FINANCE FOR ELECTRICITY IN HIGH-IMPACT COUNTRIES (USD BILLION)



NB: Values may not add up due to rounding specific tier

Grid-connected renewables includes: Wind, Solar PV, Large hydro, Geothermal, Biomass and waste, Small hydro, Other / unidentified, Biofuels.

Grid-connected fossil fuels includes: Coal, Gas, Oil, Unspecified.

Transmission and distribution includes: Transmission, Distribution, Unspecified T&D.

Market support flows were not assigned to any specific consumer sector.

Energy efficiency flows were not assigned to any specific consumer sector.

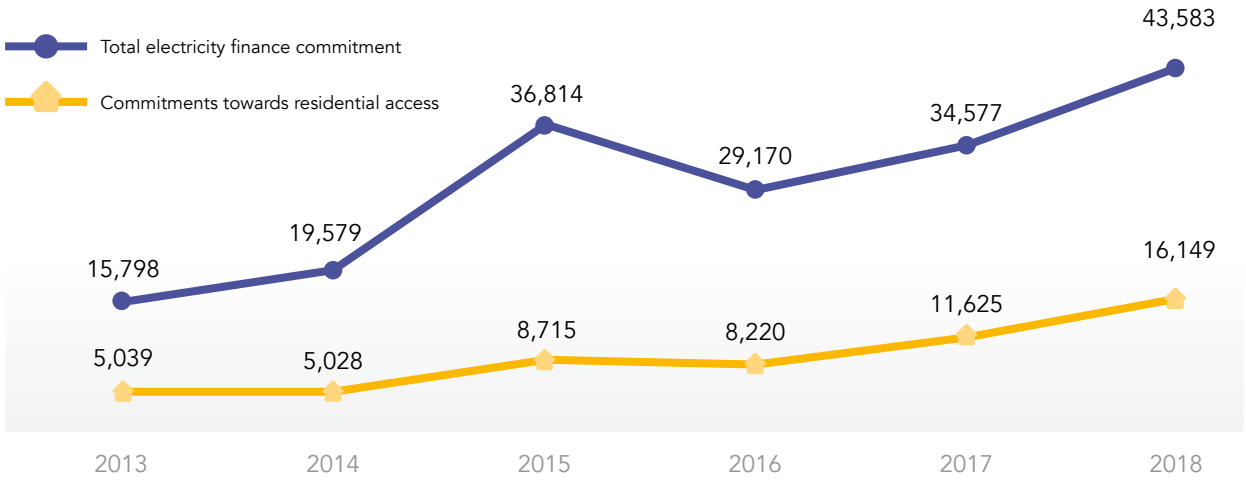
INTRODUCTION

Finance for electricity in the tracked high-impact countries (HICs) increased to USD 43.6 billion in 2018, an increase of 26 percent from the USD 34.6 billion tracked in 2017. Of the USD 43.6 billion in 2018, an estimated USD 16.1 billion, or approximately one-third of finance commitments, benefitted residential customers. The USD 16.1 billion tracked in 2018 to benefit residential customers is less than half the USD 41 billion estimated annual investment needed to attain universal electricity access by 2030 (IEA 2020).

While the overall increase in commitments brings financing levels closer to those needed to achieve universal electricity access, it is deeply concerning that **much of the increase in 2018 investment was in fossil fuel technologies concentrated in a few countries.** For instance, finance for fossil fuel plants in Bangladesh increased by USD 10 billion compared to USD 4.8 billion in 2017. This increase will lock those HICs into decades of carbon emissions and dependence on imported coal.

Finance is generally not flowing to countries with the greatest need. The six HICs with the lowest electricity access rates, where more than 70 percent of the population does not have access to electricity – Burkina Faso, Chad, Congo (DR), Madagascar, Malawi and Niger – were all in the bottom half of HICs in terms of finance for electricity committed. By contrast, three South Asian countries – Bangladesh, India and Pakistan – accounted for almost 80 percent of the total electricity finance tracked in 2018. Nine HICs received less than 1 percent of total finance for electricity tracked to all HICs in both 2017 and 2018,[10] a chronic underinvestment that will have significant adverse consequences for their ability to meet SDG7.

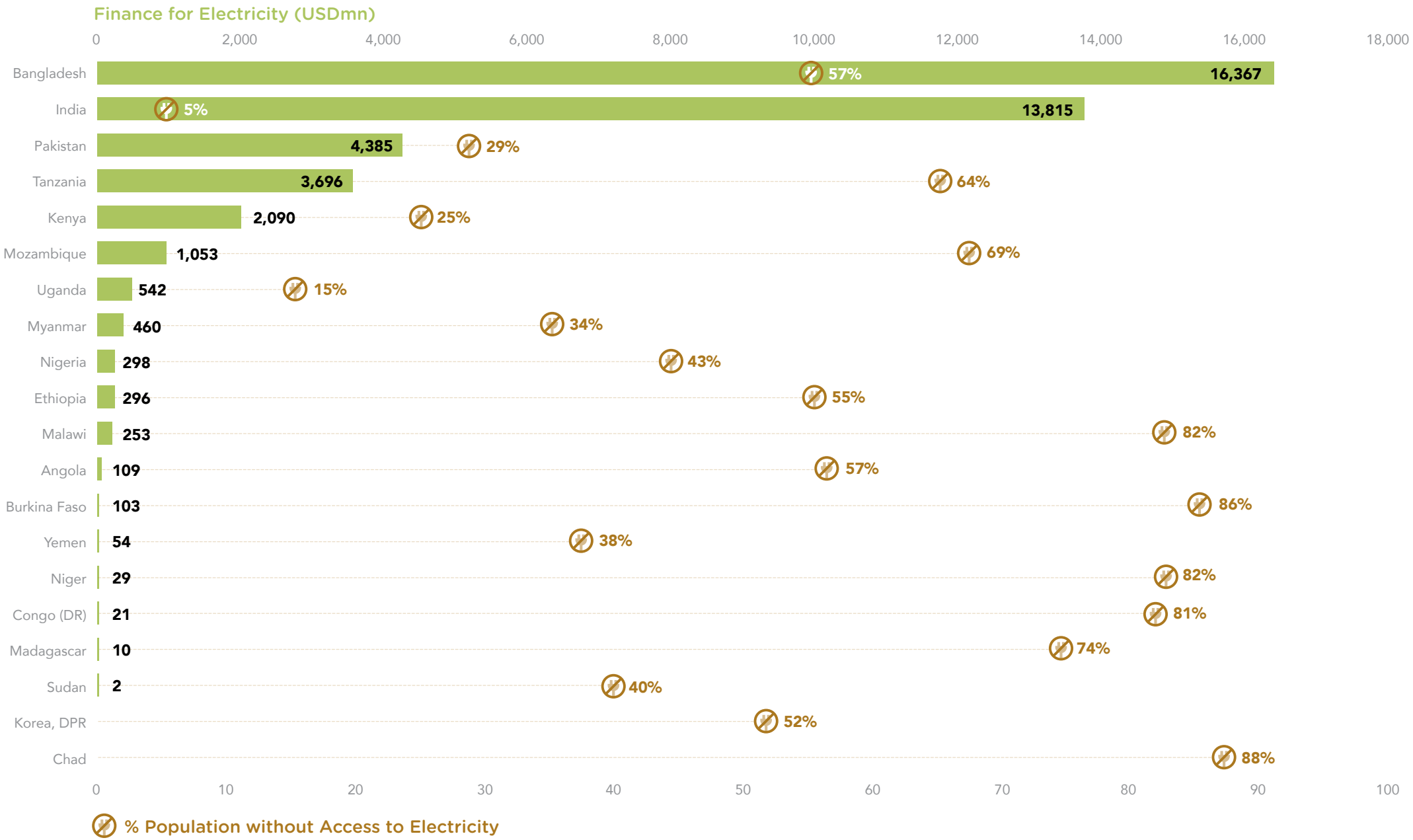
FIGURE 5
Finance to electricity in high-impact countries (2018, USD million)



[10] Angola, Burkina Faso, Congo (DR), Korea DPR, Madagascar, Malawi, Niger and Sudan.

FIGURE 6

Distribution of finance for electricity across the high-impact countries (2018, USD million)



SECTORS[11]

Fossil fuels accounted for the largest portion of electricity finance commitments for the first time in at least six years, while financing for grid-connected renewables declined for the first time since 2014. The dramatic increase in grid-connected fossil fuel finance (Figure 7) from USD 5.5 billion in 2017 to USD 21.7 billion in 2018 is due in large measure to nine coal and gas plants in four countries worth more that USD 1 billion each. Four of those projects (including the one natural gas project of over USD 1 billion) were in Bangladesh, two were in India, two in Pakistan, and one in Mozambique, as shown in Table 1.

TABLE 1
Fossil fuel projects of USD 1 billion or more

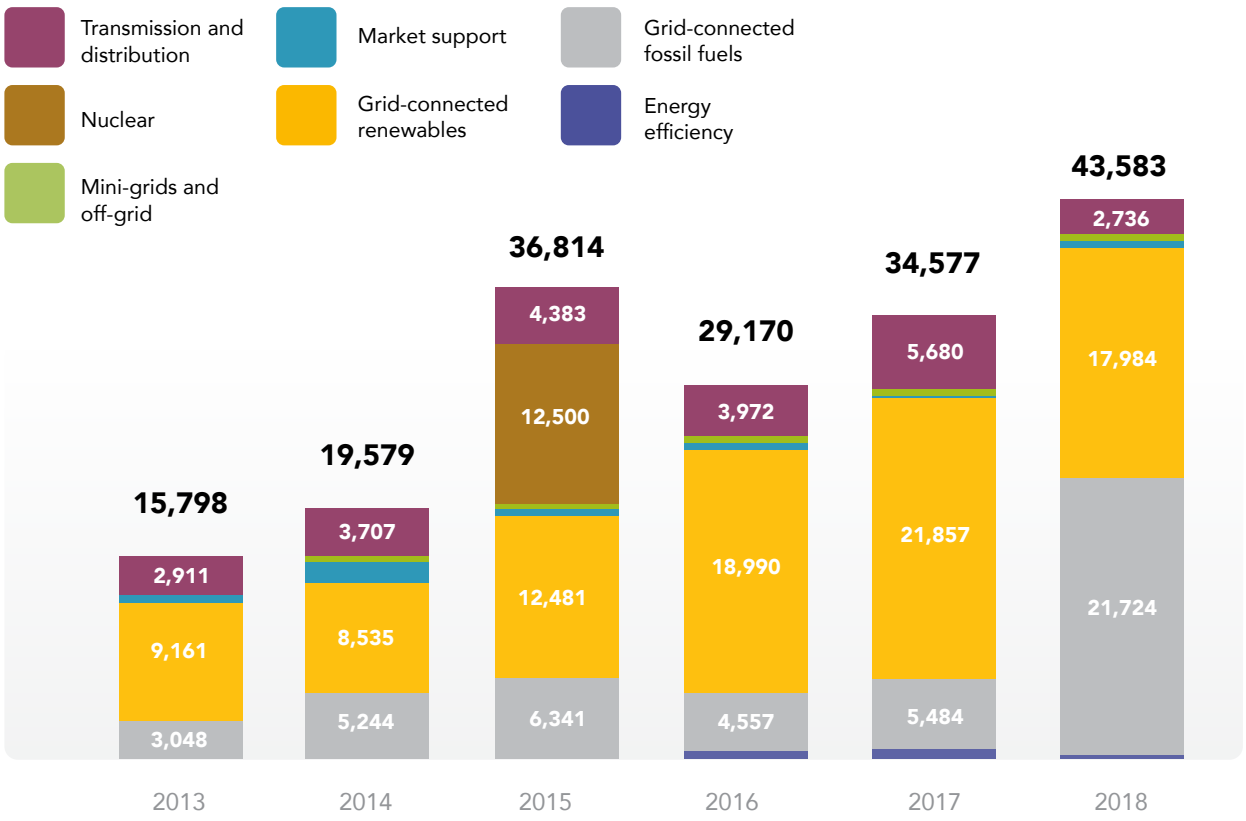
Country	USD billion	No. of projects
Bangladesh	12.8	4
India	2.7	2
Pakistan	3.1	2
Mozambique	1.0	1
Combined other	2.1	14
Grand Total	**21.7**	**23**

The fall in grid-connected renewable energy finance in 2018 to USD 18.0 billion from USD 21.9 billion in 2017 is concerning, though an almost equivalent percentage decline in the cost of renewable energy may mean that close to similar capacity[12] would be added at lower cost in 2018.

Notably, in seven[13] countries, more than 95 percent of electricity finance was committed to grid-connected renewables, mini-grids, and off-grid solutions, but those countries received relatively low volumes of overall finance commitments – USD 6.2 billion in aggregate. Of the renewable energy finance tracked in the HICs in 2018, USD 6.5 billion was committed to utility-scale solar PV, USD 5.1 billion to wind, USD 4.9 billion to large hydropower, and USD 1.6 billion to biofuels, geothermal, and unspecified[14] grid-connected renewable energy projects combined. Total renewable energy finance in the HICs in Sub-Saharan Africa averaged around USD 4 billion per annum between 2013-2018. This aligns closely with IRENA's Global Landscape of Renewable Energy Finance 2020, which tracks investment in all Sub-Saharan Africa economies and estimates an annual investment of USD 5-6 billion each during 2013-2018. The IRENA report reinforces the disproportionate flows of finance, concluding that the regions representing approximately 120 developing and emerging economies (Central Asia, Eastern Europe, Latin America and Caribbean, Middle East and North Africa, South Asia, and Sub-Saharan Africa) attracted only 15 percent of total renewable energy investments (USD 48 billion) for all these countries in 2018.

[11] Unlike previous editions, this section has been moved up in the chapter given the importance of the sectoral flows.
[12] The global-weighted levelized cost of electricity (LCOE) for solar PV and onshore wind fell 12 percent and 14 percent in 2018 respectively, compared to 2017 (IRENA 2019), while the decline in finance for grid-connected renewables in HICs fell 18 percent from USD 21.9 billion in 2017 to USD 18.0 billion in 2018. Because total finance fell at a slightly higher rate than cost, a slightly decreased amount of capacity could be funded in 2018 to 2017 given the decline in volume of finance.
[13] Angola, Burkina Faso, Congo (DR), Madagascar, Niger, Sudan, and Yemen
[14] In 2018, USD 1.1 billion in grid-connected renewable energy finance commitments to HICs tracked for this report did not contain detail from tracking sources beyond the finance's general sectoral focus on grid-connected renewables. These financial commitments are frequently part of large programmes focused on grid-connected renewables and cover a range of renewable energy sub-sectors.

FIGURE 7
Finance to Electricity by Sector (2018, USD million)[15]



Finance for transmission and distribution projects in the HICs also decreased by USD 3 billion, from USD 5.7 billion in 2017 to USD 2.7 billion in 2018. Finance commitments to the sector included USD 2.2 billion to transmission projects, USD 115 million to distribution projects, and USD 429 million to an unspecified[16] mix of transmission and distribution projects. A decline in transmission and distribution[17] projects could exacerbate a lack of funding for grid-connected power as both impact access to the grid, especially in rural areas.

Investment in off-grid and mini-grid solutions combined increased slightly in 2018 to USD 460 million compared to USD 432 million in 2017. This incremental increase is insignificant, as substantially more investment in this sector is warranted given the potential to increase energy access in underserved regions of HICs at lowest first cost. While country-specific barriers may differ, several common barriers observed include policy and regulatory constraints, small investment ticket sizes, limited access to innovative finance, a lack of local currency financing, lack of financial de-risking instruments, and an investment climate that discourages private investment (CPI 2020).

As indicated in Figure 8, investment in off-grid solutions including solar home systems, solar lanterns, solar appliances and other non-solar off-grid solutions showed a promising increase from USD 219 million In 2017 to USD 249 million in 2018. While this is encouraging, it is still far from the estimated funding necessary to achieve the off-grid sector's contribution towards SDG7. On

[15] Finance commitments for 2015 have been updated to include a USD 12.6 billion investment in Rooppur Nuclear Plant in Bangladesh, which had previously not been included in 2015 investment figures. In December 2015, the Bangladesh Atomic Energy Commission (BAEC) and Russia's Rosatom signed an agreement to invest USD 12.6 billion to build 2.4 GW of nuclear power units at Rooppur.
[16] The USD 429 million in finance to transmission and distribution projects that flowed to an unspecified mix of the two types follows from similar data limitations as described in the note above regarding grid-connected renewables. These are projects that are reported as an electrification project or power system effort, but without additional details or project documentation on the specific sub-sector targeted by the finance.
[17] Due to data limitations, the report is unable to identify if the transmission and distribution project relates to renewable energy, fossil-fuels or both.

the other hand, investment in mini grids saw a slight decrease at USD 179 million in 2018 compared to USD 201 million in 2017. This stagnation in investment in mini-grids is concerning, as estimates cited in *Energizing Finance: Understanding the Landscape 2019* indicated that between 2016 and 2030, renewable energy sources would account for 60 percent of new energy access connections, of which 40 percent would be through mini-grids. This gap highlights the need to further mainstream mini-grids in national electricity access strategies and develop dedicated regulations and financing mechanisms to support deployment.

FIGURE 8
Finance for off-grid and mini-grid solutions (2017 and 2018, USD million)

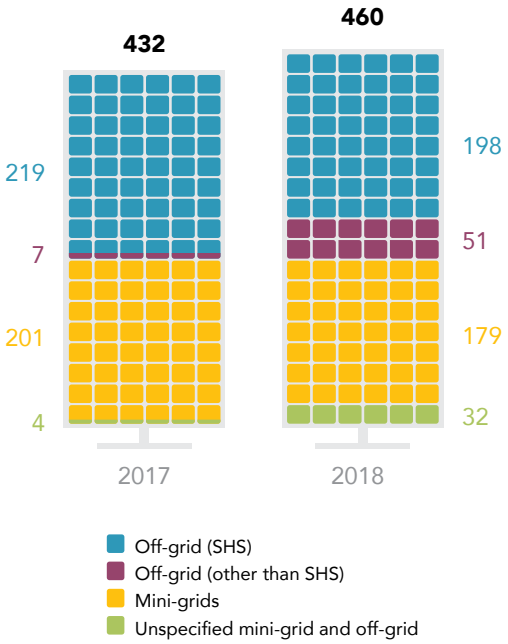
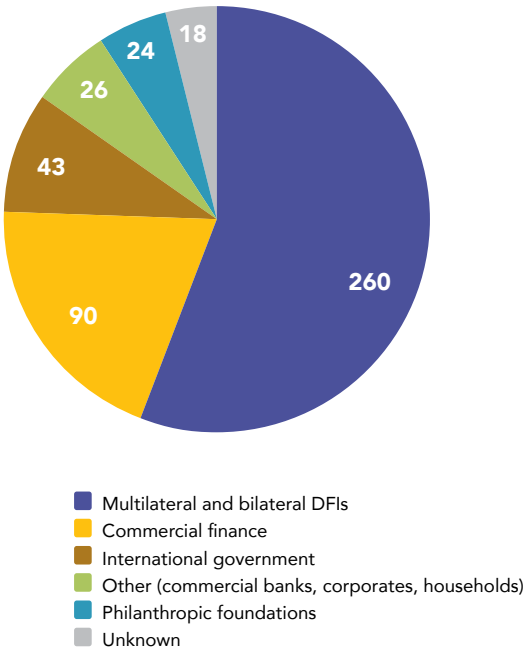


FIGURE 9
Sources for finance for off-grid and mini-grid electricity in 2018 (USD million)



Note: In this reporting round, around USD 32 million were not allocated to either off-grid or mini-grids as it was unclear which one of the two the funding was for, or it financed a blend of the two.
Figures on off-grid solar investments include only publicly disclosed commitments tracked by GOGLA's Deal Investment Database and therefore represent a conservative view of the overall finance flowing into the sector.

As illustrated in Figure 9, of the total USD 460 million in finance committed to off-grid and mini-grid solutions in 2018, bilateral and multilateral development finance institutions (DFIs) accounted for USD 260 million, followed by commercial finance[18] at USD 90 million, and donor governments at USD 43 million. The remaining USD 67 million was funded by a variety of foundation, domestic government, and corporate sources.

Five countries received more than USD 50 million in finance commitments for off-grid and mini-grid solutions in 2018: Bangladesh, India, Kenya, Tanzania and Uganda. The recipients of finance for off-grid and mini-grid solutions are more evenly distributed than in 2017, when only Kenya received more than USD 50 million in finance to the sector (USD 170 million). Improved distribution of finance commitments to the sector is a promising indication that enabling conditions and policy are becoming more widespread for deployment of off-grid and mini-grid solutions in HICs.

[18] Commercial finance is defined in this analysis as private equity, venture capital, and institutional investors.

RECIPIENT COUNTRIES

Just four countries received 88 percent of total electricity finance commitments in 2018: Bangladesh, India, Pakistan and Tanzania. The methodology for tracking electricity finance commitments to the HICs has held relatively steady with modest improvements in data sources over time, so these numbers reflect the intense concentration of finance in a handful of countries. Of those countries, most finance was committed to Bangladesh at USD 16.4 billion (38 percent of the total to all HICs), followed by India at USD 13.8 billion (32 percent of the total). **For the first time, India was surpassed by Bangladesh as the top recipient of electricity access finance since SEforALL began tracking finance flows in 2013**. It is worth noting that these changes in year-over-year finance can be influenced by a handful of very large projects, so it will be valuable to assess the following years of data to better understand trends.

Box 2 outlines the specific case of Bangladesh in additional detail, but other countries also saw significant increases or declines between 2017 and 2018. Per Table 2, **Kenya, Madagascar, Malawi, Mozambique and Tanzania all saw substantial increases in finance commitments.** However, these countries began with such low volumes of committed finance that the large percentage changes can be attributed mostly to these low baselines. Both India and Nigeria experienced declines in electricity finance commitments of about USD 5 billion in 2018, though Nigeria's[19] decline returned total annual finance to its 2016 level as most of the increase in 2017 was due to a single large hydropower project.

TABLE 2
Countries with significant changes in finance flows 2017–2018 (USD billion and %)

Country	2013–16 Annual Average (USD)	2017 (USD)	2018 (USD)	Total USD Change 2017–2018	USD Change 2017–2018 (FF)	% Change
Angola	0.36	0.01	0.11	**0.10**	-	1337%
Bangladesh	5.36	7.14	16.4	**9.28**	10.0	130%
India	12.9	16.8	13.8	**2.94**	2.68	-18%
Kenya	1.66	0.62	2.09	**1.47**	-	238%
Malawi	0.25	0.02	0.25	**0.23**	-	1188%
Mozambique	0.28	0.31	1.05	**0.74**	1.0	239%
Nigeria	0.92	6.32	0.30	**6.03**	-	-95%
Tanzania	0.61	0.09	3.70	**3.61**	-	4189%
Uganda	0.73	0.27	0.54	**0.27**	-	101%
Grand Total for all HICs	**25.3 billion**	**34.6 billion**	**43.6 billion**	**+9.06 billion**	**+16.2 billion**	**26%**

[18] Commercial finance is defined in this analysis as private equity, venture capital, and institutional investors.
[19] In 2018, USD 298 million in electricity finance commitments were made in Nigeria. Of that total, the majority was for grid-connected renewables (USD 237 million), followed by transmission and distribution infrastructure (USD 29 million). More than half of the total finance (USD 186 million) committed to Nigeria in 2018 was directed to a single project — the Nigeria Electrification Project — with an objective to provide over 500,000 people with access to affordable sources of electricity. The project is financed by the African Development Bank and the International Development Association and aims to install mini-grid systems at 250 sites and at an additional eight federal universities, deploy 24,500 solar PV appliances, and strengthen institutional capacity.

Year after year, donor governments and DFIs continue to provide countries like Angola, Burkina Faso, Congo (DR), Niger, and Sudan with minimal or zero financing. **In 2018, Chad — a recent addition to the HICs with more than 88 percent of its population without electricity access — received no tracked public or private finance.**

Except for a few countries such as India, Kenya and Tanzania, other HICs continue to lag in securing the investment volumes they need to achieve SDG7 electrification targets. Seven of the 14 Sub-Saharan Africa (SSA) countries tracked in this report each received less than USD 100 million towards energy access in 2018 – equating to between 1–13 percent of the required investment per annum (Figure 10).

FIGURE 10

Electricity – Required investment and tracked electricity access investment (USD million, per annum)

Note: The tracked investment numbers for "Other Sub-Saharan Africa (excl. South Africa)" include estimates for Burkina Faso, Madagascar, Malawi, Mali, Niger, Sudan and Uganda. The required investments numbers for "Other Sub-Saharan Africa (excl. South Africa)" include all SSA economies except South Africa. The "Rest of developing Asia" includes Bangladesh, Myanmar and Pakistan.

2 FOSSIL FUEL FINANCE IN BANGLADESH

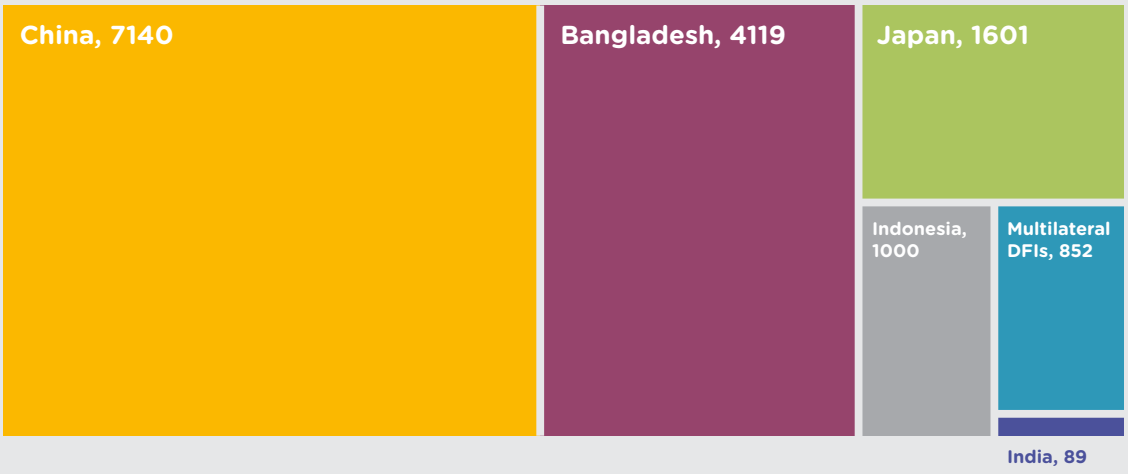
Bangladesh saw a dramatic increase in overall finance for electricity in 2018 – driven largely by finance for grid-connected fossil fuels. The latter increased dramatically from USD 4.8 billion in 2017 to USD 14.8 billion in 2018, due to ten large-scale projects. As noted in the Market Forces report *Choked by Coal*, if all of the coal plants in Bangladesh's conditional pipeline are built, annual CO2 emissions from Bangladesh will be more than twice the level of annual CO2-e that Bangladesh has conditionally indicated it intends to mitigate per its intended Nationally Determined Contribution (NDC) under the Paris Agreement.

TABLE 3
Technology and cumulative capacity of Bangladesh fossil fuel projects

Technology Type	Number of plants	Project Amount	Cumulative Capacity
Coal-fired projects	4	USD 11.4 billion	7160 MW
Gas-fired or oil-fired projects	4	USD 2.9 billion	2534 MW
OTHER NON-RENEWABLE ENERGY GENERATION	2	USD 470 million	949 MW

In Bangladesh, nearly 50 percent of all fossil fuel finance overall and 60 percent of total coal finance was committed by Chinese institutions.[20] All of the finance from Chinese institutions emanated from the private sector, while finance from Bangladesh — the second most important source of finance for fossil-fuel projects in Bangladesh — came from both public and private sources. Figure 11 below illustrates the country of origin of all financiers for grid-connected fossil fuel projects in Bangladesh in 2018.

FIGURE 11
Country origin of financiers for grid-connected fossil fuel projects in Bangladesh (USD million, 2018)



[20] Specifically, Zhejiang Jindun Holding Group Co., China Huadian Corp, China Gezhouba Group Corp, and China Exim Bank.

In total, Bangladesh has at least 29 coal-fired power projects under construction or in pre-construction with a total capacity of more than 33,000 MW. If all of these projects are completed, Bangladesh will see a 63x increase in coal power capacity from a 2019 baseline. The country has already increased to 6th in a global ranking of coal power capacity in active development (Market Forces 2019).

Despite the potential for up to 53 GW of solar power capacity in Bangladesh, which could replace its planned coal power projects at lower cost for electricity generation, as of 2018 financing for renewable energy in Bangladesh had not emerged to support a shift away from coal-fired power capacity development (Transparency International).

SUB-SAHARAN AFRICA CONTINUES TO FALL BEHIND

Sub-Saharan Africa (SSA) has more than 573 million people without access to electricity. A majority (80 percent) of them live in the 14 HICs. Despite the urgent need to scale up investment in the region, in 2018 SSA received less than one fifth (USD 3.3 billion) of its required investment needs (USD 20.4 billion per year) to achieve universal household electricity access by 2030. This can be compared to the USD 5.1 billion tracked in 2017. Six of the 14 countries tracked in SSA experienced a decline in their electricity access investments in 2018, and five countries received less than USD 100 million.

Overall finance for electricity projects also stagnated at USD 8.5 billion in 2018 compared to USD 9.6 billion in 2017. Unlike 2017, where a USD 5.8 billion hydropower plant dominated electricity financing in the region (65 percent), four countries received more than USD 500 million in 2018. Within SSA, Tanzania received most of the finance commitments (USD 3.7 billion), followed by Kenya (USD 2.1 billion), Mozambique (USD 1.1 billion) and Uganda (0.5 billion). Chad, the newest addition to the HICs in 2020, recorded no financing, while Congo (DR), Madagascar, and Sudan each received less than USD 30 million. Seventy-five percent of finance commitments for the electricity sector, or USD 6.5 billion in 2018, were directed to large-scale, grid-connected renewable energy projects, similar to the proportion in 2017. Financing for fossil fuels increased to just over USD 1 billion in 2018 compared to USD 277 million in 2017, due largely to a single USD 1 billion coal-fired power plant in Mozambique. Investment in off-grid and mini-grid solutions in the region declined slightly from USD 375 million in 2017 to USD 303 million in 2018. Of finance for off-grid and mini-grid solutions, USD 119 million flowed to mini-grid solutions in SSA while USD 180 million went to off-grid systems. The remaining USD 4 million flowed to an unspecified mix of off-grid and mini-grid solutions.

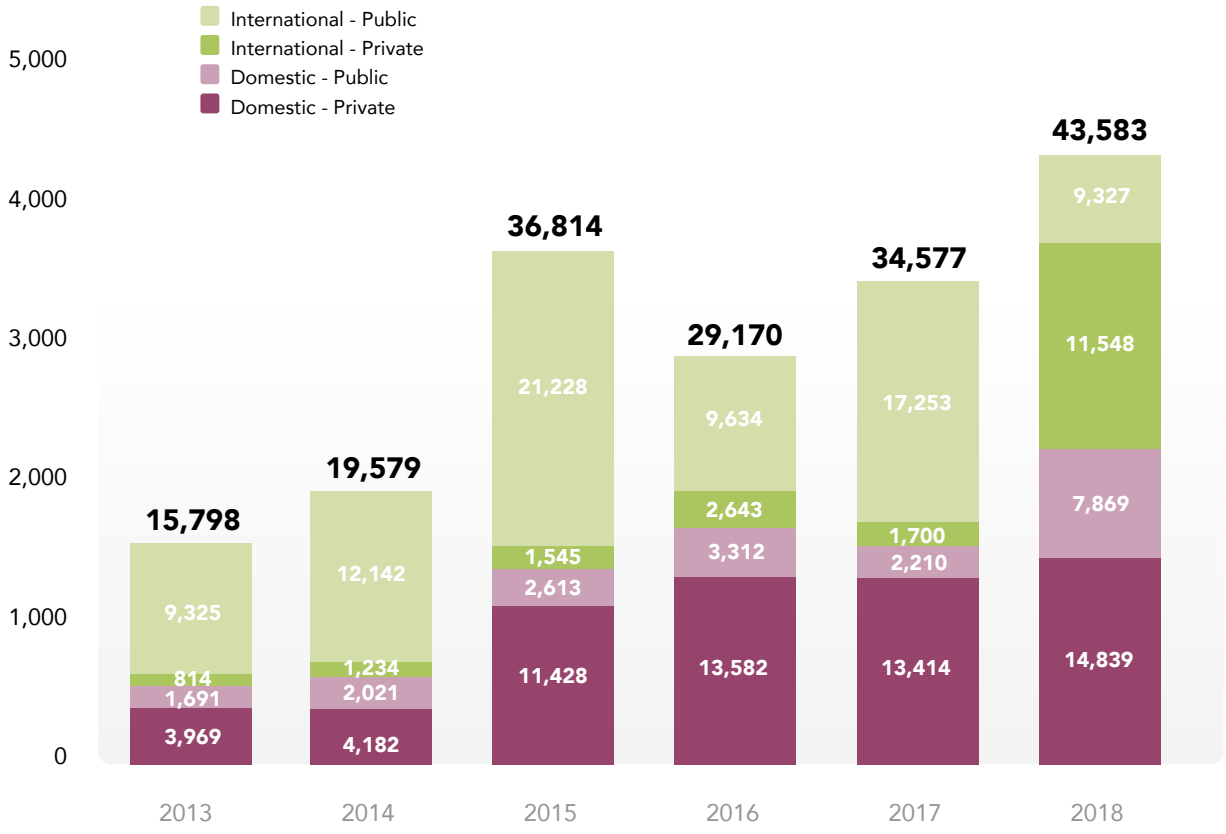
Kenya, Mozambique, Tanzania and Uganda each received between USD 49 and 56 million in finance commitments respectively for off-grid and mini-grid solutions in 2018. Finance was distributed relatively evenly across many SSA countries, with those four countries as well as Burkina Faso, Congo (DR), Niger and Nigeria all receiving at least USD 15 million. An increase in finance for mini-grid and off-grid solutions across SSA countries — including those that have historically faced most severe underinvestment — is a prerequisite for future growth in investment and access rates.

SOURCES

International finance from public and private sources represented about 48 percent of all finance tracked in 2018, a total of USD 20.9 billion (Figure 12). Domestic finance represented the remaining 52 percent. There was a significant increase in domestic public finance in 2018, largely due to three large-scale projects[21] to which domestic public financiers committed USD 6 billion in aggregate.

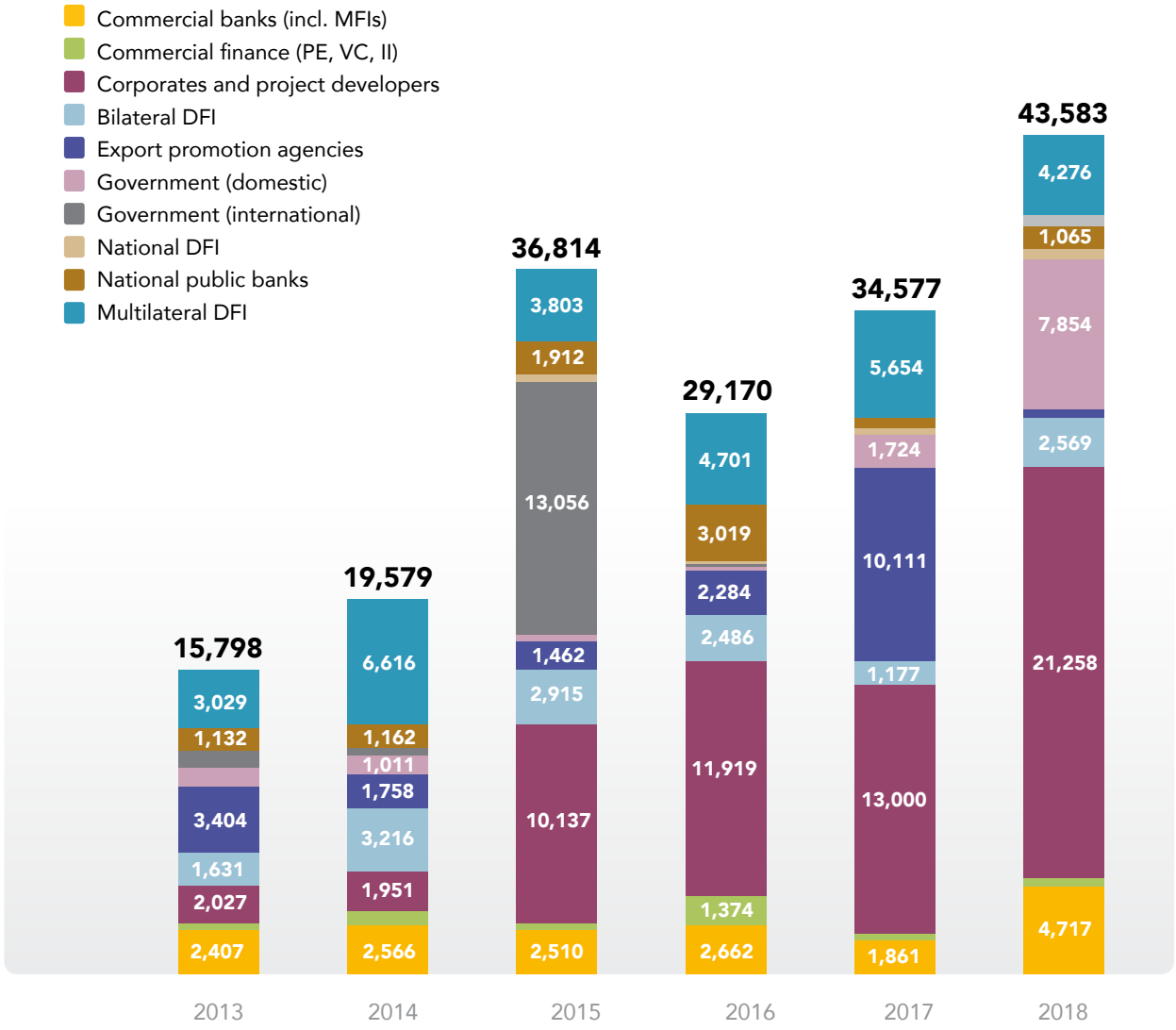
The key shift from 2017 to 2018 in terms of sources of finance for electricity across the HICs was a significant decline in finance from export promotion agencies (a key source of finance in 2017 at USD 10.1 billion, decreasing to USD 510 million in 2018). In place of export promotion agencies, domestic and international governments' commitments increased in 2018 to USD 8.4 billion in total. More details on shifts in sources of finance from 2013 to 2018 are illustrated in Figure 13.

FIGURE 12
Sources of finance for electricity across the high-impact countries (2013–2018, USD million)



[21] The three large-scale projects are located in India and Bangladesh (grid-connected fossil fuel projects) and in Tanzania (a grid-connected renewables project).

FIGURE 13
Sources of finance for electricity across the high-impact countries (USD million)

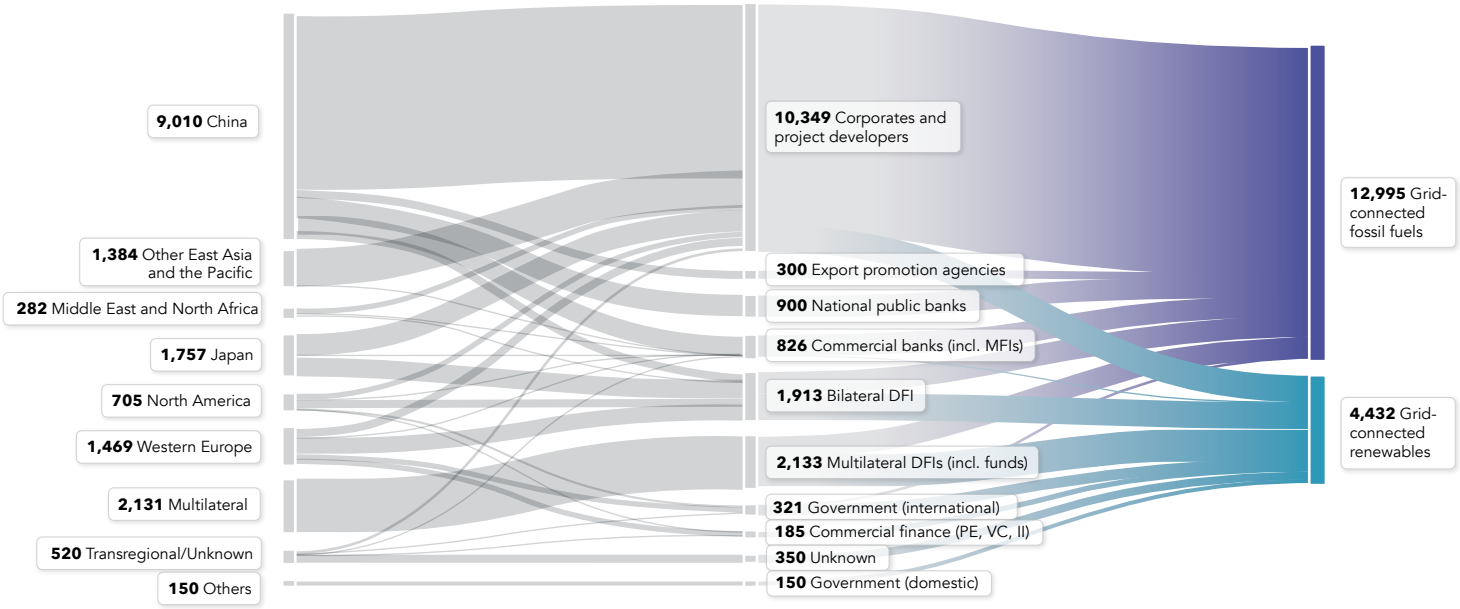


Note: The figure excludes a few categories like households, national DFIs and unspecified reporting of small investments.

As in previous years, the electricity finance portfolios of multilateral DFIs were dominated by on-grid electrification and transmission and distribution projects, with their total finance commitments falling to USD 4.3 billion in 2018 from USD 5.6 billion in 2017. Multilateral finance for both grid-connected fossil fuel and renewables projects increased by small proportions in 2018 from 2017 levels, while finance to transmission and distribution projects declined from USD 3.2 billion in 2017 to USD 1.6 billion in 2018. Bangladesh, India, Kenya and Pakistan were the main recipients of multilateral DFI finance in 2018 – combining to receive 85 percent of all multilateral DFI finance that year.

Fossil fuel financing increased across most capital providers. China was the largest provider of international finance with almost all of its finance flowing to fossil fuel projects (Figure 14). Approximately 60 percent of the total coal financing in Bangladesh in 2018 originated from institutions based in China. Further, approximately 95 percent (USD 9 billion) of finance originating in China supported the development of fossil fuel projects in the HICs, and more than 42 percent of total fossil fuel financing in 2018 originated from actors based in China.

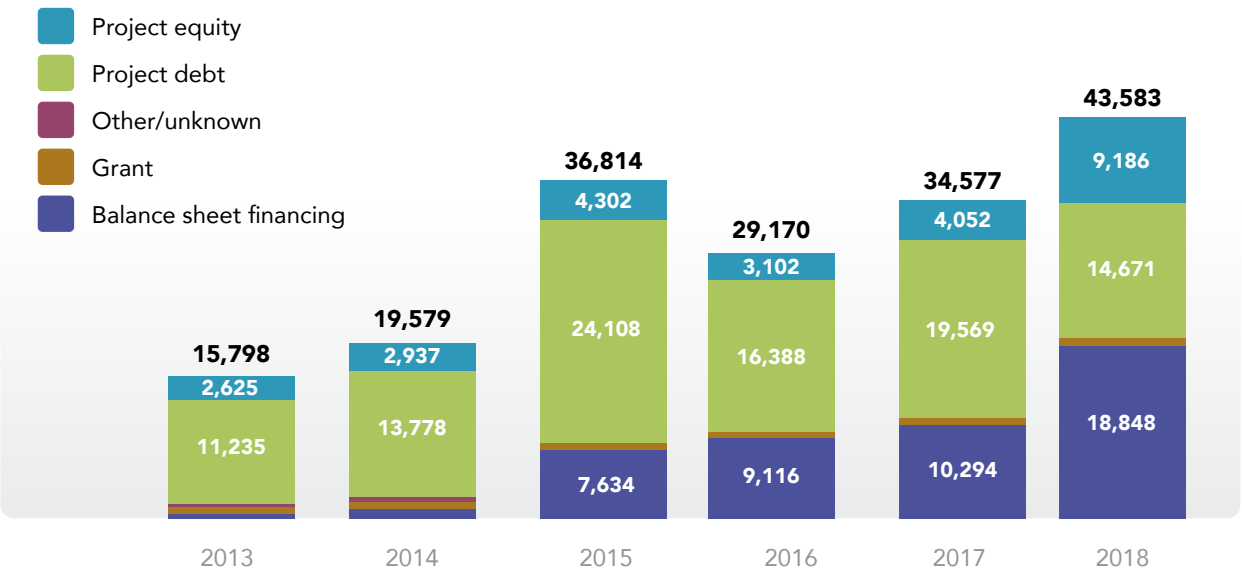
FIGURE 14
International finance for grid-connected projects by provider and sector (USD million)



INSTRUMENTS

Balance-sheet financing increased substantially in 2018 from prior levels to USD 18.8 billion, driven by finance from corporates and project developers. Grants, which stagnated at around USD 800 million in 2018, were provided mainly by bilateral donor governments (61 percent), DFIs (30 percent), and philanthropic foundations (7 percent). Project equity originated from many sources — bilateral DFIs, commercial banks, domestic governments, multilateral DFIs and national public banks — each financing at least USD 1 billion in project equity in 2018. By comparison, project debt was much more concentrated amongst a handful of provider types; domestic governments financed more than USD 1 billion in project debt in 2018.

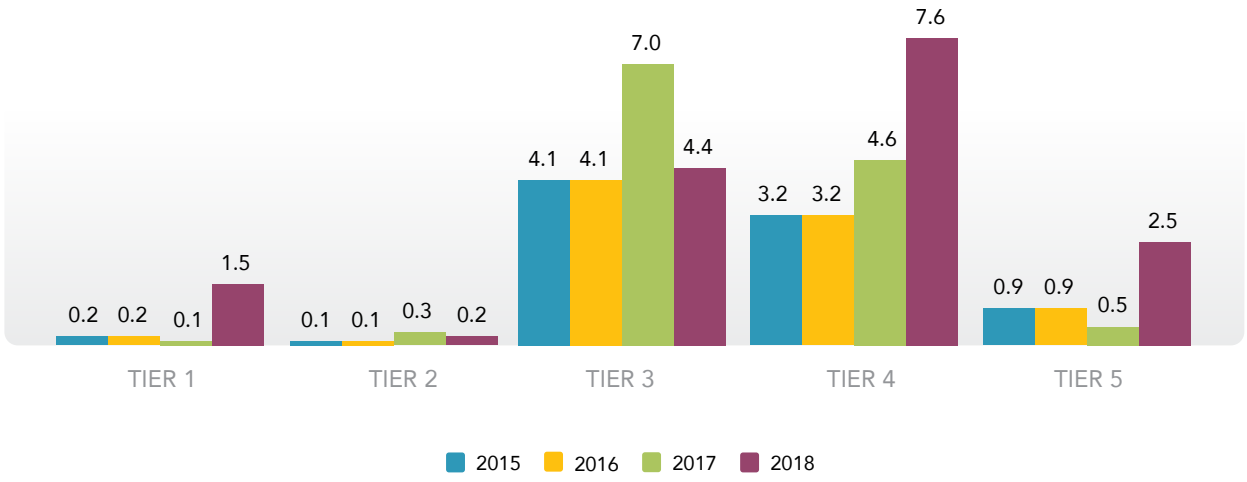
FIGURE 15
Electricity finance by instrument (2013-2018, USD million)



USES

As in analysis from previous years, to assess the share of finance flowing to residential users, this report applies relative shares of power consumption in the HICs to the total finance tracked for electricity in those countries. (See Methodology section for details). The report found that USD 16.1 billion was allocated to residential electricity access across the HICs, for grid connected, mini-grids and off-grid solutions. Commercial and industrial entities are estimated to have received USD 23.2 billion in electricity finance commitments in the HICs, while the remaining USD 4.3 billion financed other, largely public economic activities.

FIGURE 16
Finance commitments by energy access tier 2015-18 (USD billion)



Financial commitments to increase electricity access to residential consumers were also allocated to tiers per the World Bank's Multi-Tier Framework (MTF), which assesses levels of household electricity access based on the technology and reliability of each HIC's grid. In a departure from previous years, most finance for residential electricity access in 2018 was for tier 4 access (USD 7.6 billion), while USD 4.4 billion was for tier 3 (which in prior years represented most of the finance). Tier 5, which requires electricity access for at least 23 hours a day with three or fewer disruptions per week, comprised the third most finance commitments (USD 2.5 billion). Tiers 3, 4 and 5 are most frequently associated with a connection to a central grid, but grid connections often do not reach rural populations.

CHAPTER

3

IMPACT OF POLICIES ON ELECTRICIY FINANCING: A LOOK AT RWANDA

CONTEXT

Achieving SDG7 and meeting the goals of the Paris Agreement requires sound domestic policies and regulations to scale up public finance and mobilize private sector investment. Ambitious national targets and strengthening and adapting policies to evolving market conditions have historically led to progress on sustainable energy outcomes (Foster et al. 2018).

This case study explores how robust domestic policies have contributed to increased electricity access in Rwanda, by measuring electricity sector commitments against Rwanda's performance in the World Bank's Regulatory Indicators for Sustainable Energy (RISE) index. RISE is a benchmarking tool designed to quantify and compare national policy frameworks against three pillars: electricity access, renewable energy and energy efficiency.

Rwanda, despite not being a high-impact country (HIC), has shown significant energy sector transformation with accompanying increases in energy access and investment, which can help inform smart policymaking in the HICs. In fact, Rwanda was one of the top three fast movers globally in electricity access between 2010 and 2017, where electrification rates even outpaced population growth. Following changes in its energy sector policies and regulatory frameworks, Rwanda scored higher than the average of other low-income Sub-Saharan African (SSA) countries in 20 out of 28 RISE indicators.

In Rwanda, strengthening frameworks for on-grid and off-grid electrification, establishing cost-effective tariff structures, and ensuring the creditworthiness of utilities have all been instrumental in sending a strong signal to investors. Launched in 2016, the national SEforALL Action Agenda set out to bring the renewable energy mix to 60 percent of the population by 2030 (REG 2019 and ESSP 2018). This coincided with Rwanda's plan to ensure universal electricity access by 2024, with a strong focus on policies and regulations, encouraging private sector participation by securing long-term funding for projects and expanding the existing feed-in tariff regime (Rwanda Energy Group 2019).

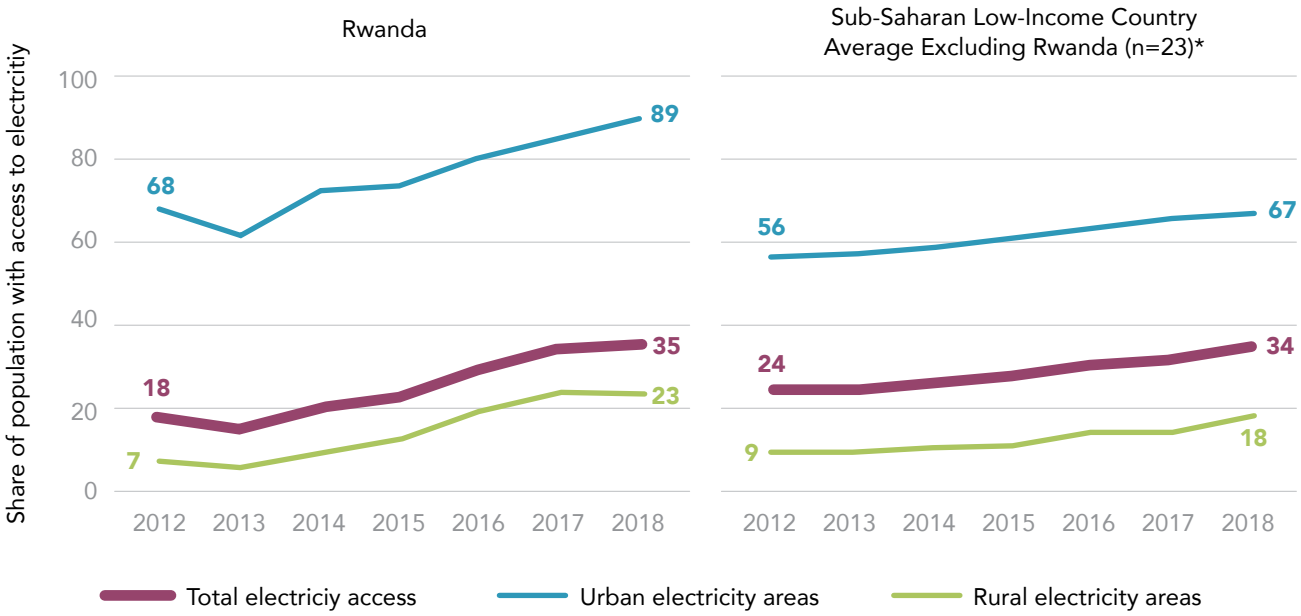
Rwanda's strong policy frameworks for on-grid and off-grid electrification, cost-effective tariff structures, and restructuring of utilities have been instrumental in increasing electricity access.

It is important to acknowledge the presence of external factors, resulting in a complex link between cause and effect, i.e. the RISE index and electricity sector investment in Rwanda, which is not explored in this case study. More in-depth analysis of trends in policy and financing variables will provide strong indications of key underlying factors that result in progress and help identify areas for future reform.

STATUS OF ELECTRICITY ACCESS IN RWANDA

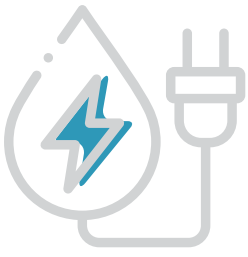
In 2018, 65 percent of Rwanda's population lacked access to electricity. This predominantly affects people in rural areas where the electrification rate is 23 percent, while 89 percent of people living in urban areas have access. Electrification in Rwanda has progressed significantly in the last decade, from under 10 percent in total in 2010 to 35 percent in 2018. Other low-income SSA countries have exhibited an overall similar trend with substantial rural-urban variations (Figure 17).

FIGURE 17
Electrification rates in Rwanda and other low-income Sub-Saharan countries



Source: The World Bank 2019.
Note *As per the available RISE data, the 23 countries representing Sub-Saharan low-income countries in this study are Benin, Burkina Faso, Burundi, Central African Republic, Chad, Congo (DR), Eritrea, Ethiopia, Guinea, Liberia, Madagascar, Malawi, Mali, Mozambique, Niger, Senegal, Sierra Leone, Somalia, South Sudan, Tanzania, Togo, Uganda and Zimbabwe.

Historically, cheaper hydropower has dominated Rwanda's energy mix, accounting for 47 percent of its energy-generation capacity for more than a decade (Rwanda Energy Group). The country has utilized its abundant rivers and waterways to such an extent that the renewable energy share of total final energy consumption throughout Rwanda has increased more than 86 percent[23] since 1995. This is a higher share than many OECD countries (World Bank 2020). However, some regions are increasingly relying on existing diesel fuel plants (currently 27 percent of the energy mix[24]) to fill the peak demand gap created by hydropower plants failing due to the increasing intensity and length of dry seasons. At peak times, diesel use increases generation cost and relays this effect onto the electricity tariff, making electricity less affordable to consumers (REG 2019).



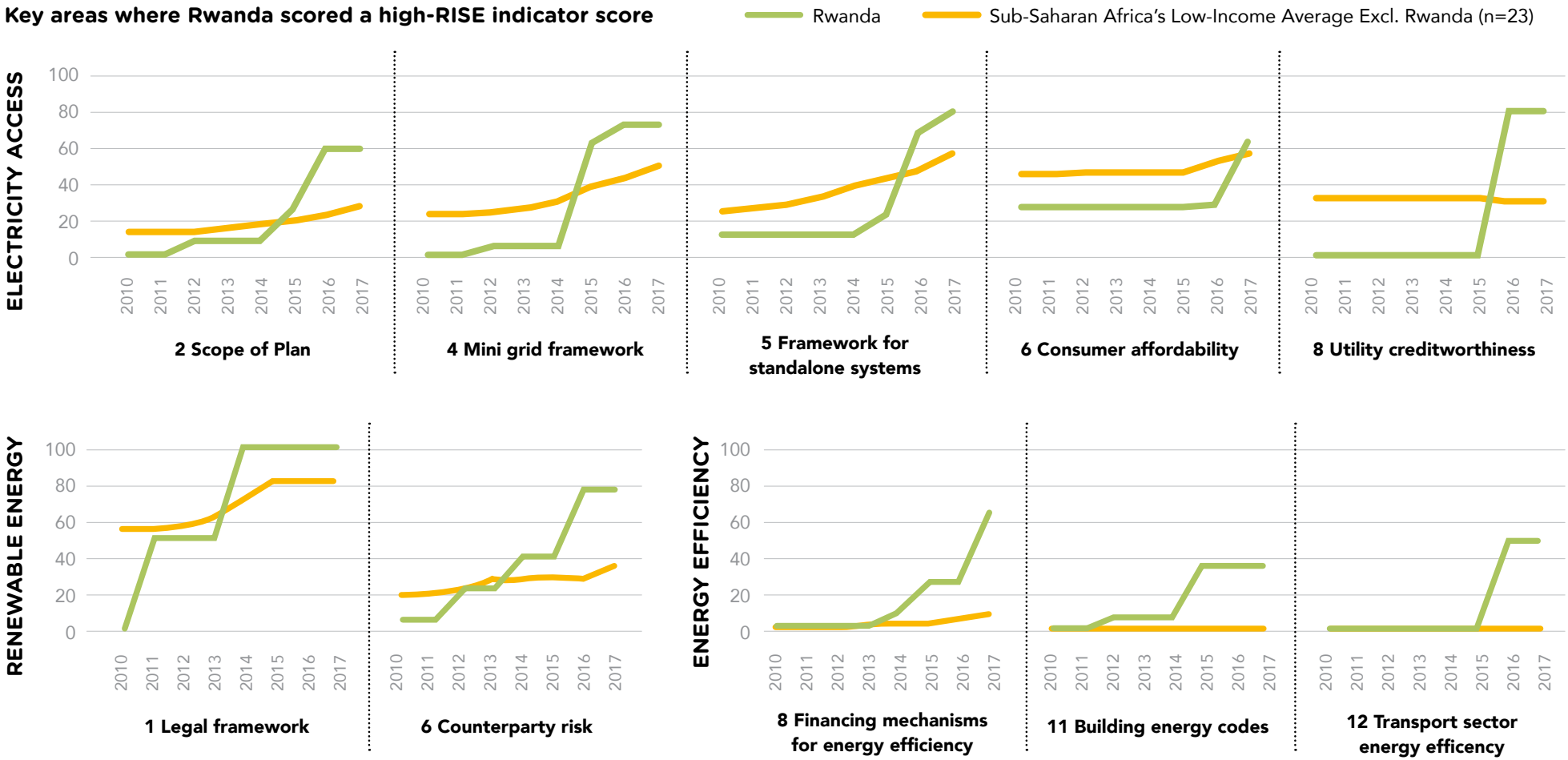
Hydropower has dominated Rwanda's energy mix, but Rwanda increasingly relies on diesel fuel generators to meet peak demand.

[23] This large difference between energy generation mix and energy consumption from hydropower is attributed to grid losses (22 percent in Rwanda), variation in hydropower production and consumption due to droughts and energy production costs where utilities aim to use the cheapest electricity at peak times (discussed in next section).
[24] This is split between government-owned diesel-power plants (27.8 MW) and other privately-owned diesel-power plants (10 MW).

KEY FINDINGS

Unlike other SSA countries, Rwanda has increased its electricity access RISE score from low[25] to high in just three years. This is mainly attributable to it expanding the scope and strength of its national electrification plan to encompass off-grid solutions, service level targets, and electricity access-related incentives, while pursuing its ambition to become middle-income country status by 2035 and becoming a high-income country by 2050. While a comprehensive assessment of all the policy indicators and sub-indicators is beyond the scope of this report, the report discusses the key polices and regulations and their implications for electricity sector financing (See Figure 18).

FIGURE 18
Key areas where Rwanda scored a high-RISE indicator score



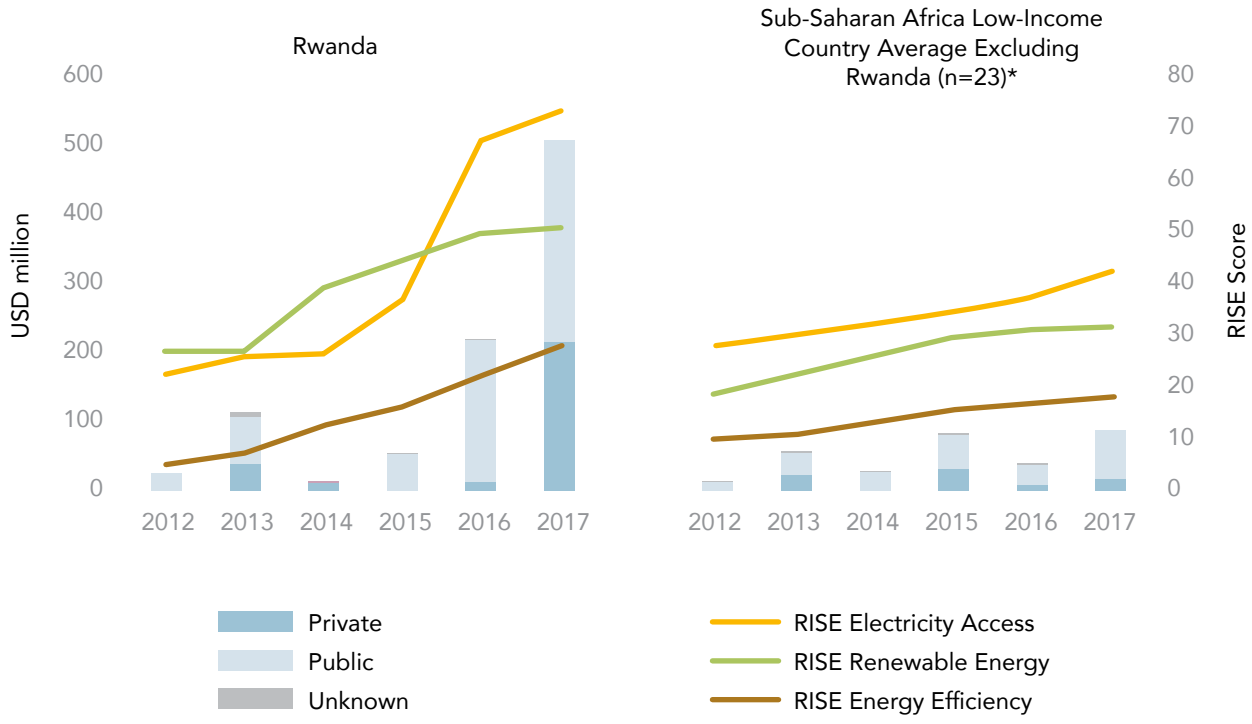
[25] RISE — which comprises 28 main indicators across the three energy pillars — divides into three equal categories, grouping the scores into low (red), medium (amber) and high (green), corresponding to the countries' regulatory environment in the energy context.

Institutions setting targets and formulating action plans: State institutions can be instrumental in driving changes in a sector (Müller et al. 2020). In the case of Rwanda, the Ministry of Infrastructure (MININFRA), which is responsible for developing energy policies and strategies, received its first set of responsibilities from the Central Government in February 2015. These included drafting, formulating and implementing polices, projects, and programmes in the energy sector, developing institutional capacity and supporting decentralized entities – all instrumental in Rwanda achieving its increased RISE score after 2015.

Prior to 2015, investment commitments in Rwanda's energy sector were substantially in line with other low-income countries in SSA. As per Figure 17, Rwanda saw an investment boost in 2016 when public funds poured into transmission and distribution systems. The increase was likely due to the 'Electricity Sector Strategic Plan (ESSP)', which targeted the installation of low- and medium-voltage lines and service connections across the country (EUCL 2019). For instance, in 2017, 744 km of high voltage (HV) transmission lines were installed by the end of June, compared to 462 km in the whole of 2014 (EESP 2018). However, MININFRA estimates that universal electricity access will require additional investment per annum of USD 510 million for on-grid and USD 78 million for off-grid power (ESSP 2018).

FIGURE 19

RISE pillar scores vs. electricity sector investment (by source) in Rwanda and other low-income countries in Sub-Saharan Africa



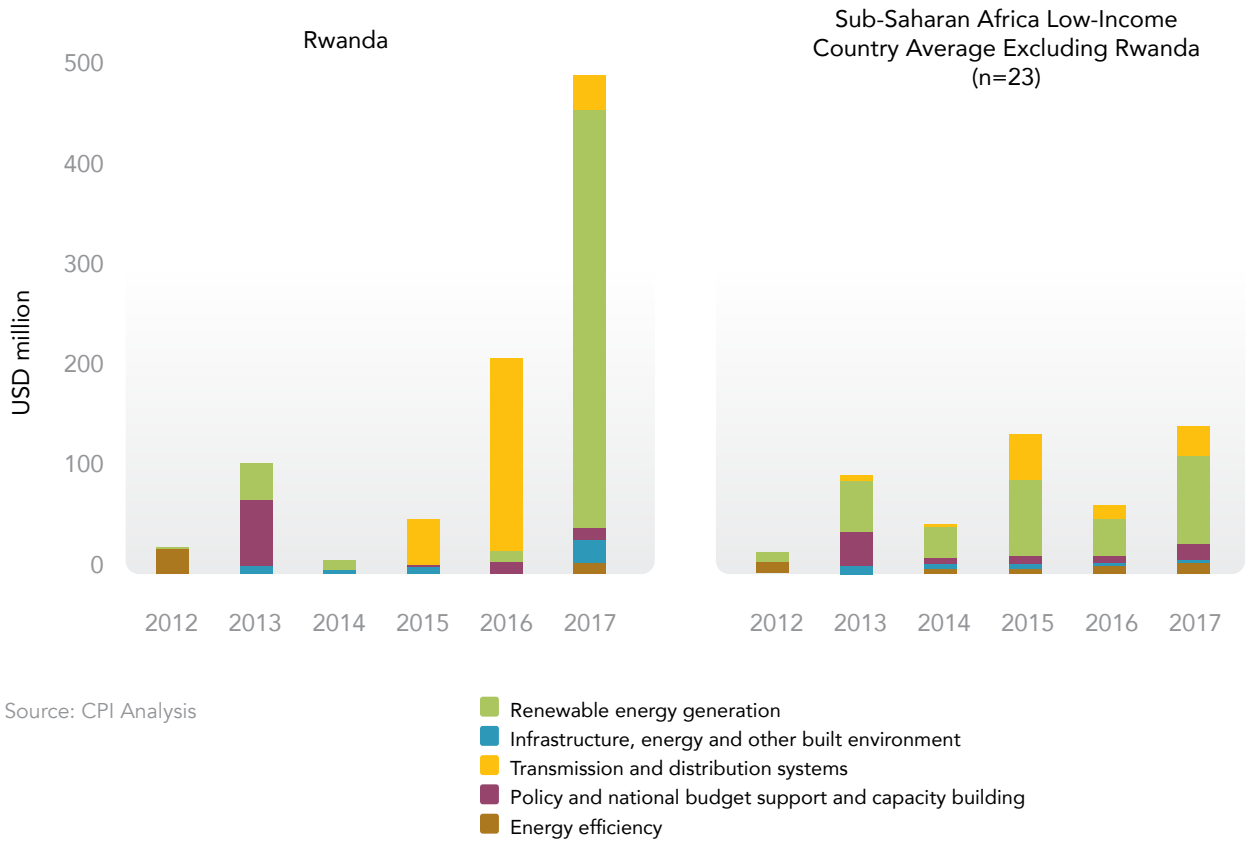
Note: The left axis measures stacked bars, grouped by source of investment, the right axis denotes the score of each respective RISE pillar. The tracked investment includes the following categories: Energy efficiency; Infrastructure, energy and other built environment; Policy and national budget support & capacity building; Renewable energy generation; Transmission & distribution systems (CPI analysis; World Bank 2018).
The analysis of the electricity access RISE score and electricity sector investment in Rwanda returned a correlation coefficient of 0.88.

Rwanda's Rural Electrification Strategy (June 2016) and 'Simplified Licensing Procedure' (2015), which established requirements for small-scale off-grid renewable energy developers, has been key to attracting private investment and off-grid electricity companies to Rwanda. These regulations helped address many of the typical concerns involving mini-grids, such as licensing requirements, tariff regulations, and provisions for grid arrival (USAID 2019). This report estimates a total investment of USD 15.8 million in Rwanda in 2017[26]. As of 2018, off-grid solar solutions served 11 percent of the rural population, supplying approximately 300,000 households using mainly solar home systems (Rwanda – Ministry of Infrastructure 2018). Also, government support to commercial financing structures (lease or on-hire purchase) and risk mitigation facilities for off-grid developers have increased private sector participation in Rwanda's electricity sector. For instance, over 20 of off-grid companies are currently operating in the country under both government initiatives and independently.

In 2017, investment in electricity generation capacity more than doubled from the previous year but was primarily driven by a USD 350 million 80 MW peat-fueled biomass plant, two thirds of which was privately funded. Currently under construction, it is set to become the largest such facility in Africa, increasing Rwanda's generation capacity by 40 percent while using 100 percent domestic fuel (Rwanda Energy Group 2018). Even after excluding this large project, total energy sector investment in Rwanda amounted to USD 154 million in 2017, almost double the SSA average in the same year.

FIGURE 20

Energy sector finance commitments (by sub-sector) in Rwanda and other low-income countries in Sub-Saharan Africa



Source: CPI Analysis

[26] These are estimates based on GOGLA data.

Focus on consumer affordability while ensuring utility's financial sustainability: Transmission and distribution (T&D) losses[27] in Rwanda were as high as 22 percent in 2017, compared to the international benchmark of 6–8 percent. Rwanda's electricity sector not only has the highest cost of service[28] but also the highest tariff, which is contributing to making electricity unaffordable for more than 75 percent of the population (World Bank 2017). To address this, Rwanda, through its various polices, has focused on ensuring that electricity remains affordable to consumers. For instance, under the revised "Electricity Access Roll-out Program" in 2017, upfront consumer payment for on-grid connection was eliminated and could be paid over time. Several other electricity tariff-related reforms were introduced between 2016 and 2018, the key one being the 'lifeline tariff.' This reduced the electricity tariff by half and increased connections for low-income households, while maintaining the electric utility's revenue base. Under the World Bank's Development Policy Operation (DPO), further initiatives were developed and implemented to keep costs down for consumers by introducing reduced off-peak tariffs to promote load shifting (REG 2019).

Rwanda has benefitted from a clear demarcation of policies and institutional roles, such as the government providing support to low-income households, the private sector leading the off-grid and mini-grid sector, and large-scale generation led by IPPs funded from various public and private sources.

On the utility side, several polices and plans were put in place to ensure regulatory independence and financial sustainability, and to increase private sector participation in Rwanda's energy sector. For instance, in 2014 the government restructured its Electricity, Water, and Sanitation Authority (EWSA) into separate entities (World Bank 2017). The Rwanda Energy Group (REG) was formed to undertake its electricity utility functions separately, with a clear division into subsidiaries of energy development (non-revenue) and utility operations (revenue-generating). With these reforms in place, 52 percent of Rwanda's generation capacity was under private ownership in 2017, and more than 17 independent power producers (IPPs) currently supply power to REG (the World Bank 2018) – an indication of policy impact on private sector investment.

Furthermore, Rwanda's energy policy framework over the years has comprised numerous direct policies such as tariff subsidies, rural electrification, and an off-grid initiative. This was complemented with integrated and enabling policies including feed-in-tariffs (introduced in 2012), competitive auctions (2015) and the National Fund for Environment and Climate Change. The latter has granted credit lines to projects twice a year since 2013 to improve consumer affordability via local lending and co-financing (BloombergNEF 2020). In fact, in a recent assessment of renewable energy policies in 34 African countries, Rwanda was found to be one of 18 countries using auction instruments, and one of 14 countries with feed-in tariffs (Müller et al. 2020). These initiatives have the potential to encourage competition, consequently reducing subsidy costs and saving public money.

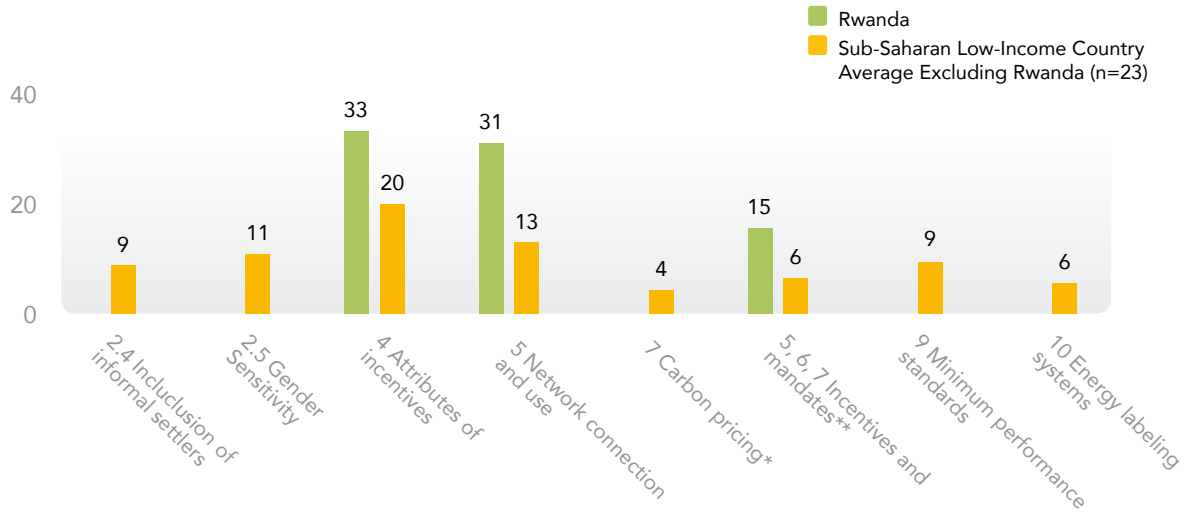
Rwanda, by strategically applying cost-reflective tariff structures (in 2017) for residential and commercial users, has targeted the use of public funding for poor households while ensuring the financial sustainability of its electricity providers. Despite relative improvements in several indicators pertaining to energy efficiency, limited information on energy efficiency investments in Rwanda hinders the ability to provide analysis of policy impact.

[27] The ESSP (2018) set a target to decrease this to 15 percent by 2024.
[28] This is attributed to limited domestic energy resources and non-competitively-procured generation capacity.

AREAS FOR POTENTIAL IMPROVEMENT

Through the analysis in this report, it became evident that there are certain areas that have shown little to no progress in Rwanda and across SSA. Figure 21 shows some of the poorest performing indicators across all low-income countries in SSA, including Rwanda, where the RISE score fell below 33, and in many cases down to zero. It is important to note that while continuing to strengthen its policy frameworks, Rwanda should also consider focusing on these areas.

FIGURE 21
Lowest RISE scores (below 33) in Rwanda compared to other low-income countries in Sub-Saharan Africa



Note: The absence of a bar indicates a zero RISE score. The numbers in the Electricity Access pillar labels denote indicator and sub-indicator. *Carbon pricing features twice in RISE, once under Renewable Energy, once under Energy Efficiency. **Incentives & Mandates in this figure show an average of three sub-categories: industrial and commercial end users, public sector and utilities.

ENERGY EFFICIENCY: Energy efficiency is key to reducing the high T&D losses in Rwanda along with meeting its nationally determined contributions (NDCs). This needs to be initiated through various demand-side measures, such as setting polices and standards for appliances, and supply-side transmission and distribution loss reductions through operational improvements. More initiatives like the Kigali Cooling Efficiency Program[29] (K-CEP) need to be undertaken to develop, implement, and scale energy efficiency projects in Rwanda (this topic will be addressed in an upcoming brief on cooling investment by SEforALL and CPI).

MAINSTREAMING GENDER CONSIDERATIONS INTO ALL POLICIES AND PROGRAMMES: The low gender sensitivity indicator highlights weak gender considerations in planning across SSA including Rwanda, but also points to limited data gathering on gender indicators, impacts and outcomes of energy projects (See Chapter 6 for more details). There is a clear need to better integrate various gender aspects into individual project consultations to enhance women's participation in village committees and energy-related activities, as well as to strengthen data and research on gender.

[29] Kigali Cooling Efficiency Program (K-CEP) is a philanthropic collaborative that works in tandem with the Kigali Amendment of the Montreal Protocol by helping developing countries transition to energy-efficient, climate-friendly, and affordable cooling solutions.

INCLUSION OF OR PROVISION FOR INFORMALLY SETTLED PEOPLE IN ELECTRIFICATION PLANS: Informally settled people living predominantly in rural areas are not included in the electrification plans of most SSA countries. There are geographical difficulties in delivering affordable electricity to scattered rural populations (Corfee-Morlot et al. 2018) but even in Kigali, Rwanda's capital, three in five people live in informal settlements (Baffoe et al. 2020). Often, these groups are faced with several financial barriers including limited access to financial institutions and lack of collateral, limiting their access to electricity. Also, there are no short- or- mid-term plans to connect them to the grid (Rwanda – Ministry of Infrastructure 2015). An additional hindrance may be that conventional electricity connections require adhering to minimum building standards, which many houses do not meet. A joint effort from the housing and electricity sectors is required to ensure compliance, for example, using ready boards, which allow for connecting even substandard houses (Blimpo et al. 2019).

TARIFF EXEMPTIONS: Rwanda is subject to the East African Community Secretariat's Customs Management Act, 2004, which sets out import duties and exemptions for the region. The Act introduced exemptions on solar power in 2006 and applied an amendment to include wind equipment in 2010. However, a recent amendment on "solar accessories and spare parts" left the category open to interpretation, resulting in inconsistent enforcement across the region, and even within the same country. This affected the private sector's participation in the off-grid solar market as imports of certain items came to a halt, leaving businesses stranded and consumers deprived of entry-level products such as multi-light systems and solar lanterns (GOGLA 2020).

CARBON PRICING: Used as an incentive to deploy renewables, carbon pricing is most effective where electricity is traded on a wholesale market before being delivered to end use consumers (Butner et al. 2020). However, like most other African economies, Rwanda currently has limited[30] carbon pricing mechanisms and formal Monitoring, Reporting and Verification (MRV) systems in place to support NDC implementation (Konrad Adenauer Stiftung 2020). Through Rwanda's Green Growth and Climate Resilience National Strategy for Climate Change and Low Carbon (2011), the Government of Rwanda has been exploring building carbon trading capacity for the past decade, with the aim of tapping private investments in the voluntary market. The United Nations Framework Convention on Climate Change (UNFCCC) has recommended that carbon pricing in SSA be introduced gradually through a carbon tax to give industry time to adapt. Rwanda is a member of the Vulnerable 20 Group — countries committed to introduce domestic carbon pricing by 2025 — and likely to benefit from such associations in the long term (UNFCCC 2019).

NEXT STEPS AND CONCLUSION

More thorough analysis is required to uncover the effect of each RISE policy indicator on the finance commitments and disbursements made to each energy sub-sector. However, assessing the results of Rwanda's rapid progress in energy policy reform hints that creating enabling policy environments is key to increasing finance commitments and delivering electricity access. Rwanda's policy frameworks have contributed to making it one of the top three fast-moving countries globally in electricity access between 2010 and 2018.

However, it is equally important to acknowledge that actual investments in Rwanda still fall short of those required. It is estimated that increasing electricity access to 100 percent will require a total per annum of USD 510 million in the on-grid sector and USD 78 million in the off-grid sector between 2018 to 2024 (ESSP 2018). Therefore, it is important for Rwanda to continue its progress, while also focusing on other areas such as energy efficiency, carbon finance, and mainstreaming gender considerations, to provide an all-encompassing approach to electricity access.

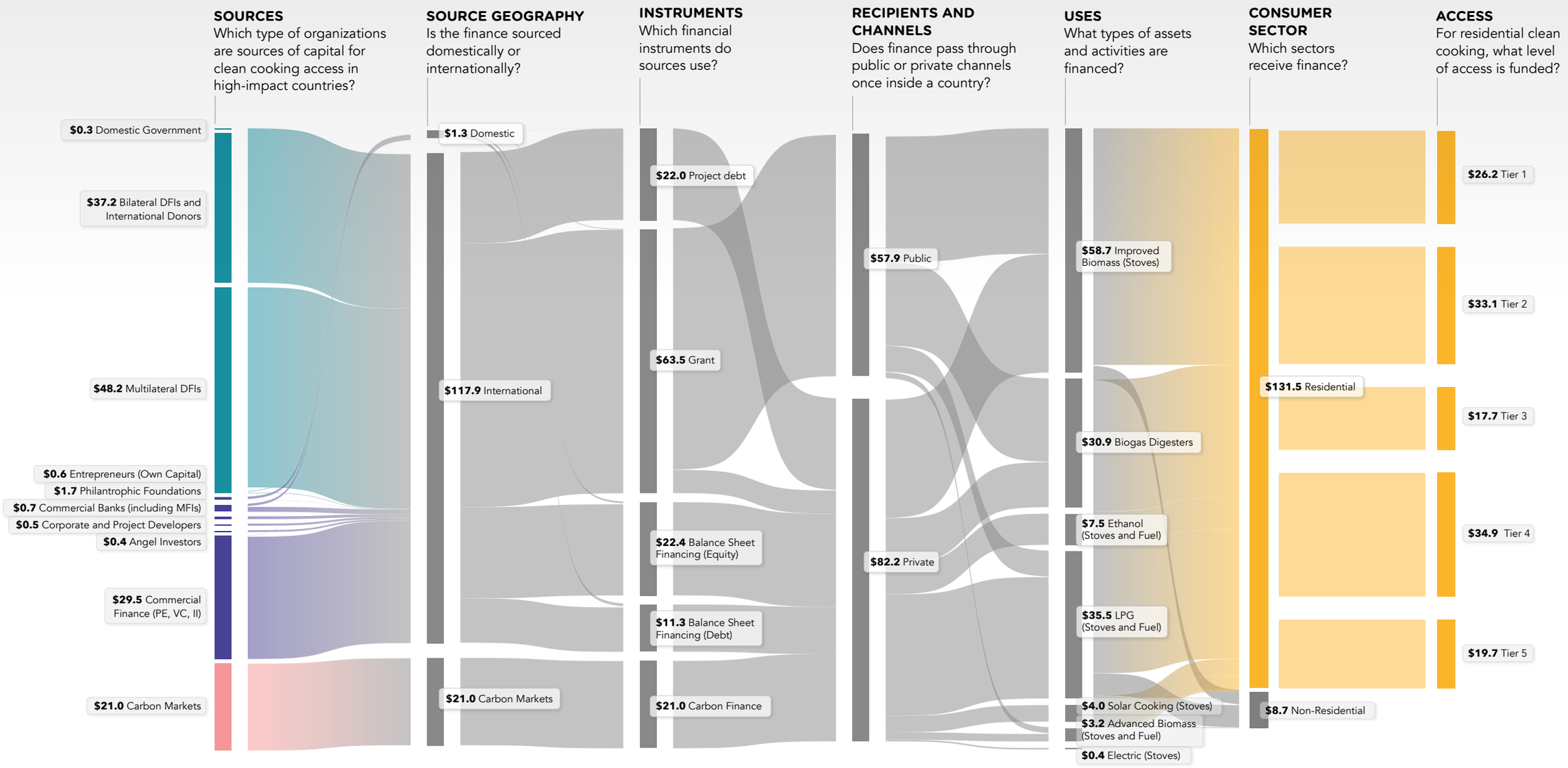
[30] Four carbon finance projects were recorded in the project registry of the UNFCCC and Gold Standard. Two projects focused on Compact Fluorescent Lamp (CFL) distribution and Solar PV while two other projects targeted ICS.

CHAPTER

4

FINANCE FOR CLEAN COOKING ACCESS

TRACKED FINANCE FOR CLEAN COOKING IN HIGH-IMPACT COUNTRIES (USD MILLION, 2018)



KEY

Public · Private · Carbon Markets · Residential Access

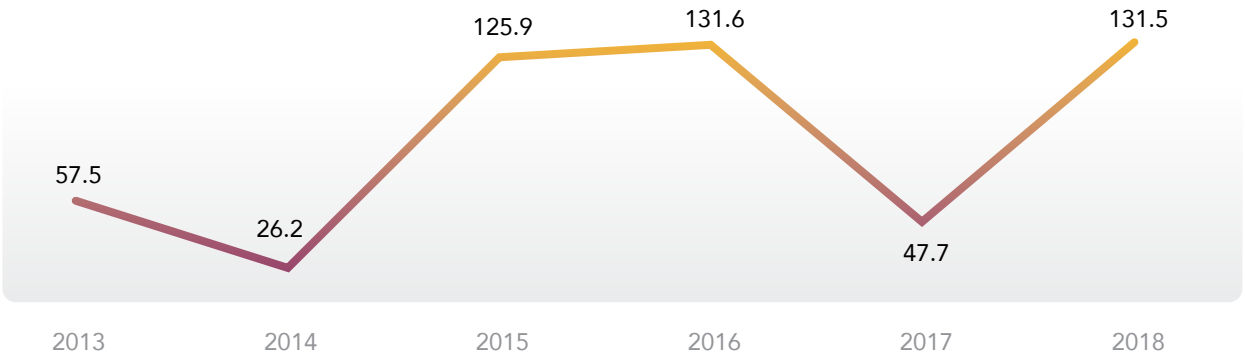
Values may not add up due to rounding

INTRODUCTION

Finance commitments for clean cooking solutions in the high-impact countries (HICs) reached USD 131.5 million in 2018. While this is the highest amount since 2013, they fall critically short of required levels of investment. While the slight uptick in 2018 is a positive indicator when compared to the low figure recorded in 2017 (Figure 22), it must be emphasized that variations are driven by a handful of publicly financed projects. They are not indicative of structural changes in sectoral investment, and are still orders of magnitude below the estimated USD 4.5 billion[31] (IEA 2020) needed annually in Sub-Saharan Africa (SSA) and South and Southeast Asia to achieve universal clean cooking access by 2030.

The total USD 131.5 million value of commitments reported in this chapter corresponds to residential clean cooking access, which represented 94 percent of the total USD 140 million tracked for clean cooking solutions in 2018.[32] This year's report includes carbon finance estimates for 2016, 2017 and 2018,[33] a shift from the methodology of the previous reports and is based on estimates from the Gold Standard, and the UNFCCC data (see Appendix I for data limitations).

FIGURE 22
Total commitments for clean cooking in high-impact countries (2013-18, USD million)



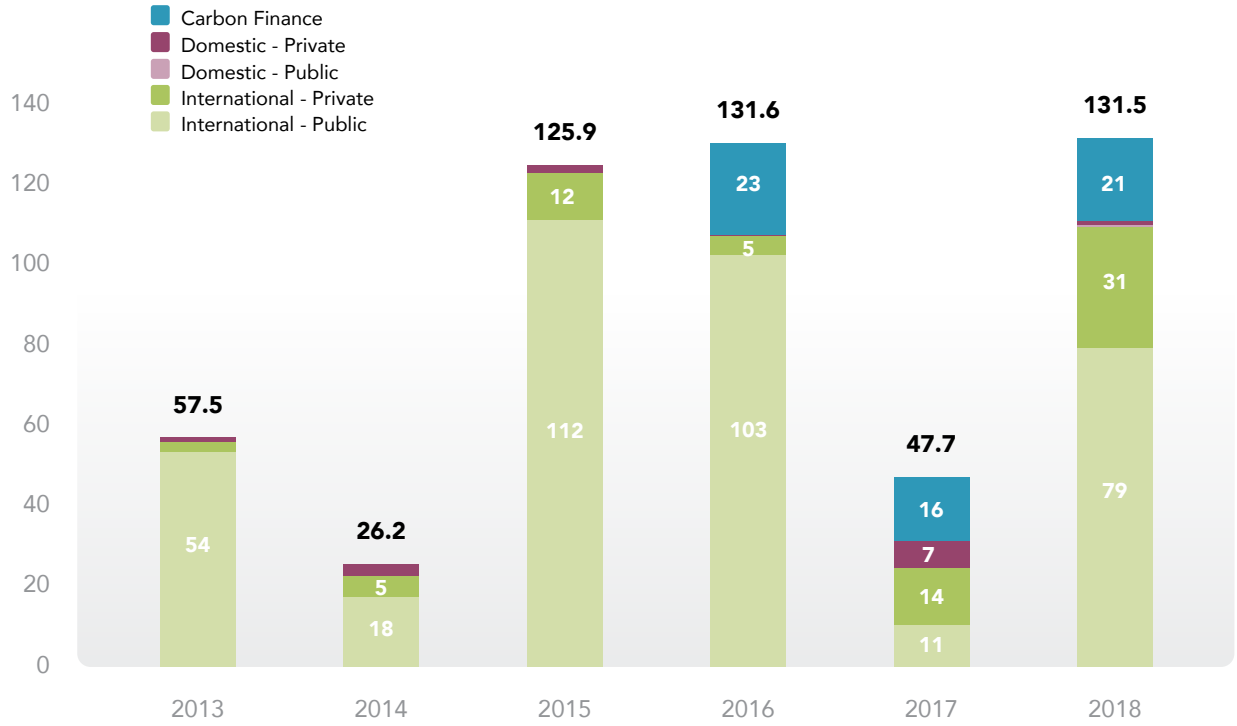
Note: Carbon finance estimates from the UNFCCC and Gold Standard are only included for 2016-2018 (see Methodology).

SOURCES

Public finance comprised most commitments for clean cooking access, with USD 79 million tracked in 2018 (60 percent of the total), primarily from international providers (Figure 23). Since 2013, clean cooking has predominantly been financed with public capital, except for 2017, when private finance (45 percent of the total) dominated due to a major dip in multilateral development finance institution (DFI) financing. In 2018, most finance committed was from international financial institutions, with these donors and private sector investors contributing 83 percent of the USD 131.5 total.

[31] Recent research by ESMAP and MECS indicates that an annual average of USD 9.8 billion would be needed to achieve an improved cooking scenario, which corresponds to achieving at least Tier 2 access (ESMAP and MECS 2020). In contrast to the IEA required investment numbers, the ESMAP-MECS figures also include public actors' expenditure such as that for fuel subsidies, which is not tracked in the report.
[32] The other 16 percent is estimated to benefit non-residential sectors, such as the industrial and commercial sectors.
[33] Respectively USD 23 million, USD 16 million and USD 21 million, contributing on average 22 percent of total finance for those years.

FIGURE 23
Total commitments for clean cooking in high-impact countries, by source (2013-18, USD million)



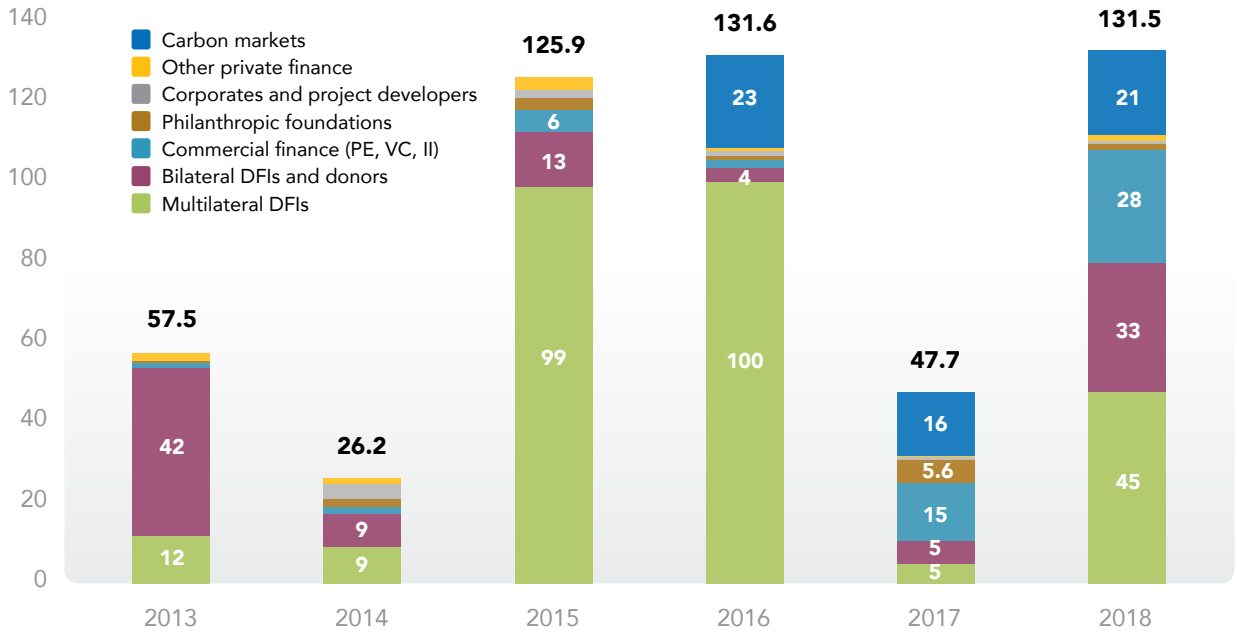
Note: Carbon finance estimates from the UNFCCC and Gold Standard are only included for 2016-18 numbers and were categorized separately from the private/public and domestic/international classifications.

Multilateral DFIs provided 57 percent of public finance committed in 2018 (USD 45 million), while bilateral DFIs and donors contributed the remaining 42 percent, driven by a handful of sizeable projects (Figure 24). Two USD 20 million projects financed by the World Bank Group in Bangladesh for the implementation of improved biomass cookstoves, biogas digesters, and LPG access, constituted 30 percent of total finance tracked for clean cooking in 2018. The significant variations in multilateral DFI investment, from USD 100 million in 2016 down to USD 5 million in 2017 and to USD 45 million in 2018, are driven by a handful of projects by the World Bank. For example, a USD 64 million loan for a biogas project in 2015 and a USD 80 million improved cookstove project in 2016, both in China, contributed the majority of commitments in those years.

Bilateral DFIs and donors[34] increased their clean cooking support from an annual average of USD 7 million during 2015–17 to USD 33 million in 2018. These commitments included a USD 20 million grant from the Green Climate Fund's Global Clean Cooking Program, aimed at increasing adoption of improved cookstoves (ICS) in Bangladesh (Green Climate Fund 2018). It is alarming to note that the critical state of investment in clean cooking rests on the shoulders of individual large projects from a small number of funding institutions, channelled to a handful of countries.

[34] Bilateral DFIs and donors include bilateral DFIs, international governments and multilateral climate funds.

FIGURE 24
Total commitments for clean cooking in the high-impact countries, by provider (2013-18, USD million)



Note: Domestic government contributions are excluded from this graphic as the level of investment tracked was lower than USD 1 million each year (see Appendix I). Bilateral DFIs and donors includes bilateral DFIs and international donor governments; Commercial finance includes institutional investors, impact investors, venture capital and private equity; Other private finance includes commercial banks (including MFIs), angel investors and entrepreneurs.

Private finance commitments increased 48 percent to USD 32 million in 2018, from USD 21 million in 2017. Private sources of finance have increasingly played an important role, contributing, on average, 34 percent of total annual finance for clean cooking in 2017-18, compared to an annual of average of 13 percent between 2013-2016. The increase in private finance was driven by institutional investors, private equity, venture capital and impact investors, a group that provided USD 28 million in aggregate (89 percent of private finance) in 2018 compared to USD 2 million from philanthropic foundations.

Clean fuel solutions such as ethanol stoves have become increasingly commercially viable and may be ripe for scale up. In contrast to public institutions, private providers did not finance ICS primarily; 34 percent (USD 11 million) of private finance went to biogas digesters, 24 percent (USD 8 million) to ethanol and 19 percent (USD 6 million) to LPG related projects. For example, Tanzania-based LPG distributor KopaGas, which attracted financing from Acumen in 2018, was acquired in 2020 by Circle Gas in a USD 25 million transaction, enabling some early investors to exit their positions (Acumen 2020). This is a critical demonstration to private investors that some innovative business models, such as pay-as-you-go fuel distribution enabled by mobile money, can be commercially viable. This model needs to be replicated through innovative financing mechanisms and use of existing technological improvements and fuel infrastructure (SEforALL and CPI 2019).

Due to tracking limitations, clean cooking investment from domestic government entities continues to be underrepresented in this report. One reason for this is likely because domestic governments' expenditure in clean cooking has increasingly been expressed as policy tools, which are not included in this report's tracking methodology.[35] These include, for example, India's LPG subsidy that represents on average USD 2.8 billion of annual expenditure (SEforALL and CPI 2019). Other policy instruments not tracked in this

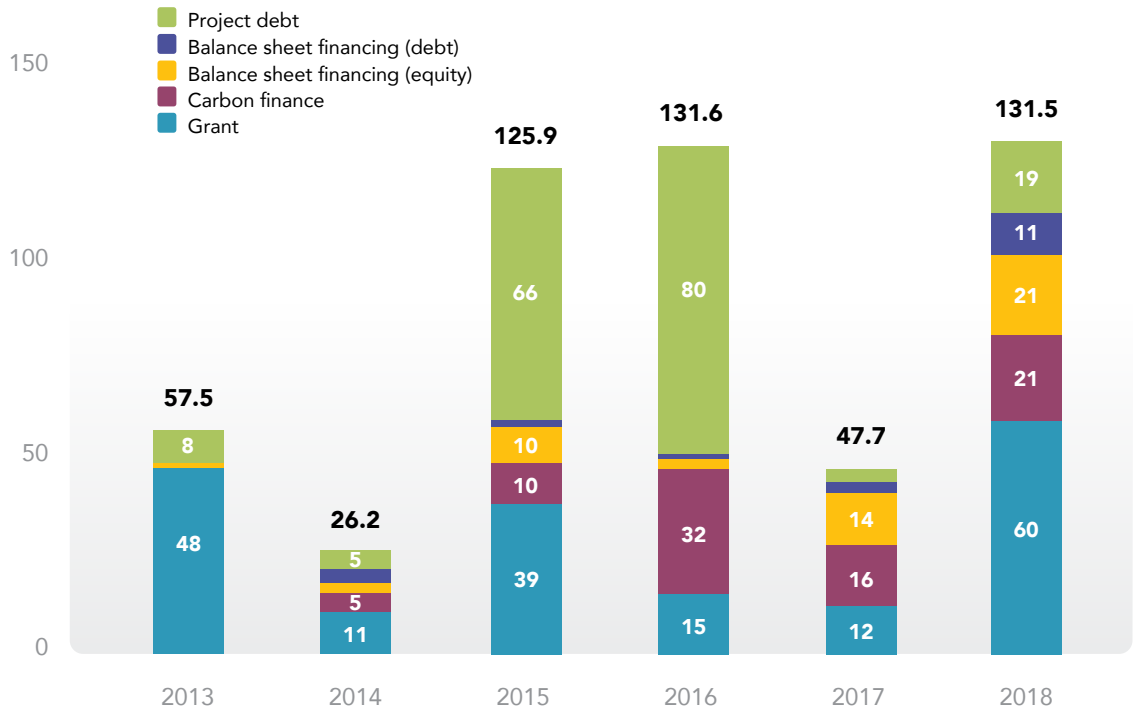
[35] Revenue-support mechanisms such as subsidies are excluded to avoid double counting, as these investments are often used to repay financing costs. The methodology tracks only primary investments in clean cooking technologies and fuels.

report are levies, taxes and import duties, as well as fossil fuel subsidy phaseouts. For example, kerosene subsidies make cleaner, alternative fuels relatively more expensive, affecting affordability of clean cookstoves for end users. The 2019 edition of *Energizing Finance: Understanding the Landscape* estimated that around USD 4.4 billion was committed to clean cooking in 2017 through domestic government programmes. However, this was not included in this year's report due to several challenges such as the risk of double counting if government-led initiatives are ultimately financed by external donors or international programmes, and the challenges of isolating the clean cooking component of a programme, among other issues.

INSTRUMENTS

Clean cooking investments in 2018 were marked by a stronger role for grants, which increased from USD 12 million in 2017 to USD 60 million in 2018. While 2017 saw proportionally higher balance-sheet equity due to higher levels of commercial finance, significant grants provided by the World Bank Group and Green Climate Fund to ICS and biogas projects in Bangladesh and Kenya translated into the highest level of grants recorded since 2013 (Figure 25). Other significant providers of grants were international donor governments and agencies, such as Norway, which provided USD 6 million for LPG and advanced biomass projects in Bangladesh and Kenya.

FIGURE 25
Total commitments for clean cooking in high-impact countries, by financial instruments (2013-18, USD million)



Note: Carbon finance estimates from the UNFCCC and Gold Standard are only included for 2016–18 numbers. Carbon finance investment figures recorded for 2014 and 2015 consist of World Bank carbon finance projects that were collected separately, while 2016 includes both World Bank and estimated carbon finance projects (which were checked for double counting).

Balance sheet financing provided USD 32 million for clean cooking solutions in 2018. Driven by investment from commercial financiers such as institutional and impact investors, USD 10 million of finance for biogas digesters was provided on balance sheet, with USD 8 million flowing to ethanol cooking and USD 6 million to LPG. Project debt increased from USD 3 million in 2017 to USD 19 million, with 90 percent of the investment due to a single International Finance Corporation project in Bangladesh to increase access to LPG fuel for cooking and commercial activities. This is, however, a decrease from the high annual average of USD 73 million in 2015-16, which was provided at market rates from the World Bank for ICS and biogas projects in China.

Carbon finance was estimated at around USD 21 million, with the majority (80 percent) employed to finance ICS projects from voluntary markets using Gold Standard data. Carbon finance, in which clean cooking project developers sell verified credits for reduced emissions compared to a baseline carbon intensive scenario, is a challenging source of finance to track due to the opacity of available data and complexities of carbon pricing.[36] In this report, an annual average of USD 20 million per year was added for the 2016–18 period, enabled by new data sources and an improved methodology. Data included voluntary market credits from the Gold Standard Impact Registry, which provides information on carbon offset projects that have been certified by the internationally recognized standard, and mandatory market credits from the UNFCCC, for emission-reduction projects under the Clean Development Mechanism (CDM) (see Methodology for more details).

Solar cooking attracted USD 4 million of carbon finance in 2018, USD 1 million of which was estimated for mandatory markets. These initial estimates show that carbon finance has a significant role in clean cooking finance. It may be ready to play an even bigger role in light of upcoming negotiations on Article 6 of the Paris Agreement and the emergence of national carbon markets like the South Korea Emission Trading Scheme, in addition to expanding carbon accounting methodologies for emerging modern fuel solutions such as electric cooking. (See Box 5 for more details).

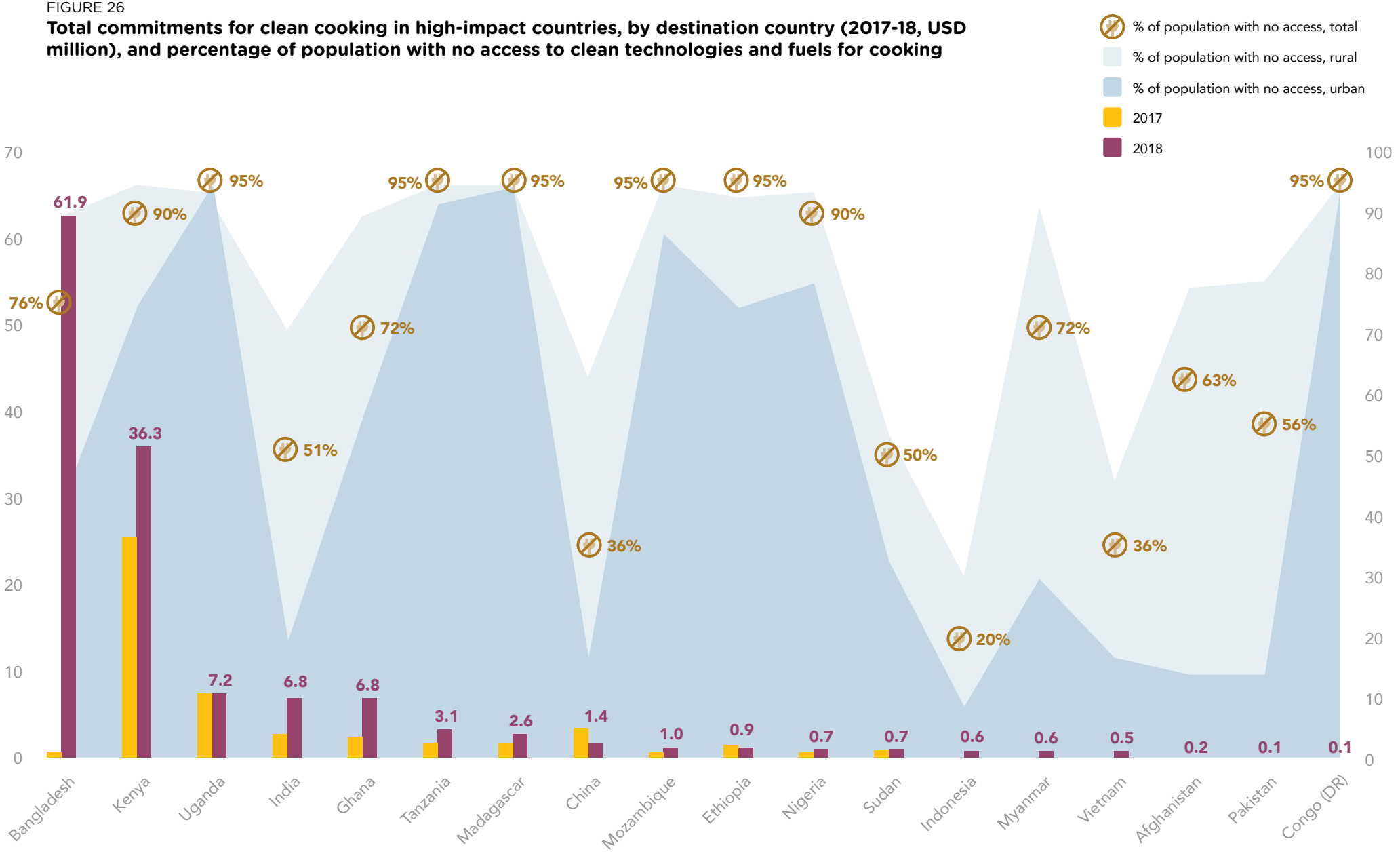
RECIPIENT COUNTRIES

The distribution of finance committed for clean cooking access across HICs in 2018 is disconcerting, with 92 percent of public finance in 2018 concentrated in Bangladesh and Kenya. While the top recipients of finance commitments, Bangladesh and Kenya, attracted 75 percent of the total finance tracked in 2018 with USD 62 million and USD 36 million respectively, many other HICs like Ethiopia, Mozambique and Nigeria each received meagre amounts below USD 1 million (Figure 26). This discrepancy highlights the need to scale up finance and to prioritize systemic clean cooking programmes within the multilateral development bank (MDB) and donor community in all access deficit countries in SSA and Asia.

[36] Projects were checked for double counting using project descriptions where possible, and assuming that a large portion of voluntary carbon market finance is provided by private sector companies and thus does not overlap with the report's public finance data sources (OECD CRS). While there may be some overlaps with companies anonymously surveyed by the Clean Cooking Alliance, detail on financial instruments used indicate these transactions consisted of grants, debt or equity rather than carbon finance. Furthermore, companies surveyed by the Clean Cooking Alliance generally produce and distribute cookstoves regularly, as opposed to the one-off distribution of cookstoves observed in carbon finance projects.

FIGURE 26

Total commitments for clean cooking in high-impact countries, by destination country (2017-18, USD million), and percentage of population with no access to clean technologies and fuels for cooking



Note: North Korea and the Philippines are excluded from this graphic as no finance for clean cooking was recorded in 2018. Carbon finance estimates from the UNFCCC and Gold Standard are only included for 2016–18 numbers.

While both Bangladesh and Kenya received significant finance commitments in 2018, their sources were very different. The significant commitment level in Bangladesh was mainly due to large ICS and biogas programmes financed by the World Bank and the Green Climate Fund, as well as a project to improve LPG cooking fuel access. 55 percent of finance committed in Kenya was provided by commercial financiers — funds, private equity, or institutional investors — primarily for modern or renewable fuels such as ethanol, biogas and LPG projects and companies.

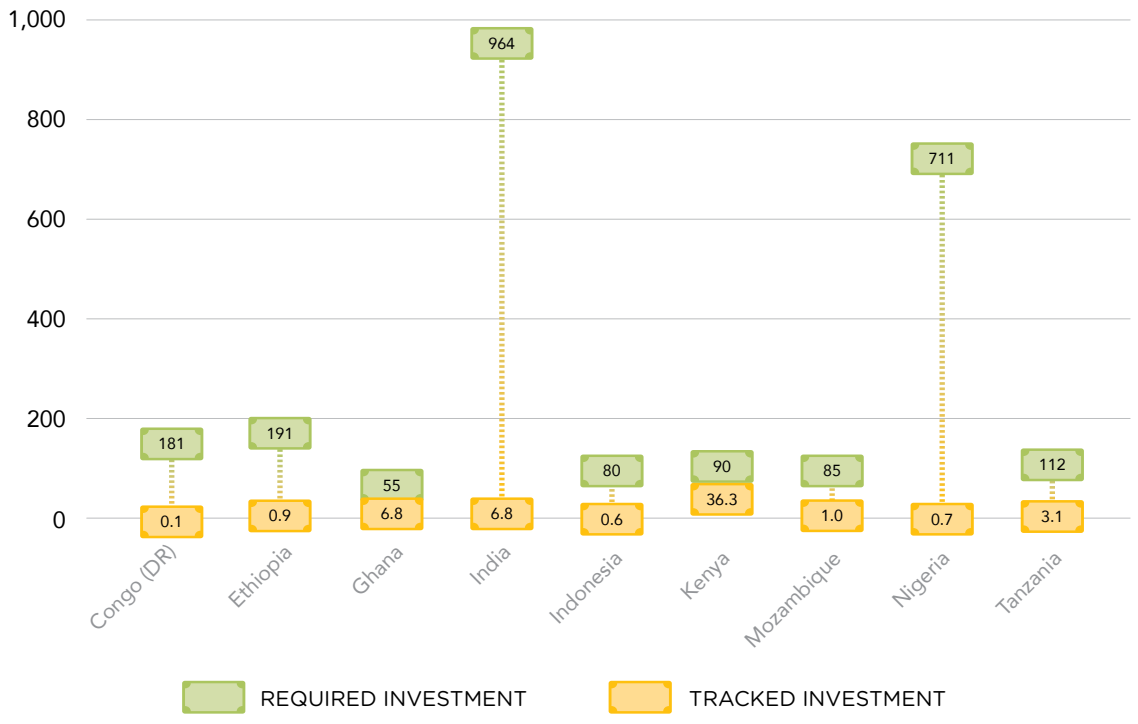
HICs in SSA attracted finance at levels dramatically below those needed to achieve universal access by 2030. Countries such as the Congo (DR) and Ethiopia, with nearly 95 percent of their populations without access to clean cooking fuels and technologies, received negligible levels of commitments. As shown in Figure 27, Ethiopia attracted USD 0.9 million in 2018 in contrast to the USD 191 million it needs annually to provide its entire population with access to clean cooking solutions, and the Congo (DR) attracted USD 0.1 million in 2018, far from the USD 181 million required annually (IEA 2020).

This year's clean cooking landscape includes the addition of Ghana to the list of HICs, which counts 72 percent of its population as lacking access to clean cooking fuels and technologies. USD 7 million was committed in Ghana in 2018, around 8 times lower than the annually required USD 55 million.

India and Indonesia showed progress in clean cooking access through government-led policies and programmes. While progress in access for urban populations, supported by domestic government-led programmes and increasing from 69 percent to 81 percent between 2010 and 2018, seems promising in India, rural access remains at 28 percent (from 14 percent in 2010) (IEA, IRENA, UNSD, World Bank, WHO 2020). Access to clean cooking in Indonesia increased from 41 percent of the total population to 80 percent in 2018, with levels of 91 percent for urban and 68 percent for rural access. This significant progress was likely helped by the government-led kerosene-to-LPG fuel conversion programme in 2007, which decreased usage of kerosene from 37 percent to 6 percent in 2012, while LPG increased from 11 percent to 55 percent in the same year (SEforALL and CPI 2018).

FIGURE 27

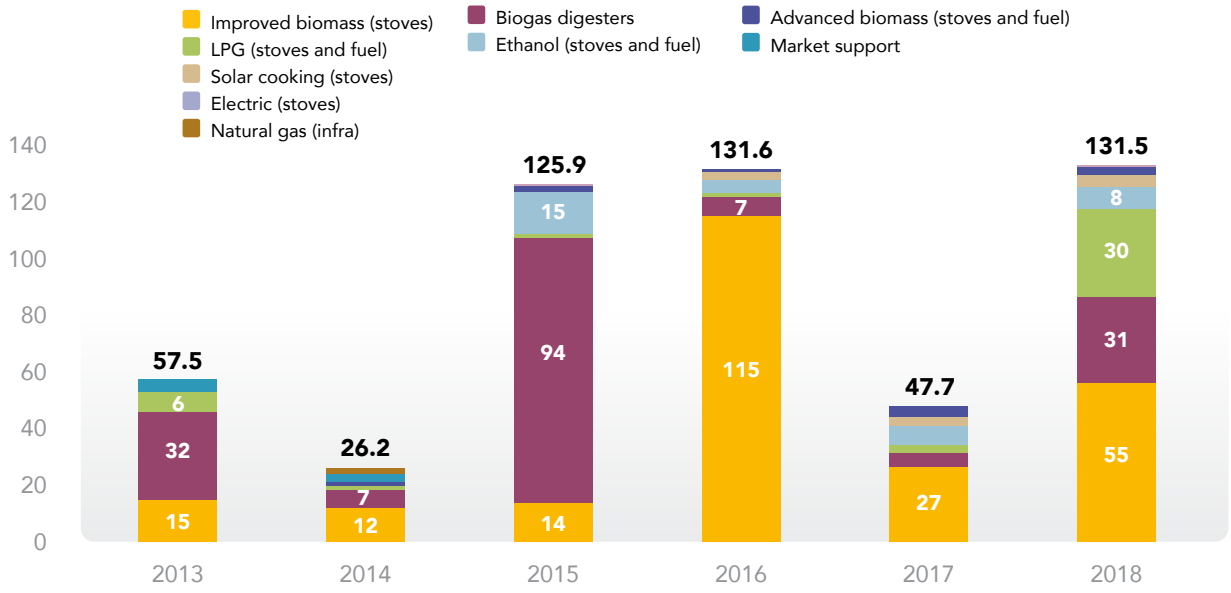
Total commitments for clean cooking in high-impact countries compared to investment needs (2013-2018, USD million)



TECHNOLOGY: STOVES AND FUELS

As in 2016 and 2017, most finance committed supported deployment of ICS (USD 55 million), accounting for over 40 percent of the total finance tracked in 2018 (Figure 28). ICS burn fuels like firewood, charcoal and crop residues and are often more affordable than cleaner solutions like gas and electric cookers. They constitute transition solutions as they emit less noxious pollutants than traditional cookstoves. (See Box 4 for a review of clean cooking definitions). The high upfront costs of stoves and poor access to fuels for LPG and electric cooking are all barriers that continue to slow the widespread adoption of more modern solutions beyond ICS.

FIGURE 28
Total commitments for clean cooking in high-impact countries, by technology (2013-2018, USD million)



Finance commitments for biogas digesters increased from USD 5 million in 2017 to USD 31 million in 2018. While commitments for this renewable fuel solution peaked in 2015 at USD 94 million (driven by a single World Bank funded project of USD 64 million in China), there were actually more biogas projects in 2018 than in 2014 (19 versus 14), including a World Bank funded USD 20 million project in rural electrification and renewable energy development in Bangladesh.

Increased investment in LPG stoves and fuel — from USD 3 million in 2017 to USD 30 million in 2018 — shows that interest has picked up for LPG, with technology performance surpassing that of advanced biomass in terms of emission efficiency (CCA and ESMAP 2015). It is important to note that 56 percent of the total LPG investments were due to a single project in Bangladesh, financed by the International Finance Corporation. While not included in the landscape, this report explores alternative approaches to tracking finance for fuels that require large-scale distribution infrastructure, such as ethanol and LPG (see Box 7).

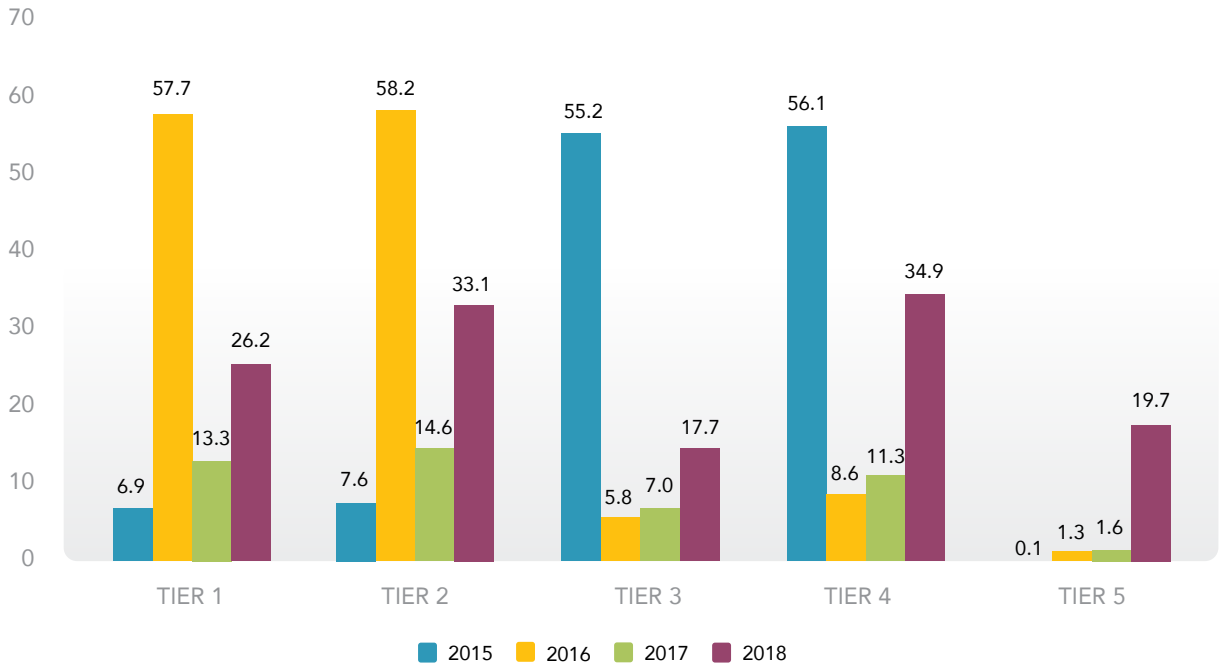
Finance commitments tracked for ethanol, solar and electric cooking in 2018 remained sluggish. Finance for ethanol cooking has stagnated, attracting USD 8 million in 2018, a slight increase from the USD 6 million annual average recorded in the 2014–17 period. Commitments for solar cooking have shown similar inertia, standing at USD 4 million in 2018, only barely higher than the USD 3 million tracked the previous year. Electric cooking received very low levels of finance — USD 0.4 million in 2018 in both grants and debt — which is insufficient for a technology that has strong potential for synergies with electrification and emissions reduction (see Box 6).

The slow increase in finance for technologies other than ICS illustrates that the entire clean cooking sector needs to move on all fronts to expand investment not only to a range of technologies but also to more HICs.

USES: TIERS

Using a similar approach to the electricity landscape, this report allocates shares of tracked finance for residential access to clean cooking fuels and technology to tiers ranging from 1 to 5, following the Multi-Tier Framework (MTF) (see the Methodology for a more in-depth description).

FIGURE 29
Total commitments for clean cooking in the high-impact countries, by tiers of access (2015-18, USD million)



Finance committed in 2018 went primarily to tier 4 access, due to large LPG and biodigester investment in Bangladesh (Figure 29). This was closely followed by tier 2 access with USD 33 million, which corresponds to meal preparation times of less than 10 minutes per meal and mid-range levels of efficiency, along with other indicators linked to cooking exposure, safety and fuel availability. USD 26 million was committed to tier 1 access, which is too low an access level to qualify as modern clean cooking fuel (ESMAP 2020a).[37]

The recent *State of Access to Modern Energy Cooking Services* report produced by the World Bank's Energy Sector Management Assistance Program (ESMAP) qualifies households as having modern energy cooking services if they reach tier 4 or 5 access, which generally corresponds to better quality access with limited accidents, improved convenience and efficiency, as well as reduced health impacts (ESMAP 2020a). Projects leading to tier 4 and tier 5 access attracted a combined USD 55 million in 2018 (USD 35 million and USD 20 million respectively), financed primarily through grants and balance sheet equity. In comparison, tier 2 and 3 access projects attracted a combined USD 51 million, corresponding to households having access to improved cooking services according to ESMAP (2020a). (See Box 4 on the definition of clean cooking.)

[37] Tier 1 access numbers are still included in the total finance tracked as they correspond to a portion of investment for ICS. Data sources do not generally include details on the type of ICS or tier achieved by the project.

Way forward for the clean cooking sector

LEVERAGING EXISTING INFRASTRUCTURE FOR FUEL DISTRIBUTION: It is not commercially viable for project developers to build entire fuel supply chains themselves, from production to capillary distribution. Disassociating the stove from the fuel, leveraging existing infrastructure or subsidizing their construction with concessional finance or carbon finance to de-risk capital expenditure or upfront purchase costs can contribute to greater penetration of clean cooking technologies.

KOKO Networks is an example of this successful approach, which leverages the distribution network owned and operated by Shell-branded service stations, operated by Vivo Energy Kenya. By using the existing liquid fuel infrastructure in Kenya, KOKO Networks provides the technological platform that brings distribution infrastructure to "chokepoints" in local corner stores in Nairobi, which are more numerous and closer in location to end users. This works to reduce the final retail price of the ethanol, effectively undercutting the price of charcoal, without any significant initial capex expenditure on distribution infrastructure.

LEVERAGING INCREASING ELECTRIFICATION TO POWER CLEAN COOKING INITIATIVES: Grid-powered electricity, which currently attracts the highest level of electricity access finance, could be a first mover in scaling up electric cooking in HICs. Furthermore, decentralized electricity, supported by decreased costs and increased efficiency of cooking appliances and solar photovoltaics and storage solutions, has been shown to make electric cooking from renewable energy a commercially viable technology with strong potential in coming years.

Many countries have started piloting projects and campaigns to better understand the transformative potential of electric cookstoves. Supportive government policies to address limitations, such as lack of reliable and sustainable electricity supply, cultural cooking habits, unaffordability of cookstoves and limited financing models, are needed to increase uptake at scale.

FUEL STACKING IS A REALITY THAT NEEDS TO BE INCORPORATED IN CLEAN COOKING PROGRAMME PLANNING: It is unlikely that one single cooking technology and/or fuel will fully dominate in households, especially considering the diversity of conditions, target groups and needs of different regions and countries. As seen in the Bangladesh case study (Chapter 5), in the near to medium term, diverse fuels and technologies are likely to be used simultaneously, especially in semi-urban and rural centres, due to income limitations, uncertainty as well as difficulty in accessing fuel, and traditional cooking habits.

Hence, it is time to push forward on all fronts including different technologies and fuels, innovative business models, and financing mechanisms. Cooking that relies on fuels such as biogas, ethanol, LPG and pellets are all complementary solutions to electric cooking that could tap into the progress made in electrification, especially in the long term. Incorporating the reality of fuel stacking to other critical characteristics, such as affordability and convenience of clean cooking solutions, is necessary to ensure an accelerated transition to cleaner cooking fuels and technologies.

GOVERNMENTS SHOULD FACILITATE PRIVATE SECTOR INVESTMENT THROUGH TARGETED POLICIES: Governments of HICs have a strong role to play in providing incentives such as levies and subsidies for households to shift from "free" fuels — as costs of health impacts and time spent collecting firewood are not priced in — to more expensive but cleaner fuels. Specific tools such as taxes and subsidies can play a role in favouring more efficient technologies in some situations but can also create price distortion in markets, as well as negatively affect other technology markets and private sector participation. It is thus critical to adopt an approach to clean cooking policymaking that is targeted in terms of impact and the ability to scale solutions and business models. An example of a synergistic approach is the "Give It Up" scheme for LPG in India, which allows well-to-do urban beneficiaries to voluntarily opt out of subsidies that are shifted to expand access to LPG for rural and lower-income communities (IISD 2019).

To ensure we expand clean cooking access, it is important to target clean cooking subsidies to vulnerable populations only, implement financing mechanisms that support and do not distort markets, provide finance for small and medium-sized enterprises (SMEs) and other innovators, and coordinate programmes across ministries relating to health, energy, women's development and environmental protection.

4 DEFINITION OF IMPROVED AND CLEAN COOKING SOLUTIONS

Cooking solutions are mainly comprised of stoves, fuels, or a combination of the two. The ensuing experience of cooking can then be qualified through a variety of lenses, such as health impacts, source and availability of fuel (fossil or renewable based), or improvement over a baseline cooking method (see Appendix II for a mapping of clean cooking definitions). This report follows the ESMAP definitions and approach, which cover all clean and improved cooking solutions that can improve on fuel efficiency and emissions performance when compared to the baseline of traditional cooking technologies such as the three-stone fire, open U-shaped clay or mud stoves, "metal bucket" charcoal stoves, and unvented coal stoves (ESMAP 2020a). In practice, this can include intermediate ICS, advanced ICS, modern fuel stoves (such as LPG, electric, natural gas), and renewable fuel stoves (biogas, ethanol and solar cookers).

While this report follows the definitions set out by ESMAP, what constitutes clean cooking is often contingent on individual countries' characteristics. Conclusions of studies comparing the local emission level of cooking solutions and their life cycle environmental impact (LCA)[38] will indeed vary according to several factors such as the baseline stove usage scenario, geographic location and electricity supply mix (see an example in the Methodology). While electric cooking may have a high global warming potential in a country with fossil fuel-supplied electricity, the picture would be different in a country with greater renewable energy supply.

These varying conclusions suggest that establishing a ranking of cooking solutions according to a qualification of "clean" is highly context dependent. It is therefore important that these variations — spanning local emissions level, combustion rate, availability of a local fuel supply chain, both upfront and running costs, and traditional cooking practices — are considered when qualifying and evaluating the potential of clean cooking solutions.

Furthering the challenge in qualifying the "clean" aspect of clean cooking, it is important to consider the numerous co-benefits associated with cooking solutions that displace the use of traditional biomass or charcoal. These co-benefits, which encompass gender equality, health, economic opportunity, and protection of land and forests, may generate outcomes beyond the emission-reduction impact (CCA 2014). While it is difficult to incorporate all these various aspects in a holistic definition, doing so is critical to informing business-centric evaluations and country-level recommendations.

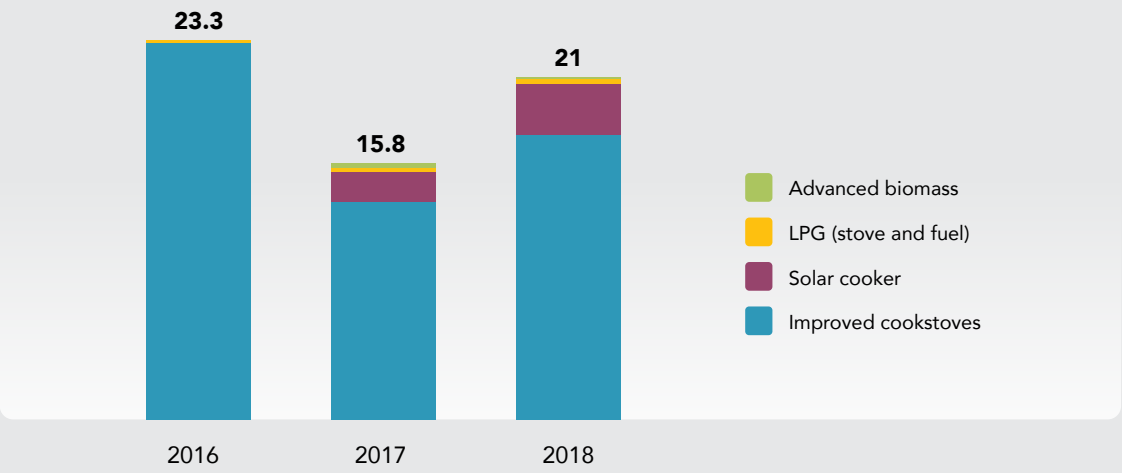
[38] A life cycle assessment (LCA) considers the impact at all stages of a product, from production to use. For example, in one study, the LCA of cooking with LPG takes into account oil and gas extraction and refining, while the impact of electric cooking includes electricity generation (Aberilla et al. 2020).

5 ESTIMATING THE ROLE OF CARBON FINANCE FOR CLEAN COOKING

The financing of clean cookstoves has been enabled through both voluntary and regulated carbon markets and accounting methodologies for at least 12 years (Ecosystem Marketplace 2019). This report used issuance data from the sources for the regulated and voluntary carbon markets - the Gold Standard, and the Ecosystem marketplace and UNFCCC respectively - to estimate the amount of carbon finance in the clean cooking sector. Please see Appendix III for more details.

With this methodology, the report has added an average of USD 20 million in carbon finance per year during the 2016-18 period, predominantly towards ICS projects (Figure 30). This is an encouraging step in capturing a source of finance that, with upcoming negotiations under the Paris Agreement and the emergence of significant national carbon markets, should gain momentum in the coming years.

FIGURE 30
Estimated carbon finance flows for clean cooking projects in the mandatory and voluntary markets, by technology (USD million)

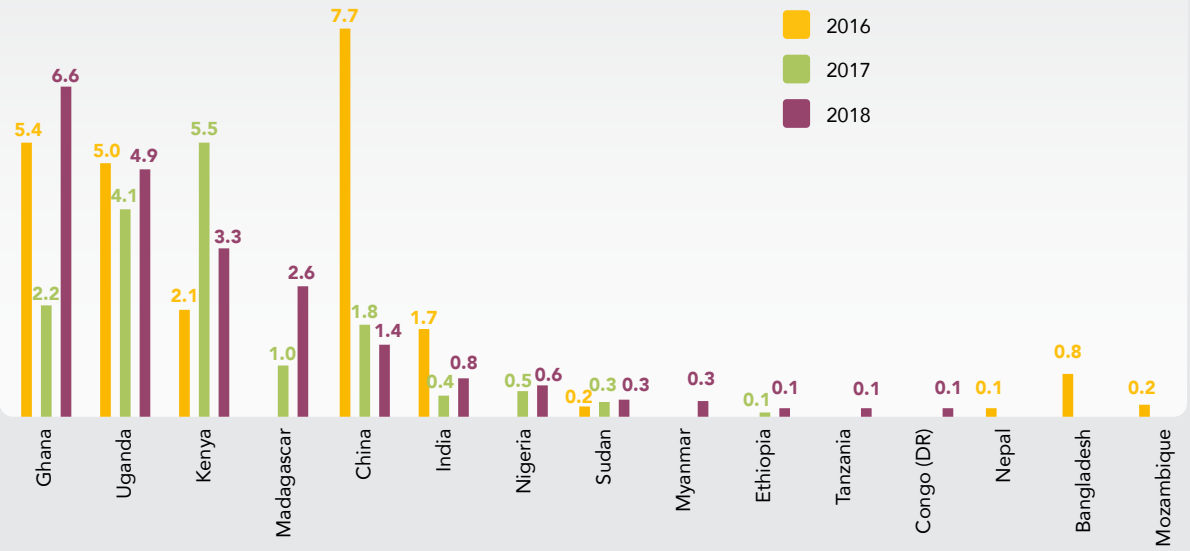


Around USD 21 million in carbon financing for clean cooking projects in HICs is estimated to have occurred in 2018. Of this, USD 19 million was tracked through the voluntary market, as a result of 3.8 million voluntary emission reductions (VERs) issued in the course of the year. This is an increase from the USD 13.9 million voluntary credits estimated in 2017 but a slight decline from the peak USD 20.7 million estimated in 2016. These numbers are consistent with totals reported by the Ecosystem Marketplace report, which finds that the voluntary market for clean cooking reached at least USD 24.8 million in 2018. The corresponding numbers for mandatory carbon market were somewhat sparse; the report tracks only USD 2 million in 2018, a slight decrease from the annual average of USD 2.3 million tracked in 2016–17.

Figure 30 shows that carbon markets are predominantly used to finance ICS, representing on average 89 percent of total finance in 2016-2018. A handful of projects in India, Madagascar and Sudan were also registered in the Gold Standard Impact Registry in advanced biomass, LPG and solar cooking.

FIGURE 31

Estimated carbon finance flows for clean cooking projects in the mandatory and voluntary markets (VER), by destination country (USD million)



In 2018, Ghana registered the highest amount of carbon finance with the Gold Standard, receiving USD 6.6 million for ICS (Figure 31). Over the 2016–18 period, Ghana saw a consistent level of carbon finance, averaging USD 4.7 million annually. A significant project with a total of 1.15 million VER issuances in 2018 (equivalent to USD 5.8 million) in Ghana was the Gyapa Cookstoves Project, a partnership between ClimateCare and Relief International to manufacture and sell more efficient cookstoves.

Uganda also averaged USD 4.7 million a year over the same period, following the government's efforts to attract a source of finance. The ICSEA 'Improved Cook Stoves for East Africa' umbrella programme registered by the Uganda Carbon Bureau in 2012 aimed at incentivizing project developers to enter the Ugandan market without going through brokers as intermediaries.

While this analysis results from estimated figures, they are encouraging methodological steps towards a better estimation of carbon finance for clean cooking. Future coverage of the voluntary market could be improved through a systematic application of average prices for projects under other carbon registries beyond the Gold Standard, provided the data quality and transparency allow for it.

6 ELECTRIC-BASED COOKING TECHNOLOGIES

Electric-based cooking technologies[39] were long neglected as a clean cooking solution in developing countries primarily due to low electricity access rates in rural communities where the majority of households without access to clean cooking solutions reside. Despite this, the technology's health and use potential have kept it on the list of "modern fuels," along with biogas, LPG, ethanol, electrcity, natural gas and solar. Electric cooking appliances also offer higher efficiency, reaching efficiency levels of 90 percent – much higher than the 20 percent typical of ICS and the 60-70 percent of LPG stoves (ESMAP and CCA 2015). Despite these known benefits, the unaffordability of electric cookstoves, not to mention unavailability and poor reliability, has hindered the development of this technology which only represented 7 percent of main fuel type used for cooking in low- and middle-income countries in 2018 (IEA, IRENA, UNSD, World Bank, WHO 2020).[40]

With recent strides in electrification rates, growing on- and off-grid capacity, the declining cost of solar photovoltaics, and technological progress in the energy efficiency of appliances (stoves as well as pressure cookers and crock pots), electric cooking is becoming commercially viable. For rural households connected to mini-grid and solar home systems, the cost of cooking with electricity is now within the cost-competitiveness range of other cooking alternatives (World Future Council and Hivos 2019; MECS 2020b). For instance, with the right loss reduction mechanism and battery storage, the cost of solar PV-based cooking is comparable to charcoal-based cooking, the latter of which has seen costs increase due to government disincentives such as bans on logging (Business Daily Africa 2020).

In addition to the decreasing cost of electric cooking devices, potential synergies between electrification and clean cooking are significant and yet not fully explored. Coordinated planning between the two, where increasing the penetration of electric cookstoves can stimulate demand for electricity and cause prices to fall, has shown to have the potential to reduce electricity costs by 34 percent and increase electric cookstove viabilities from 42 percent to 82 percent (Lee et al. 2015).

Despite the possible benefits, a range of economic, cultural and technological barriers have limited the uptake of electric-based cooking solutions. These include:

1. Lack of quality, reliable and sustainable electricity supply in both rural and urban areas. For example, in India, in 2015 it was argued that an electric cookstove with above 1 kWh wattage may not be a sustainable solution for newly electrified households receiving a 0.5 kWh connection (NITI Aayog 2016). Today, experiments with 300W and 500W pressure cookers and smaller rice cookers are providing far more convincing alternatives.
2. Lack of a natural matching of cultural cooking habits across geographies with electric cooking. Households can be reluctant to introduce behavioural changes in cooking patterns to accommodate modern technologies that may not be suited to the nature of traditional meals, although electric cooking may benefit from a perceived modernity of appliances and be suitable for changing food habits such as the reheating of food.
3. Few business and financing models incorporating households' willingness and ability to pay for electricity, especially for newly electrified households.
4. Higher energy requirements for cooking, resulting in overloading of existing grid lines and higher household expenditure on electricity.

[39] Electric cooking refers to stoves powered through a grid system connection. This solution uses technologies such as electric or induction stoves, or appliances such as pressure or rice cookers, irrespective of the source used to generate the electricity (ESMAP and CCA 2015). Electric cooking excludes solar cookers that capture solar thermal energy directly.
[40] This number may underrepresent the role of electric cooking when considering electric appliances such as kettles.

5. High cost of electric cooking appliances like induction stoves, slow cookers and hotplates, although others such as rice or pressure cookers can be more affordable, while covering a large range of cooking needs in some countries (ESMAP 2020b).

Several economies, especially India, Nepal and Nigeria, have started piloting targeted projects and campaigns to better understand the transformative potential of electric cookstoves (MECS 2020a). Some countries have taken steps towards putting in place the necessary conditions to enable electric cooking: for example, Nepal's Ministry of Energy, Water Resource and Irrigation has stated the government's plan to reach the goal of an "electric stove in every house" through strengthening the country's distribution networks, discussing the possible adjusting of electricity tariffs to favour electric cooking (Vaidya 2020). Furthermore, the Modern Energy Cooking Services (MECS) programme, a five-year USD 50 million (MECS 2019) project funded by the UK Foreign, Commonwealth and Development Office (FCDO),[41] aims to leverage renewable energy (both grid and off-grid) to expand clean cooking access. This programme applies a comprehensive approach to provide evidence on drivers for transition including households' cooking demand, behaviour and optimization of multi-fuel use.

Such programmes and studies are instrumental in providing economic evidence to debunk several pre-conceived notions that preclude the uptake of clean cooking. For instance, electric pressure cookers can be used to make more than 80 percent of the staple meal recipes in Kenya, Myanmar, Tanzania and Zambia (Batchelor et al. 2019), without altering the perceived taste of the meals.

Furthermore, the adoption of clean cooking at a large scale would require a rework and rethink on government policies and subsidies for all the technologies. For instance, countries can consider shifting some focus to electric-cooking solutions for urban and peri-urban areas with a reliable electricity supply and supplemented with self-storing fuels like LPG to address the issue of peak load at the time of evening cooking.

Several countries like Bangladesh and India import more than 60 percent of their domestic LPG needs while offering significant subsidies for LPG cylinders and fuels. The fuel conversion from kerosene to LPG programme in Indonesia, which contributed to increasing its use in the country to 72 percent in 2016, is an example of a strong government push for the fuel (SEforALL and CPI 2018). However, with consumption costs of LPG cylinders equivalent to the cost of cooking with an electricity-based solution, national governments may consider rebalancing subsidies between gas and electricity in certain settings. This can render multiple benefits such as reducing fuel import dependency, meeting national renewable energy targets and strengthening a country's transmission and distribution network. An example is Indonesia's effort to move consumption from subsidized LPG (70 percent of which is imported) to induction-based electric cooking (Jakarta Post 2019).

In the past, ICS technologies have been the mainstream solution to achieve clean cooking access, with solutions like LPG dominating the modern fuels space. However, because of the vast gap that remains between universal access to clean and modern fuels and the present level of access, it appears to be time to push forward on all viable fronts, including different technologies and fuels, innovative business models, and financing mechanisms. Electric cooking is one such potential complementary solution that could piggyback on the progress made in electrification, especially in the long term.

[41] Previously the Department for International Development (DFID) before the merging of DFID and the Foreign Office to form the Foreign, Commonwealth and Development Office (FCDO) in 2020 (GOV.UK, 2020).

7 CAPTURING CLEAN COOKING INVESTMENT FROM THE LPG SUPPLY CHAIN

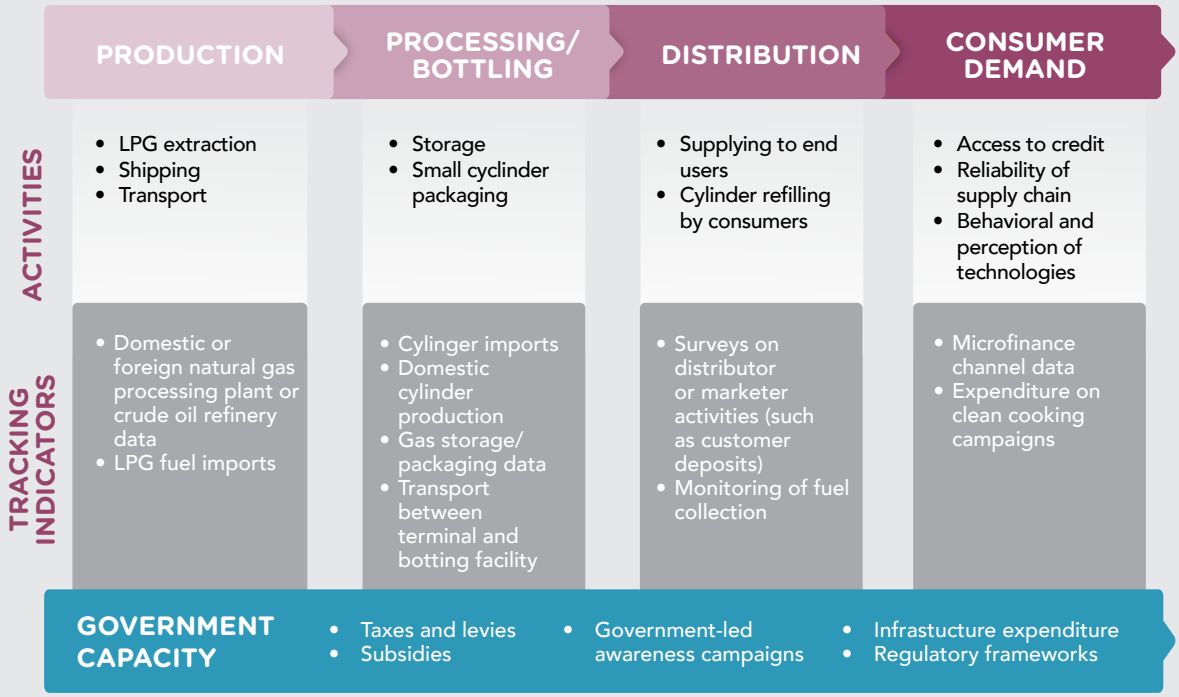
This section proposes a framework to track finance for fuels such as LPG and ethanol, which require volumes of investment well beyond current commitments in cookstoves and cylinders. To address potential data gaps, the methodological framework follows the value chain of fuels to isolate the most relevant points to capture residential clean cooking investment, providing an order of magnitude estimate to complement the data tracked in this report.

Capturing investment in residential clean cooking access for these fuels, which require heavy infrastructure investment, is a consistent challenge for this tracking exercise, for the following reasons:

1. In contrast to the other clean cooking solutions tracked in this report — such as ICS, biogas digesters, and solar cookers — investment in LPG and ethanol solutions requires significant industry and infrastructure investment. While investment for stoves is captured in this report, the bulk of investment for these fuels concerns large-scale infrastructure provided by private project developers or SMEs that do not report to the data sources used in this report. However, in a case where enough evidence is available that a large infrastructure LPG investment is specifically targeting clean cooking access, the project is included in the analysis. The imported LPG cylinder estimates discussed below are excluded from the landscape numbers due to data limitations.
2. Similarly, domestic government-led fuel subsidies, which can amount to billions of dollars in annual expenditure (SEforALL and CPI 2019), cannot be included as it cannot be assured that the end use is directed toward primary asset investment rather than revenue-building activities. Furthermore, the investment estimate of USD 4.5 billion used in this report does not include fuel subsidies (IEA 2020), although price incentives are likely to be part of the solution to displace the use of traditional stoves in HICs.
3. Infrastructure investments that can be tracked are usually multi-million dollar transactions for which the residential clean cooking use can be difficult to demarcate. Further, large capital investments, as opposed to project-level data usually tracked in this report, encompass wider revenue-building activities that may not correspond to primary asset investment.

Despite these methodological challenges, addressing data gaps remains a priority for this report. Figure 32 illustrates a proposed tracking framework for investment in these fuels, based on the LPG value chain.

FIGURE 32
Proposed framework for capturing LPG investments



Source: Information gathered and adapted from WLPGA (2019), DLPGOVP (2020), Puzzolo et al. (2019)

Considering the goal of tracking primary asset investment in LPG as a clean cooking solution for households in HICs, a trade-off between accuracy and accessibility of data can be observed. While data on upstream activities may be more readily available, this report's methodology generally excludes projects that finance terminals for the import of LPG, due to the opacity and disconnect between the upstream data and the financing's end use. For the same reason, upstream data on LPG extraction are completely excluded, due to the irrelevance to end-user cooking use, especially considering that most HICs import the fuel.

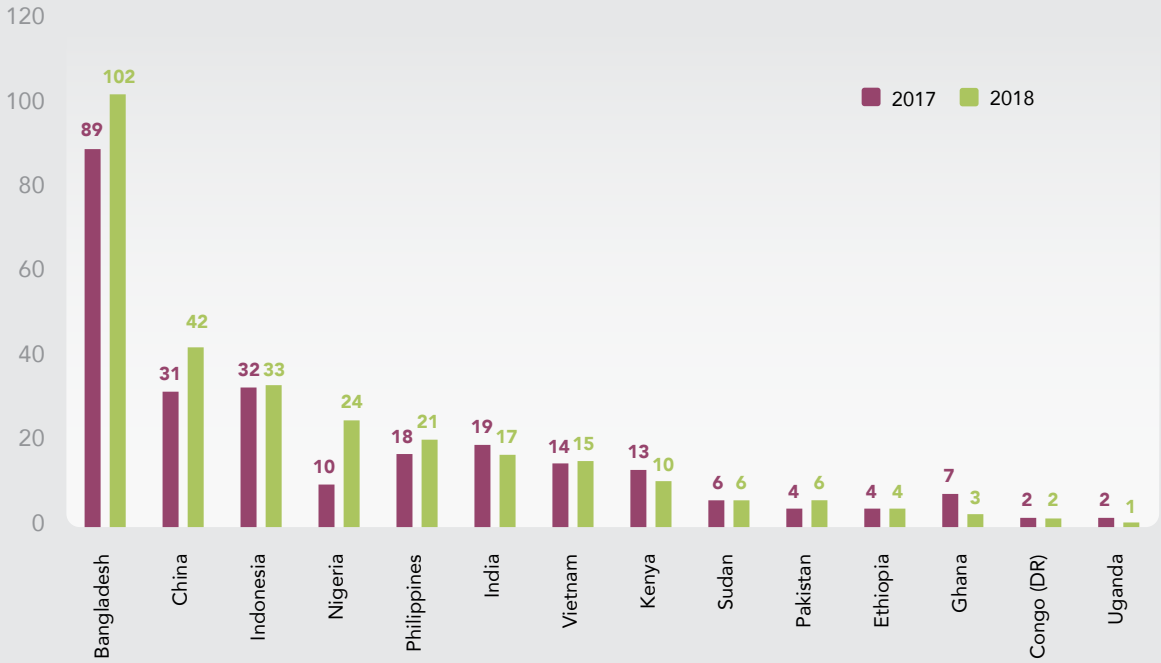
In contrast, downstream data points could potentially capture the investment numbers relevant for this report but are lacking in availability. Investments could potentially be captured through activity-level data from LPG distributors or through consumer surveys such as the World Bank's Multi-Tier Framework (MTF) survey, and data on other activities such as microfinance loans or demand-side awareness campaigns could capture relevant investment in advancing access to clean cooking. However, these downstream indicators are limited and generally provided at country-level only.

LPG cylinder imports – A relevant datapoint in the LPG value chain: Based on the above framework and interviews conducted for this report, using imported LPG cylinder is the most globally-relevant proxy to estimate residential LPG clean cooking investment. Country values of LPG cylinder imports in USD value, using International Trade Centre (ITC) data, were used as a proxy for investment into this solution. This approach is complemented with consumption patterns of LPG to estimate the residential proportion of these imports (WLPGA 2019).[42]

[42] Data can be used to identify the percentage of total LPG that is used by the domestic sector, which includes "residential and commercial use for LPG as a cooking and heating fuel primarily from cylinders and bulk tanks."

Using this combination of cylinder import and consumption pattern data, the report estimates that USD 285 million was spent in 2018 to import LPG cylinders for residential use in HICs (Figure 33). Bangladesh, where 20 percent of households use LPG for cooking, was the highest importer in 2018, spending USD 102 million on LPG cylinders (Business Standard 2020).

FIGURE 33
Total value of LPG cylinder imports for residential use (USD million, 2017 and 2018)



Source: CPI estimates based on ITC and WLPGA numbers

The use of LPG consumption data is a significant improvement over previous estimates, where *Energizing Finance: Understanding the Landscape* used the oil products consumption data (IEA estimates). The consumption estimates from WLPGA show that, for the countries tracked in this report, an average of 80 percent of LPG use went to the domestic sector,[43] a much higher estimate than the average 7 percent of oil products going to the residential sector, as estimated by the IEA.

Despite these improvements, this approach has persistent limitations, such as ignoring domestic production of LPG cylinders, although that is likely to be significant for only a few HICs. Furthermore, adopting an activity-based data scoping approach such as considering imports of LPG cylinders as proxies for investment in residential clean cooking will not be compatible with large-scale infrastructure investments that are lumped together rather than separated at project-level, for reasons of both double and over-counting investments in LPG solutions.

[43] While the use category of "domestic sector" in the data provided by WLPGA includes both cooking and heating, the report also states that LPG is mostly used as a cooking fuel in developing countries, and thus in HICs. Interviews actually indicate that an even higher proportion of LPG cylinders are used for residential clean cooking in HICs. However, the report opts for conservative undercounting, especially as granularity on the size of LPG cylinders is lacking in the available data.

CHAPTER

5

CLEAN COOKING IN BANGLADESH

Photo by: Clean Cooking Alliance

COUNTRY CONTEXT

In Bangladesh, the eighth most populous country in the world, more than 60 percent of the population currently lives in rural areas and is mainly dependent on agriculture as a primary source of income (World Bank[44]). As of 2018, almost 80 percent of households (of a total 35 million households) lacked access to clean cooking alternatives. This includes both rural and urban areas (CCA[45]).

According to the World Health Organization (WHO), over 70,000 people in Bangladesh die annually from diseases related to Indoor Air Pollution (IAP). Moreover, excessive reliance on fuelwood and burning of biomass continue to contribute to deforestation and other climate challenges in Bangladesh. Between 2011 and 2019, the country lost 9 percent of its tree cover (global average of 9.2 percent) equivalent to more than 65Mt of CO2 emissions (Global Forest Watch 2020). Despite multiple environmental, health and economic effects, rural households are reluctant to switch to cleaner cooking technologies due to social, economic and cultural factors such as lack of awareness, affordability, and preferences to a certain taste and texture of the meals, among others.

Albeit at a decreasing rate, Bangladesh's population is expected to grow to approximately 245 million by 2050, creating additional pressure on already scarce resources (UNDP). However, this also brings several opportunities. A younger demographic coupled with increasing urbanization, rising health and technological awareness, and rising standards of living indicate a potential concomitant transition to cleaner cooking preferences. Over 95 percent of the population and more than 80 percent of the rural populace in the country has electricity access which can be leveraged to establish a supply chain for efficient electricity-based cooking solutions in the most remote areas (see Box 6).

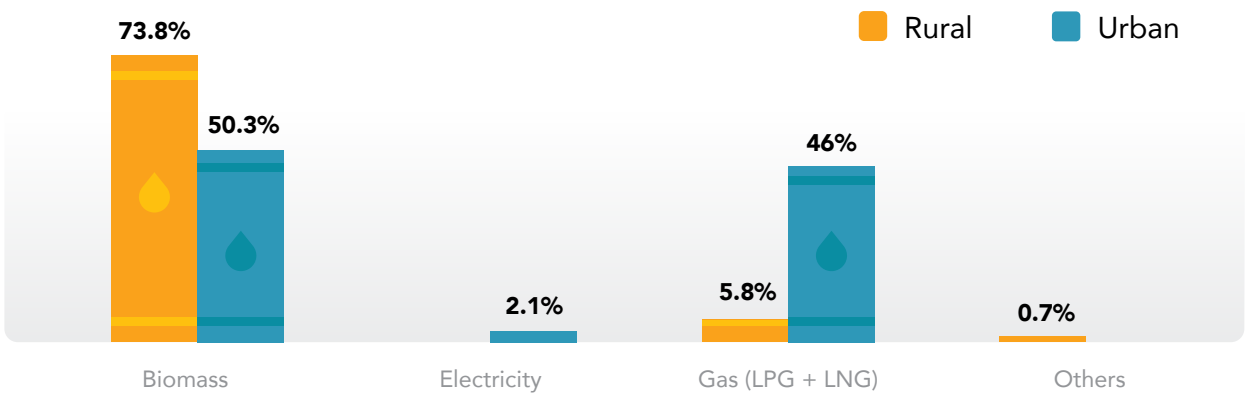
Despite more than 55 percent of the population using traditional cookstoves,[46] the current landscape of Bangladesh offers a conducive market for clean cooking technologies, driven by increasing incomes, urbanization, and favourable government support.

[44] https://data.worldbank.org/country/bangladesh
[45] https://www.cleancookingalliance.org/country-profiles/focus-countries/6-bangladesh.html
[46] The term usually refers to stoves that are burning firewood, charcoal, agriculture residues or dung.

CLEAN COOKING TECHNOLOGIES IN BANGLADESH

Fuel and/or cookstove stacking is very common globally, and in Bangladesh 75 percent of households nationwide that use firewood also use other biomass fuels. 55 percent of clean stove users in rural areas and 10 percent of users in urban areas also continue to use traditional biomass stoves, depending on the time of the day, cultural predilections and habits, and convenience (ESMAP 2019).

FIGURE 34
Rural and urban fuel use in Bangladesh (2018)



Source: Bangladesh Bureau of Statistics (2018)

Almost 74 percent of the rural population relies primarily on biomass fuels for cooking, which includes straw/leaf (28.6 percent), husk/bran (4.0 percent), and jute stick/wood/bamboo (41.2 percent)[47] (Figure 34). Lack of technological awareness and affordability gaps have led to low penetration of modern technologies like LPG and electric stoves, in both rural and urban areas. The transition towards cleaner solutions has been quite slow in the urban segments as well, with half the Bangladeshi population still depending on biomass. Approximately 300,000 households, (approx. 1 percent of the total) own electric cookstoves, the uptake of which is slow due to high usage costs.

Around 4 million households (or 9 percent of total[48] households) are connected to piped natural gas (sourced from Liquefied Natural Gas, LNG,). In 2016–17, the government suspended additional installations of LNG connections to households owing to depleting reserves and increased demand from the industrial sector, giving way to substitute technologies like LPG.

A market-based approach in conjunction with government promotions and schemes, such as tax exemptions for LPG imports including a waiver of the 15 percent duty on the import and reduction in Advance Income Tax (AIT) from 5 percent to 2 percent (Financial Express 2018), has led to an annual growth rate of 8–10 percent in LPG adoption nationwide. Despite this growth, challenges remain in this form of high upfront and refill costs, safety hazards and accessing remote rural areas.

Improved cookstoves (ICS) in Bangladesh come in many variants of fuel (pellets, briquettes, ethanol, solar) and build structure (cement/clay/concrete, fixed/portable, and locally manufactured/imported). Despite its significant fuel-saving potential and a very low-cost recovery period of three to four months, uptake has not been substantial, with only 10 percent nationwide adoption (Table 4). ICS offers huge potential in remote and inaccessible areas. However, more research and investment are required to transform ICS from basic to advanced models such as briquette, solar and pellets, and to increase adoption.

[47] Bangladesh Bureau of Statistics (2018) Bangladesh Sample Vital Statistics 2018.
[48] Khan, M.F.R. (2018). BPC Study Report.

TABLE 4
Current usage, targets and projections

Technology	Current Usage (2017–18, ~35 million households) as % of total households	2030 Targets (Projected ~50 million households)
LPG-based stoves	15%	55%-65%
LNG-based stoves	10%	10%
Improved cookstoves	10%	40%
Electric stoves	1.1%	7.5%
Biomass-based stoves	74%	**Projected at ~30%***

Note: Totals may not add up to 100% due to stove stacking.
Source: National Action Plan for Clean Cooking in Bangladesh 2020–2030.
*Under business-as-usual scenario.

Owing to high dependence on the agricultural sector (~40 percent), biogas presents a significant opportunity for expansion and rural penetration (Statista[49] 2020). The enormous amount of agricultural and cattle waste generated in Bangladesh, coupled with the decentralized nature of biogas production, makes for a reliable opportunity. The Government of Bangladesh, through Infrastructure Development Company Limited[50] (IDCOL), has been providing subsidies to establish biogas plants across the country (Siddique 2017); approximately 102,000 biogas digesters had been installed by 2018. However, inherent challenges related to the installation of the plants, land availability, and high upfront costs still need to be addressed to include biogas as a mainstream solution.

Under a business-as-usual scenario, 30 percent of Bangladeshi households will continue to rely on biomass for fuel in 2030. There is a need to steadily redesign the existing policy and financing framework to achieve the vision of zero biomass use by 2030.

[49] https://www.statista.com/statistics/438360/employment-by-economic-sector-in-bangladesh/
[50] IDCOL is a government owned non-bank financial institution under the Ministry of Power.

CLEAN COOKING POLICIES AND FINANCING LANDSCAPE IN BANGLADESH

In 2013, Bangladesh's first Country Action Plan for Clean Cookstoves[51] (CAP 2013) focused predominantly on the removal of existing financing barriers by enabling access to capital by small and medium-sized enterprises (SMEs), promoting access to climate funds (such as GCF), leveraging government funds to finance women-led businesses in the sector and lobbying for additional financing options from international donors at lower rates (CAP 2013). However, the results have shown mixed success.[52]

Most financing to the clean cooking sector from development finance institutions (DFIs) is focused on ICS. For instance, the Improved Cook Stove Program — pioneered by IDCOL with support from the World Bank and the Government of Bangladesh — had installed 1 million ICS by 2017 in its first phase. IDCOL is now implementing phase II of the programme for the dissemination of 5 million ICS by 2021, financed by grants from the Green Climate Fund (GCF) and credit from the International Development Association (IDA). The second phase focuses on tier 2 and higher technologies, market promotion to build awareness, and supply chain development activities.

Another key initiative to promote ICS is the 'Market Development Initiative for Bondhu Chula', led by the Department of Environment with financial support from the Bangladesh Climate Change Trust Fund (BCCT) and GIZ.[53] The project employs local micro-entrepreneurs as its distribution and supply chain networks, which not only generates employment but also addresses issues of cost and affordability. Carbon financing has been used to subsidize stove installation and provide after sales services, as well as training for local employees. Details of the major programmes implemented in Bangladesh are listed in Table 5.

Furthermore, the government has a subsidy/safety net programme, implemented by IDCOL for promoting renewable energy solutions (including ICS), called KABITA, which promotes free distribution of these cookstoves often affecting commercial viability of other technologies. IDCOL, under the Domestic Biogas Program, is also providing credit of up to 80 percent of the total loans processed to households at 6 percent interest per annum (equivalent to the risk-free rate) – a step in the right direction to promote other clean technologies.

Financing from DFIs is mainly focused on ICS technologies in Bangladesh with limited private sector participation, highlighting the need to focus on diverse technologies and financing mechanisms and to address policy uncertainties.

Except for private businesses in the LPG sector, private sector financing and participation is missing in Bangladesh's clean cooking sector. While LNG was phased out starting in 2016/17, a high-powered government committee recently observed that LNG was more economically viable than LPG in urban areas, and has posited that the government imports the required quantity of LNG and builds sufficient terminals to cope with rising demand (Financial Express 2020). Such policy uncertainty poses risks, which have the effect of pushing away public and private finance from the sector.

[51] Developed by the Government of Bangladesh in partnership with the Clean Cooking Alliance, NGOs and private sector players, with the objective of 100 percent access to clean cooking by 2030
[52] National Action Plan for Clean Cooking in Bangladesh 2020–2030, Sustainable and Renewable Energy Development Authority (SREDA).
[53] Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH.

TABLE 5
Clean cooking initiatives and financing

Programmes Implemented	Technology	Implementing Entity	Key Partners	Project Costs and Financing	Timelines	Additional Details
Global Clean Cooking Program – WB IDCOL programme under RERED II	>Tier 2 Improved Cookstoves (ICS)	Infrastructure Development company Limited (IDCOL)	World Bank (International Development Association)	Total project cost: USD 386 million with USD 82.1 million for the clean cooking interventions: GCF Grant: USD 20 million IDA concessional loan: USD 20 million Parallel Financing from rural households: USD 42.1 million	Phase 1 2013–2017 Phase 2 2017–2021	Phase I – 1 million ICS Phase 2 – 4 million ICS
Market Development Initiative for Bondhu Chula	2 pot Cement based ICS with chimney (fuels include biomass and solar)	Bondhu Foundation (BBF)	Bondhu foundation, GIZ, Department of Energy Netherlands Development Organisation (SNV), Retail Partner organizations, NGOs	First Phase GIZ: USD 7.5 million for salary, training, promotional activities BCCT[54]: USD 3.2 million for subsidy, entrepreneur support and incentive Second Phase GIZ: USD 8 million for all cost except subsidies BCCT: USD 1.3 million for subsidies/incentives	Phase 1 2012–2014 Phase 2 2015–2016	Disbursed 2.6 million stoves, reaching more than 5.4 million people
Carbon Offset Improved Cook Stoves Project	2 pot cement based ICS with chimney (fuels include biomass and solar) incl. awareness programmes	Bondhu Foundation (BBF)	UNICEF, Marks and Spencer's	First Phase UNICEF: BDT 500 subsidy/per chula (USD 6.5/chula) Second Phase UNICEF: ~USD 1 million	Phase 1–2014 Phase 2 – 2014–2016	40,000 households from 8 districts.
Domestic Biogas Program	Biogas digestors	Government of Bangladesh (GoB), IDCOL	SNV Netherlands, KFW and World Bank	IDCOL: BDT 13,500 investment subsidy Loan to household 80% of the cost at a concessionary rate	2006 onwards	102,000 biogas plants as of 2018

[54] The Bangladesh Climate Change Trust (BCCT) was established on 13 October 2010 through the passage of the Climate Change Trust Act, 2010. The Government of Bangladesh has allocated USD 400 million to the fund.

BARRIERS AND PATHWAYS TO INCREASED CLEAN COOKING ACCESS

Following its partial success in 2013, the new National Action Plan for Clean Cooking in Bangladesh (2020–2030)[55] is currently being formulated. The plan aims to achieve 100 percent clean cooking access by 2030 and posits a total investment requirement of USD 2.9 billion over the next 10 years. This includes USD 0.86 billion in public and private sector investments and USD 2.01 billion of consumer expenditure financing. The sheer magnitude of required investments necessitates a well-integrated national energy access plan to ensure coordination across private and public capital providers and sectors and a diverse range of technologies.

The new National Action Plan for Clean Cooking must promote innovative business and financing models for different technologies, while ensuring an enabling environment with easy access to supply- and demand-side financing.

ENSURE PRICE AND COST PARITY BETWEEN TECHNOLOGIES TO ATTRACT PRIVATE SECTOR CAPITAL IN THE SECTOR

Government policies and incentives must provide an even playing field for all technologies. While the government (through IDCOL) is promoting biogas plants, awareness campaigns and promotional schemes to date have been focused on ICS and LPG. Low sensitization to other technologies, such as ethanol and pellet-based ICS, and electricity-based cooking, results in scarce seed funding for small and micro businesses, increases the cost of customer acquisition, and stifles innovation. Also, DFI funding, owing to the long-running IDCOL ICS programme, is disproportionately higher for ICS technologies, and DFIs should consider supporting new technologies and financing mechanisms.

The government's Economic Relations Division (ERD), as the National Designated Authority (NDA), has been very active in approving participation in Clean Development Mechanism (CDM) projects. Bangladesh has a unique opportunity to leverage existing carbon financing activities to support clean cookstove programmes. However, it is important to acknowledge that CDM project implementers providing free cookstoves can distort markets, leading to risk and asset misallocations. Therefore, a calibrated approach is needed to ensure that the market for other technologies and players is not distorted by perverse incentives.

THE POTENTIAL OF NEW FINANCIAL SOLUTIONS AND PAYMENT MECHANISMS IS YET TO BE EXPLORED

Despite multiple government initiatives to advance the sector, access to short-term finance has been an impediment for various actors. Key needs on the supply side include financing for capital investment (like R&D processes, machinery), developing distribution chains, and working capital. For instance, currently the small LPG distributors procure credit lines and purchase in cash from large LPG conglomerates, while these distributors in turn sell on retail credit to households. Large LPG companies do not necessarily provide corporate guarantees to the distributors, which results in default risk being borne by the retailer entirely. On the demand side, commercial loans and consumer financing have

[55] National Action Plan for Clean Cooking in Bangladesh 2020–2030 (to be published).

been underwriting the growth of the cookstove sector (SEforALL 2017). The need for collateral and high interest rates has been a major barrier to accessing finance. Microcredit, subsidized loans and credit guarantees in the sector are still quite underdeveloped and uncommon.

One of the solutions to this financing problem is direct capital access for households through microfinance institutions (MFI) and commercial banks. In fact, a systemic review conducted in Bangladesh postulates that microcredit access to end users is strongly associated with ICS adoption (Lewis and Pattanayak 2012). In Bangladesh, Grameen Shakti has spearheaded a mechanism where it sources biogas and cookstove components itself and provides low-cost financing[56] to the end user, leveraging its in-house financing approach and supply chain network. While the MFI sector is relatively mature in Bangladesh, there are currently not many scaled examples of MFI lending for stove purchases (ESMAP 2015).

Furthermore, automations across the value chain, which are likely to benefit smaller players to reduce their distribution costs, are yet to be successfully explored in the sector. For instance, Paygo energy is collaborating with Omera, a large LPG player, to introduce smart metering to remove cost barriers. With 'pay as you go' smart metering for cylinders, the customers pay an initial installation fee and subsequently purchase gas credits using mobile money. It also enables retailers to monitor usage conveniently. But such examples are few and far between in Bangladesh. The adoption and scale up of such technologies and innovative business models can circumvent the barriers of access and affordability, which can be explored in the medium to long term.

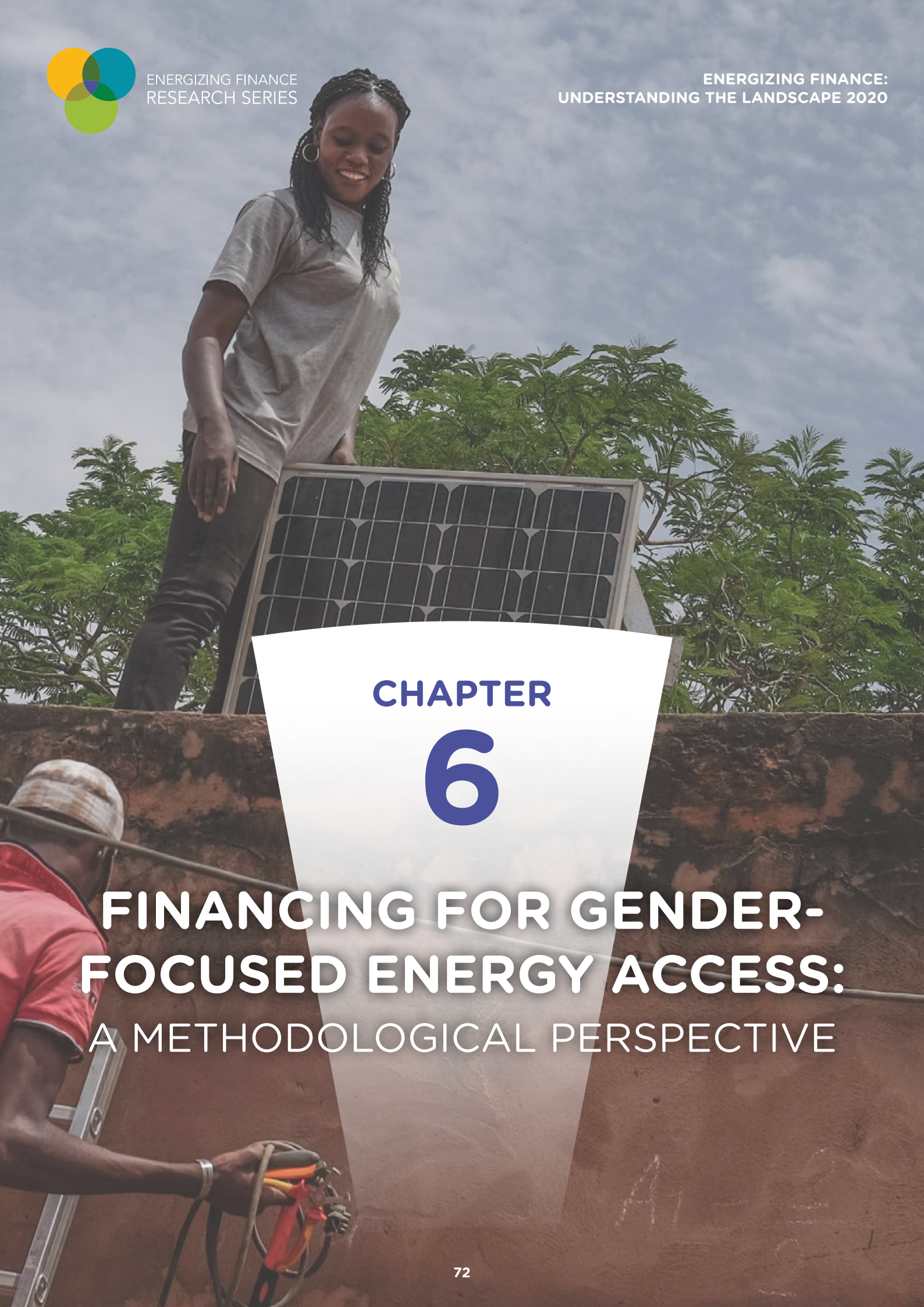
STOVE AND FUEL STACKING – A RURAL REALITY – TO BE SUPPORTED WHILE SPREADING AWARENESS ABOUT CLEANER COOKING FUELS

In the near to medium term, diverse fuels and technologies are likely to be used simultaneously, especially in semi-urban and rural centres. Evidence suggests that stove-stacking households tend to prefer traditional stoves over cleaner alternatives (60 percent of the cooking time). This practice often interferes with the benefits of modern cooking solutions. Notwithstanding the disadvantages, stove stacking is convenient, and essential, for deriving maximum benefits out of the present situation characterized by income limitation and uncertainty, as well as difficulty to access fuel and traditional cooking habits, among others. The practice can be encouraged if it is complemented with efforts to sensitize the population and the government of its health impacts and co-benefits respectively. School curriculum and pedagogical methodologies can play a role in instilling awareness around health outcomes related to the use of cleaner technologies.

RURAL AND URBAN SECTORS WILL REQUIRE DIFFERENT INTERVENTIONS

Policymakers must be cognizant that a transition toward a cleaner future for rural households may look very different from that of their urban counterparts. Most rural households primarily rely on the lower tiers of cookstoves with ~78 percent using tier 1 stoves while the urban areas consist of higher tier households with more than 40 percent relying on tier 4 cookstoves. While convenience in usage and cost are the common considerations across segments, differences in income structure, quality of life, and access to fuel may call for different approaches. Bangladesh's latest national action plan for clean cooking must address these disparities between the segments by aligning investments and policy decisions with appropriate technologies.

[56] It provides flexible payment options to customers like a 50 percent down payment followed by monthly instalments.



CHAPTER

6

FINANCING FOR GENDER-FOCUSED ENERGY ACCESS: A METHODOLOGICAL PERSPECTIVE

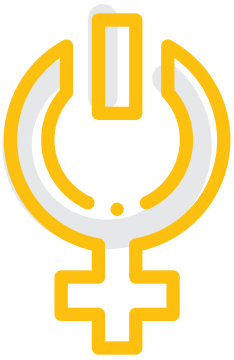
INTRODUCTION AND CONTEXT

In *Energizing Finance: Understanding the Landscape 2019*, SEforALL, for the first time, assessed public sector finance for energy projects targeting women and girls, and discussed strategies to reduce gender inequality in and through the energy sector. *Energizing Finance: Understanding the Landscape 2020* updates the figures and proposes a framework for donor countries to improve the accuracy and consistency of reporting finance with a gender equality objective.

There has been substantial movement towards integration of gender considerations into the design and implementation of climate change policies and finance in the last year. At COP25 in December 2019, the Parties adopted a Gender Action Plan (UNFCCC 2019) that calls for a focus on financial and technical support to promote gender equity in climate policies and best practices to increase climate finance for women's organizations.

Sustainable Development Goals (SDGs) 5 and 7 are inextricably linked, as a lack of energy access disproportionately affects women and girls in the form of health, productivity, unpaid labour, and employment burdens (see Table 6). Both SDGs are also inextricably linked to climate change, which likewise disproportionately affects women and girls who represent a majority of the world's poor and who are more dependent than men on local natural resources facing risk of depletion (UN WomenWatch).

Amid the COVID-19 crisis and recovery process, UN Secretary-General (SG) António Guterres has called for women and girls to be central to the recovery to ensure a response to the compounding economic and social impacts of the pandemic on women. SEforALL has produced a series of regional guides for Africa, the Caribbean and Southeast Asia to demonstrate how countries can 'Recover Better' from the crisis and prioritize clean energy investments. The SG has called for direct financial support to informal work and women-led businesses, including those in the energy sector, and integrated gender assessments into all county-level needs analyses of the impact of COVID-19. It is therefore imperative that tracking efforts accurately capture finance with a gender equality objective to ensure energy projects meet the SG's call to action.



International development finance for energy projects with gender equality objectives has increased over the last decade but remains a small share of total finance.

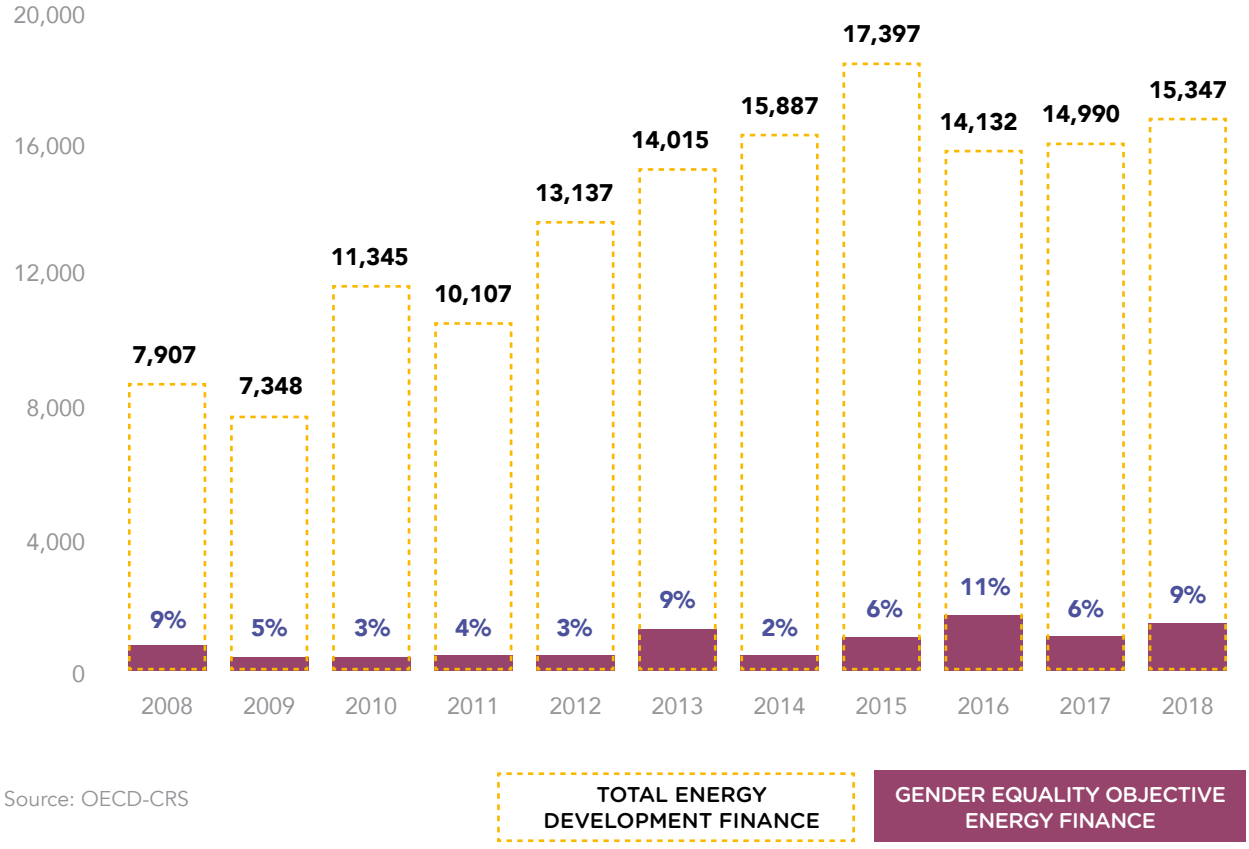
FINANCE FOR ENERGY PROJECTS WITH A GENDER EQUALITY OBJECTIVE

The most comprehensive data on development finance targeting projects with a gender equality objective is the OECD's data on development finance. The OECD's Development Assistance Committee (DAC) gender marker follows a three-point scoring system to mark project flows as "Principal"[57], "Significant"[58] and "Not Targeted"[59] to gender equality aims. In 2017–18, 42 percent of total DAC member assistance[60] in all sectors targeted gender equality as either a Significant or Principal objective (OECD 2020a). Total assistance with a gender equality objective has advanced steadily from USD 29.6 billion in 2009 to USD 54.9 billion in 2018. However, gender-focused development finance in the energy sector has seen much more uneven growth.

As indicated in Figure 35, development finance in the energy sector with a Principal or Significant gender equality marker increased in 2018 from 2017 levels but remained below the record-high level set in 2016. The latter in 2016 was driven by a greater number of gender-focused development projects in Sub-Saharan Africa (SSA) and East Asia and the Pacific, while finance to South Asia increased in 2018 to levels not reported since 2013. Finance for projects with a gender equality marker as a proportion of total development finance for energy projects remained relatively stable in 2018 compared to prior years, at 9 percent. This is in contrast to the 42 percent of total DAC member finance across sectors that is marked with gender equality objectives.

FIGURE 35

Energy sector development finance with gender equality objective (USD million) and as % of Total, 2008-2018



Source: OECD-CRS

[57] Projects that are marked "Principal" are scored a 2, when gender equality is the main objective of the project and is fundamental in its design.
[58] Projects that are marked "Significant" are scored 1, where gender equality is an important and deliberate objective but not the principal reason for undertaking the project.
[59] Projects that are marked as "Not Targeted" are scored 0, where the project has been screened and has been found not to target gender equality.
[60] DAC members account for 89 percent of all development finance.

Development finance for the energy sector with a gender equality objective has remained low (only 9 percent of all energy sector development finance in 2018) in recent years, in contrast to the proportion of development finance for other sectors.

In 2017 and 2018, 93 percent of a total USD 2.4 billion tracked finance with a gender equality marker was funded by just 10 agencies. Those agencies, indicated on the map below, together financed USD 2.2 billion in energy sector activity with a gender equality objective over the two years, or USD 1.1 billion on an annual average basis. This finding may be indicative of both agencies with the most significant financial focus on gender equality objectives as well as the relative quality of reporting by various agencies.[61]

FIGURE 36
2017-18 top 10 public funders of energy projects with a gender equality objective

[61] Canada and Sweden, for example, mark most of their finance as supporting gender equality because they have declared feminist foreign policies, but that marking may differ from the decision-making processes of other agencies (Government of Canada) (Government Offices of Sweden).

METHODOLOGICAL CHALLENGES IN TRACKING GENDER-FOCUSED FINANCE

Since *Energizing Finance: Understanding the Landscape 2019* was published, public discussions of the gaps and challenges in tracking energy access finance targeting women and girls have increased. This includes a 2020 Oxfam report that identifies key challenges associated with the gender markers employed by the OECD (Oxfam 2020) and a new effort undertaken by Publish What You Fund to improve the publication of gender-related financial and programmatic data.

Defining and measuring the volume of development finance for energy access that has gender equality objectives remains a significant challenge. The OECD-DAC Gender Equality Policy Marker Guidance (OECD-DAC Guidance) — one of the commonly applied approaches — provides rigorous detail on the overall scoring system of the gender marker and outlines recommendations and best practices from GENDERNET members in applying the marker. However, it does not include clear guidance for how the concept of "gender equality" should be applied to the energy sector. The OECD-DAC Guidance notes that for a project to be marked as either "Principal" or "Significant," it must have a gender equality and/or women's empowerment objective that is explicit and deliberate and cannot be unintended or assumed. There is no significant detail regarding a set of criteria for assessing whether a project addressed gender inequality, and no detail offered regarding application to the energy sector.

Inconsistency across organizations in the quality of reporting on gender outcomes hinders accurate capture of the precise quantity of development flows with gender quality objectives. Limitations in capturing a clear picture of these flows makes it challenging to develop strategies targeted to increase such finance.

Limited capacity of data aggregators to independently verify information from reporting institutions can result in misleading and/or incorrect gender markers. For instance, a 2019 Oxfam report notes that frequently projects marked as "Significant" do not have an explicit focus on gender equality beyond a general aim to include insights from all genders as well as examples of projects marked "Principal" where gender equality was not the main objective. The report also finds that about 25 percent of projects examined in its analysis were given an incorrect policy marker by the reporting agency. More projects were marked incorrectly in the direction of positive gender equality indicating that in aggregate, projects are likely too liberally marked as having gender equality outcomes.

RECOMMENDATIONS FOR TRACKING ENERGY SECTOR FINANCE TOWARDS A GENDER EQUALITY OBJECTIVE

To enhance tracking of finance to energy access projects with a gender equality objective, projects should be required in the project documentation to meet the following criteria:

1. Set out the context of gender inequality in the sub-sector and region where the project will be implemented, referencing the types of inequalities listed.
2. Establish and state the project's intent to address the identified gender inequality in each element of the project cycle – from planning to implementation to monitoring/reporting.
3. Demonstrate a direct link or outcome between the identified gender inequality context and the financed activities.

The IDFC-MDB Common Principles for Climate Change Adaptation Finance Tracking inform this set of criteria (MDB IDFC 2019). Adaptation finance tracking faces a similar set of reporting and context-dependency challenges to gender equality objective reporting.

Set out the context of gender inequality: To clarify the definition of gender equality in the energy sector, the first step is to interrogate more closely the inequalities that persist in the sector to elucidate how "gender equality" projects aim to address them. This report proposes a two-type categorization of the inequalities (Table 6).

TABLE 6
Gender inequality taxonomy[62]

Categorization	Effect
1. Access to Energy Sector Workforce and Economic Opportunities: ***Women are underrepresented in the energy sector labour force and face additional financial and logistical hurdles to engaging in the energy sector as entrepreneurs or workers.***	• **Access to finance:** Women report lower ability to access the finance needed to start a business due to gender-biased credit scoring, gender stereotyping in investment evaluations, legal and regulatory constraints including national restrictions on opening a bank account without a male family member, and a lack of credit history or collateral (OECD 2017). • **Patent applications:** Women submit less than 11 percent of patent applications in the energy sector (IEA 2020a). • **Labour force participation:** Women make up less than 30 percent of the energy sector labour force (compared to 48 percent of the global labour force) (IEA 2020b). • **Career development:** Energy companies' board membership is 75 percent male (IRENA 2019). Women face challenges to rise to leadership positions given unequal wages, a lack of policies to support employees with families, and limited training opportunities. • **Energy access in the workplace:** In countries where female mobility is restricted, many women locate their businesses at home – often at a distance from access points for energy for heating and lighting (World Bank 2017).
2. Access to Energy in the Household and Workplace: ***Women experience energy poverty differently and more severely than men.***	• **Access to finance:** Women face limitations in accessing finance for energy for their households and workplaces due to many of the same restrictions that limit access to finance for energy sector businesses listed above. Along with those restrictions, there are also some national restrictions on ownership of resources under a woman's name that can limit access to energy finance for female-headed households. • **Energy access in female-headed households:** Data indicate that female-headed households differ only slightly in overall electricity access rates from male-headed households (31 percent vs. 33 percent)[63] (IRENA 2019). However, in male-headed households, women generally are less likely to have their own cash income, use of formal financial services is lower to purchase energy, and women are often excluded from economic decision-making (UN Stats 2015). • **Health outcomes from a lack of clean cooking fuel:** Women and children account for 85 percent of deaths from biomass induced air pollution (UN Women 2014). • **Safety outcomes from lack of available energy:** Women face gender-based violence due to the need to gather fuel for household use, often in areas that lack street lighting (UN Women 2013) (UN Women 2014). • **Labour and time allocation outcomes:** The Clean Cooking Alliance has found that women provide up to 91 percent of households' total efforts in collecting fuel and water, and women have an average working day of 11–14 hours, compared to 10 hours on average for men, for both compensated and uncompensated labour (CCA). In Gujarat, India, women spend up to 40 percent of their waking time collecting fuel for cooking, leaving limited time for other productive activities (ESMAP 2014).

[62] Not an exhaustive list.
[63] Approximately one quarter of global households are female-headed (World Bank 2016).

State the project's intent to address the identified gender inequality. This process should be initiated in a project's pre-design phase, or in the origination phase of an investment. Considerations for project preparation should include whether the financing approach used typically favours male-owned businesses and structures and if the deal structure could target female-led businesses. This project documentation should be as publicly reviewable as possible subject to confidentiality constraints.

Projects should also consider the use of gender audits, highlighted in the *Energizing Finance: Understanding the Landscape 2019* report. Gender audits use outcome metrics to ensure that project implementers have a common understanding of gender equality goals and a shared knowledge of the relationship between gender, access to energy, access to finance, and poverty. These audits would supplement rigorous processes applied during the pre-design or deal origination phase to ensure that project implementation meets the standards set for gender equality at the beginning of a project. Alongside gender audits, energy sector projects (especially large infrastructure projects) should be designed to incorporate a grievance mechanism to ensure a focus on secondary project impacts on women and girls, including gender-based violence and harassment.

To effectively execute recommendations from a project's pre-design or deal origination phase, donors must direct sufficient financial resources and human expertise to ensure project managers and other personnel have the capacity to accurately report on gender equality markers. There should be a concerted effort to obtain buy-in from leaders of project development companies, implementing agencies and financiers to mainstream gender in energy access finance. These efforts should include all levels of leadership and involve staffing core competencies so that experts can guide sectors towards a nuanced understanding of gender dynamics as they intersect with race, religion, and ability status in energy access projects.[64] Provision of case studies or a comprehensive list of "Principal" and "Significant" energy projects could also be beneficial to reporting institutions but are outside the scope of this report.

Demonstrate a direct link or outcome between the identified gender inequality context and the financed activities. Tracking energy access projects with a gender equality objective would be improved by using meaningful performance indicators to monitor and evaluate financing aimed at gender equality. Performance indicators should align with the context of gender inequalities that persist in the energy sector to measure how project outcomes are affecting inequality. A proposal for performance metrics by gender inequality type is included below.

TABLE 7
Performance metrics to measure energy sector project outcomes

Categorization	Gender Inequality	Project Outcome	Example Progress Indicators
1. Workforce and Economic Opportunities	Limited access to finance for energy sector labour opportunities	Increase women's access to finance for energy sector project development	Increase in number of women with access to formal finance flows through local institutions Approach towards uniform credit assessment for equal credit between male and female applicants
	Unequal patent applications	Increase research and development funding for women in the energy sector	Increased proportion of patent applications from women

[64] An emphasis in approach on the intersection between gender inequality and other forms of discrimination — through race, religion, and ability status — is critical to ensure that these contexts are not treated as independent phenomena but that each component of an individual's identity influences their ability to access energy finance and energy sector economic opportunities.

	Low labour force participation Lack of career development training	Increase women's role in implementation decision-making and technical and nontechnical employment Ensure women and men engaged in implementation have equal facilities and pay Provide training opportunities to retain female talent in the energy sector for potential rise to leadership positions	Increase in number of women employed in technical and nontechnical recruitment Consistency of women-friendly design of workplaces with reliable water supply, proper locks, lighting and sanitation Approach towards equal pay levels for equal work between male and female workers Increase in technical training to make women more competitive internally to reach decision-making positions Greater gender inclusiveness in organizational processes, reflecting women's needs for energy access
	Barriers to energy access in the workplace	Increase energy access options for women's workplaces to reach gender parity	Increase in percentage of female-led workplaces with energy access
2. Energy Access Outcomes	Limited access to finance for energy access	Increase women's access to finance for energy access	Reduction in legal and regulatory restrictions on women's access to financial markets and credit
	Barriers to energy access in female-headed households	Increase energy access in female-headed households and for traditionally female services within a household	Increased number of households and individuals (males and females compared) with improved access to low-emission energy sources
	Poor health outcomes from lack of clean cooking fuel	Improve health by decreasing women's exposure to indoor air pollution caused by kerosene, inefficient wood-burning stoves, other types of harmful fuels	Decreased mortality and morbidity rates of women and girls due to biomass cooking
	Adverse safety outcomes from lack of available energy	Reduce gender-based violence due to energy collection needs and lack of lighting	Lower rates of gender-based violence attributable to energy collection or lack of energy access
	Poor labour and time allocation outcomes	Save time by offering electric or more efficient alternatives to traditional stoves using charcoal or biomass Increase available work and leisure hours by offering electric lighting	Increase in time available to women for activities unrelated to energy provision or fuel collection to achieve greater economic participation

CONCLUSIONS AND RECOMMENDATIONS ON GENDER EQUALITY

Energy finance with a gender equality marker increased in 2018 from 2017 levels but remained below the record level (albeit still low in absolute terms) set in 2016. This report also finds that finance for projects in South Asia with a gender equality objective increased in 2018 to levels not reported since 2013. Gender equality marked flows were 9 percent of total development finance for energy projects in contrast to the 42 percent of total DAC member finance across sectors that is marked with gender equality objectives.

Defining and measuring finance to energy access projects with a gender equality objective remains a significant challenge. Inconsistencies in reporting development finance with gender equality outcomes affects our ability to quantify the percentage of development finance targeting women and girls and limits funders' ability to target their finance to desired end user groups.

The approach outlined in this chapter would improve reporting of development finance with a gender equality objective by ensuring that projects: (1) set out the context of gender inequality from the outset, (2) establish and state the project's intent to address the identified gender inequality in each element of the project cycle, and (3) demonstrate a direct link or outcome between the identified gender inequality context and the financed activities. Assuming reporting entities have the capacity and monitoring approaches to capture and report the outcomes, this process would both improve the quality of tracking in the energy sector and improve underlying projects themselves by ensuring they are rigorously developed to assess and address gender inequality.

The recommendations highlighted here are not comprehensive but are intended to spark further conversation and action towards improving tracking in this field to both improve project design and outcomes and to accurately assess finance flows. Success will occur when the a gender equality objective has increased. This effort should take place in parallel with actions to better document finance flows, to ensure the gender equality components of projects are transparent and so that subsequent reporting is as rigorous as possible.

APPENDIX I: ELECTRICITY LANDSCAPE: DATA IMPROVEMENTS AND GAPS

While the report aims to provide the most comprehensive analysis of finance for energy access, several data gaps can have implications on the report's findings (Figure A1)

FIGURE A.1
Electricity finance captured by the report

Improvements and/or additions in the current edition:

Dedicated surveys to development finance institutions (DFIs): Based on recommendations generated from previous editions of *Energizing Finance: Understanding the Landscape*, the OECD Secretariat introduced amendments to the CRS sector classification in 2019. This will improve accuracy in tracking finance, especially to mini-grids and off-grid solutions, and clean cooking solutions. However, these changes will not be reflected in the data until 2021. To fill this gap in the current edition, this report obtained survey data from four DFIs on their finance commitments to mini-grids and off-grid solutions and clean cooking solutions, which are often contained within large development and/or infrastructure projects.

International Energy Agency (IEA): This year's edition has substantially benefitted from collaboration with the IEA. The IEA provided the energy access investment requirements for several HIC countries tracked in its World Energy Outlook (IEA 2019c) and the Africa Energy Outlook 2019 (IEA 2019a) reports. The IEA also shared its 2018 electricity consumption estimates by country, published in the World Energy Balances report (IEA 2020), which improves accuracy of this report's estimates for residential and non-residential investments.

GOGLA: GOGLA is the global association for the off-grid solar energy industry. Established in 2012, GOGLA now represents over 180 members as a neutral, independent, not-for-profit industry association. Since 2017, GOGLA has improved the coverage of overall financing activity for the solar off-grid solutions captured in the report by providing data on the financial transactions of companies selling pico-solar products, and solar home systems, and off-grid solar appliances targeted towards residential access (GOGLA's Deal Investment Database). This dataset includes information both on publicly disclosed transactions, as well as confidential ones shared by investors and off-grid solar companies since 2012. However, due to confidentiality of the latter, only the publicly disclosed deals have been shared for the purpose of this report, and as such the figures outlined

in the main body of text represent a conservative view of overall financing activity for solar off-grid solutions.

The World Bank: The current edition incorporates additional data from Multi-Tier Framework (MTF) surveys, undertaken by the Energy Sector Management Assistance Program (ESMAP) team, for four countries – Bangladesh, Ethiopia, Kenya and Myanmar. This helps improve the accuracy of estimates for tier-level energy access investments. In addition, the World Bank team shared the detailed Regulatory Indicators for Sustainable Energy (RISE) index data, which were instrumental in assessing the policy impact on electricity sector financing in Rwanda (Chapter 3).

Carbon finance: *Energizing Finance: Understanding the Landscape 2020* uses the project registry data from Gold Standard to capture carbon finance projects on the voluntary market, in addition to the UNFCCC's Clean Development Mechanism, which publishes details on annual issuances online. This approach covers around 40 projects per year. This is a significant increase in the number of projects covered as compared to previous reports, which included three carbon offset projects financed by the World Bank in the headline numbers, and only covered five UNFCCC projects in the carbon finance estimation.

Data gaps in the current edition:

Domestic public finance: Data tracking for domestic public finance, such as spending through national public budgets, transfers from national government to local government, and infrastructure investment in state-owned enterprises, remains largely limited. Collecting such information is challenging due to a lack of consistent methodologies and guidelines across countries, difficulty in distinguishing between different budget items (operational and investment), and in many cases insufficient institutional capacity of national governments and their agencies.

Private expenditure on diesel generators: As seen in the case of Rwanda (Chapter 3), diesel generators play an important role in providing energy access, especially in the rural hinterland. However, capturing private sector capital expenditures on diesel generators would entail conducting country-level household expenditure surveys, such as the World Bank's MTF surveys, which is beyond the scope of this report.

Private sector investment in energy efficiency: Energy efficiency investments are often components within larger projects, requiring additional information that private actors are unlikely to report voluntarily. Consequently, this report provides limited information on energy efficiency except for transactions reported by public actors.

Fuel subsidies: Fuel subsidies are not included in the Methodology as they are revenue support mechanisms that often pay back investment costs, as opposed to the primary asset investment tracked in this report. However, these subsidies can play an important role in promoting clean cooking solutions, and the *Energizing Finance: Understanding the Landscape* report series addresses this gap with country case studies and deep dives in government-led initiatives (SEforALL/CPI 2019).

Fuel infrastructure: Investment or expenditure in infrastructure for fuels, such as LPG or ethanol, are not included in the numbers reported due to data gaps and opacity of the available data, unless there is sufficient evidence on it benefitting residential consumers. Box 7 addresses this data limitation in more detail.

APPENDIX II: DEFINING CLEAN COOKING

While there are no universally-accepted definitions of "clean cooking solutions," several institutions and definitions are guided by the " ISO[65] Tiers of performance" of stoves and fuels, and consider: indoor air quality, solid versus non-solid, and traditional versus modern approaches (outlined in Methodology).

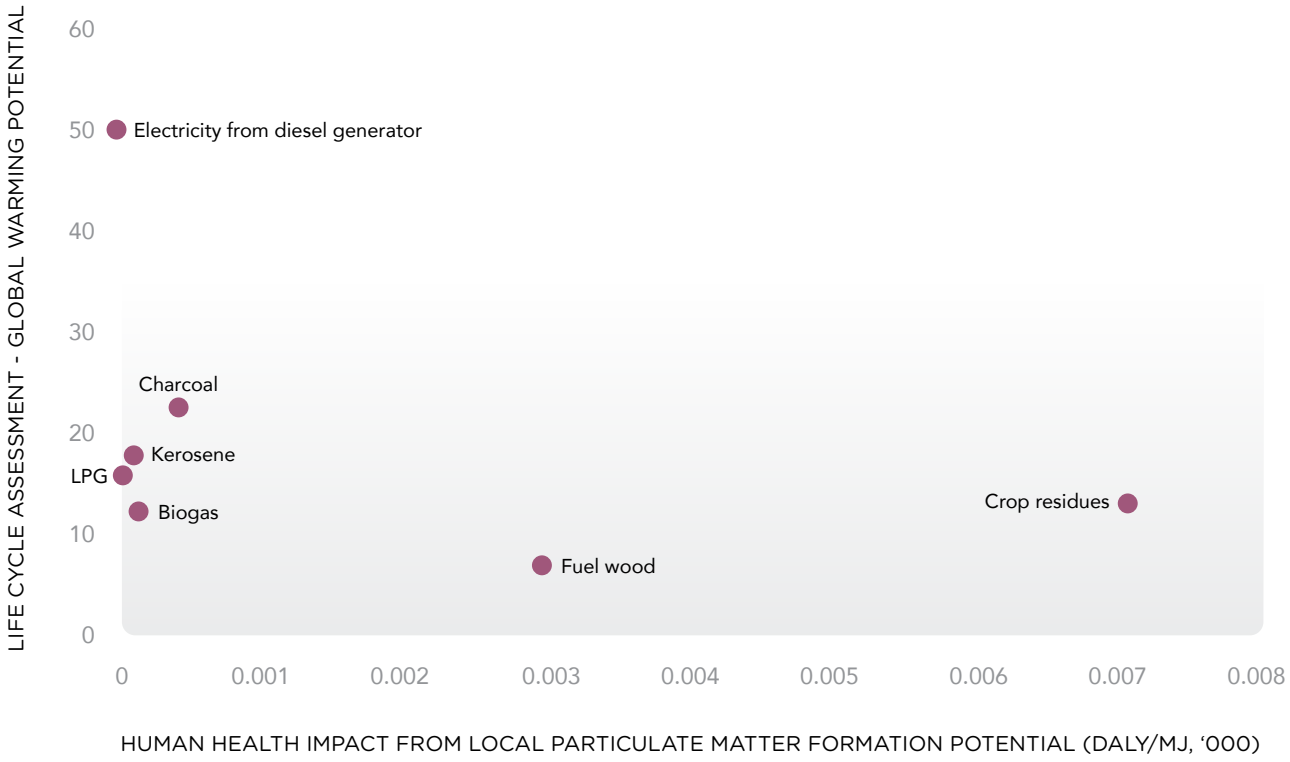
FIGURE A.2
Different perspectives and definitions of clean cooking

Perspective	Description/Definition	Source/ Organization
SOLID VS. NON-SOLID	Solid fuels, such as wood, charcoal and biomass (with the exception of processed biomass), are polluting and dangerous when compared to their non-solid counterparts, such as LPG, kerosene and electricity, which are considered clean. This definition does not consider the role played by the stove technology efficiency. UN Statistics indicates that while this notion has been used to collect data, technical guidance from the WHO recommends pairing fuel with stove to qualify clean cooking solutions (UNSD and WHO 2020).	
INDOOR AIR QUALITY	This definition focuses on the health impact of the stove and fuel, where a clean solution is defined by an emission rate target from household fuel combustion for particulate matter ($PM_{2.5}$) and carbon monoxide (CO) depending on whether the stove is vented. In addition to this, specific normative guidance for fuels such as processed coal and kerosene (solid but polluting fuel) is included.	WHO (WHO 2014)
TIER APPROACH	The Clean Cooking Alliance categorizes stoves and fuels as "efficient" or "clean," and follows a tiered performance of stoves and fuels. Under this definition, stoves/fuels are efficient if they meet minimum tier 2 for efficiency and are clean if they meet tier 3 for indoor or overall emissions.[66]	Clean Cooking Alliance (CCA 2020)
COUNTRY BASELINES	The World Bank definition refers to "clean cooking solutions" as a combination of stove technologies and clean fuel cooking solutions that produce lower particulate and carbon emissions levels compared to the current baseline in a specific country. These emission levels and efficiency are defined by the ISO Tiers of Performance for the indoor emissions indicator. In contrast to the other perspectives, RISE has shown that standards and definitions of "clean" can thus depend on the country's context.	ESMAP (RISE 2018)
MODERN ENERGY COOKING SERVICES AND IMPROVED COOKING SERVICES	ESMAP refers to Modern Energy Cooking Services (MECS) for households that reach tier 4 or higher level of access to clean cooking for the six attributes of the MTF (exposure, efficiency, convenience, safety, affordability and availability). Households that satisfy tier 2 or 3 standards of access across these attributes are categorized as having Improved Cooking Services and are considered to be in transition.	ESMAP, World Bank Group, MECS (ESMAP 2020a)

[65] These definitions are aligned with the interim tiered performance guidelines agreed in the ISO International Workshop Agreement (IWA) in February 2012.
[66] "Clean" can relate to either potential health or environmental impacts.

Another important aspect to be considered is the trade-off between the different perspectives. One study compared the local emissions level for several cooking solutions with their life cycle environmental impact (LCA),[67] which depends on the electricity supply mix, in contrast with the common approach of measuring the local health impact only (Aberilla et al. 2020). Based on the grid supply of rural communities in the Philippines, the study shows that while cooking with LPG has no adverse impact on the user's health, the global warming potential is slightly above that of other fuels.

FIGURE A.3
Local and global impacts of clean cooking solutions



Note: Adapted from Aberilla et al. (2020). Impact is measured per MJ at stove. DALY corresponds to disability-adjusted life years. Both local and global impacts are calculated from assumptions based on rural communities in the Philippines, for electricity supply mix and other inputs.

The results from this study are contingent on characteristics of the analysed countries and would vary when considering other baseline scenarios and electricity supply breakdowns.

[67] A life cycle assessment (LCA) considers the impact at all stages of a product, from production to use. For example, in this study, the LCA of cooking with LPG takes into account oil and gas extraction and refining, while the impact of electric cooking includes electricity generation (Aberilla et al. 2020).

APPENDIX III: CARBON FINANCE ESTIMATES

As a sector with significant impact in net emissions reduction, compared to the baseline inefficient cooking scenario, the financing of clean cookstoves has been enabled through carbon markets for at least 12 years (Ecosystem Marketplace 2019). Recent strenuous negotiations concerning the Paris Agreement's Article 6, by which countries could meet their nationally determined contributions (NDCs) through the purchase of another country's emission reductions, have brought carbon markets back into the spotlight (IISD Reporting Services 2019). This international mechanism, which boasts significant catalytic potential for climate mitigation finance, foresees a transition from the Kyoto Protocol Clean Development Mechanism (CDM) to the Sustainable Development Mechanism (SDM), where established methodologies for the design of carbon credit projects are likely to persist.

Under these mechanisms, project developers develop Emissions Reduction Purchase Agreement (ERPAs), specifying the terms of sale and monitoring of carbon offset projects, following certified carbon accounting methodologies that have evolved over the past 20 years. However, while information on the number of credits generated by a project — corresponding to the incremental emission abated compared to the carbon intensive baseline — is publicly available, there is less transparency on the financial terms of the transaction. The following key points illustrate the challenge in tracking carbon finance as a source of clean cooking finance commitments:

LACK OF TRANSPARENCY: ERPAs are negotiated between two or more parties and may include terms that do not directly concern the volume of emissions reduction. The ultimate value of the transaction is therefore difficult to deduce using publicly- available impact reports. This lack of transparency and general information asymmetry between project developers and buyers is especially problematic as it can create negotiating power imbalance for local project developers as the "market" price is often unknown (ADEME et al. 2012).

CARBON PRICING: While prices may not be publicly disclosed, carbon offset projects have extensive documentation on the reduction impact. However, the range of carbon prices can vary from below USD 1-100, adding to the fact that financial transactions can be difficult to extrapolate from the detailed monitoring reports of emissions avoided (SEforALL and CPI 2019).

MONITORING: Carbon projects must be regularly monitored to implement the methodology and ensure that the estimated emissions reduction have taken place. This is a challenge for the distribution of stoves as end-user usage must be closely monitored for the volume of credits to be confirmed, especially considering proven fuel stacking. Recent progress in monitoring either at the fuel distribution level or in technological improvements in stove usage tracking can ensure that the project has generated the credits, thus significantly reducing the burden of monitoring for project developers and making the process more efficient.[68]

In *Energizing Finance: Understanding the Landscape 2019*, an initial estimate was made by applying carbon pricing to five clean cooking projects provided by the UNFCCC, yielding estimates in the range of USD 2.5–51 million. This year's approach, while still an estimation, offers a significant improvement in methodology from the previous report, for the following reasons:

IMPROVED PROJECT COVERAGE: *Energizing Finance: Understanding the Landscape 2020* uses the project registry data from Gold Standard to capture carbon finance projects on the voluntary market, in addition to the UNFCCC's Clean Development Mechanism (CDM), which publishes details on annual issuances online. This approach covers around 40 projects per year. This is a significant increase in the number of projects covered as compared to previous

[68] Both SEforALL and the Clean Cooking Alliance have advanced or supported research to improve the monitoring of stove use to track adoption of cooking solutions (SEforALL 2018).

reports, which included three carbon offset projects financed by the World Bank in the headline numbers, and only covered five UNFCCC projects in the carbon finance estimation.

CARBON PRICE ESTIMATES: The report uses the price estimates produced by Forest Trends' Ecosystem Marketplace, which surveys over 105 voluntary carbon market participants such as project developers, traders, and other intermediaries on their activities. While project-level data are not available, the report states that the price for clean cooking projects averaged USD 5.0 in 2018, only a slight decrease from the average of USD 5.1 and USD 6.2 recorded by respondents in 2016 and 2017, respectively.[69] This provides more accurate estimates than using the aforementioned wide range of potential CO2 prices.

GRANULAR INFORMATION: Project-level data from the Gold Standard Impact Registry provide granularity on the amount of verified emissions reduction (VER) issuances occurring in a given year, allowing a more accurate estimate than the previous approach, where the total VER for a project spanning multiple years was divided by the number of years of issuances.

Through this methodological improvement, USD 20 million of carbon finance was added to the report's clean cooking tracking inventory for 2018. A significant portion of this figure consists of carbon offset projects in the voluntary carbon market, as the report used an average price obtained through the Ecosystem Marketplace report to estimate transactions from detailed issuance data from Gold Standard. In contrast, this analysis only included data from the UNFCCC CDM when data on both capital investment and annual issuance volumes were available. While the graphs in this section include numbers resulting from both approaches, the report details its approach and results for both mandatory and voluntary markets.

THE GROWING IMPORTANCE OF THE SOUTH KOREAN EMISSIONS TRADING SCHEME (KETS): The first of its kind in East Asia and second largest carbon market after the EU Emissions Trading System (EU ETS), the KETS has gained significantly in size since its formal launch in 2015, trading at a volume of 1.88 million tons of CO2 equivalent in the second quarter of 2017 (ADB 2018). KETS, in its second phase (2018–2020), has allowed CERs generated by international projects after 2016 to be traded on the market – allowing projects like clean cookstoves to be financed through this mechanism.

The general relaxing of carbon trading guidelines by authorities has resulted in an arbitrage market that has allowed the KETS to take off. For example, in 2018, the South Korean financial institution, SK Securities Co, along with a power supplier and CDM services provider, launched an overseas CDM carbon offset project to earn credits through the distribution of clean cookstoves in Bangladesh, with follow-on sales of the credits to South Korean companies with emissions offset needs (Pulse News 2018).

Additional changes are expected in the third phase of the KETS, starting in 2021 and running through 2025, in which financial investment institutions and securities will be able to participate in the market. This change, which might accompany the introduction of carbon emissions derivatives, is expected to lead the market to higher growth in the future (Climate Scorecard 2020).

In coming years, the challenges and lessons learned during the implementation of KETS will hopefully serve as inspiration for the establishment of more flexible carbon trading schemes that are open to international projects, perhaps through linkage with other carbon offset markets. In light of improvements in methodologies and technology to measure the impact of clean cookstoves, paired with countries' pressing needs to achieve their NDC targets, the emergence of efficiently-designed national carbon markets may provide opportunities for clean cooking projects to attract more much-needed capital.

[69] The Forest Trends report conducts a survey for market participants on the voluntary market only. Prices reported thus correspond to Verified Emission Reduction (VER) credits rather than Certified Emission Reduction (CER), the latter of which refers to carbon offsets issued under the CDM. Both are equivalent to one ton of CO2 emission avoided.

DETAILED METHODOLOGY

List of HICs

The HICs tracked in the previous three editions of *Energizing Finance: Understanding the Landscape* were taken from the Global Tracking Framework 2015 (IEA and the World Bank 2015). To better reflect the evolving realities of the energy access landscape, this year's report has been updated as reported in the *Tracking SDG 7: The Energy Progress Report* (IEA et al. 2020) to include Chad and Pakistan for electricity; it no longer includes Afghanistan and the Philippines for electricity access. For clean cooking, Ghana has been added and Nepal is no longer tracked.

FIGURE A.3

High-impact countries analysed in the report

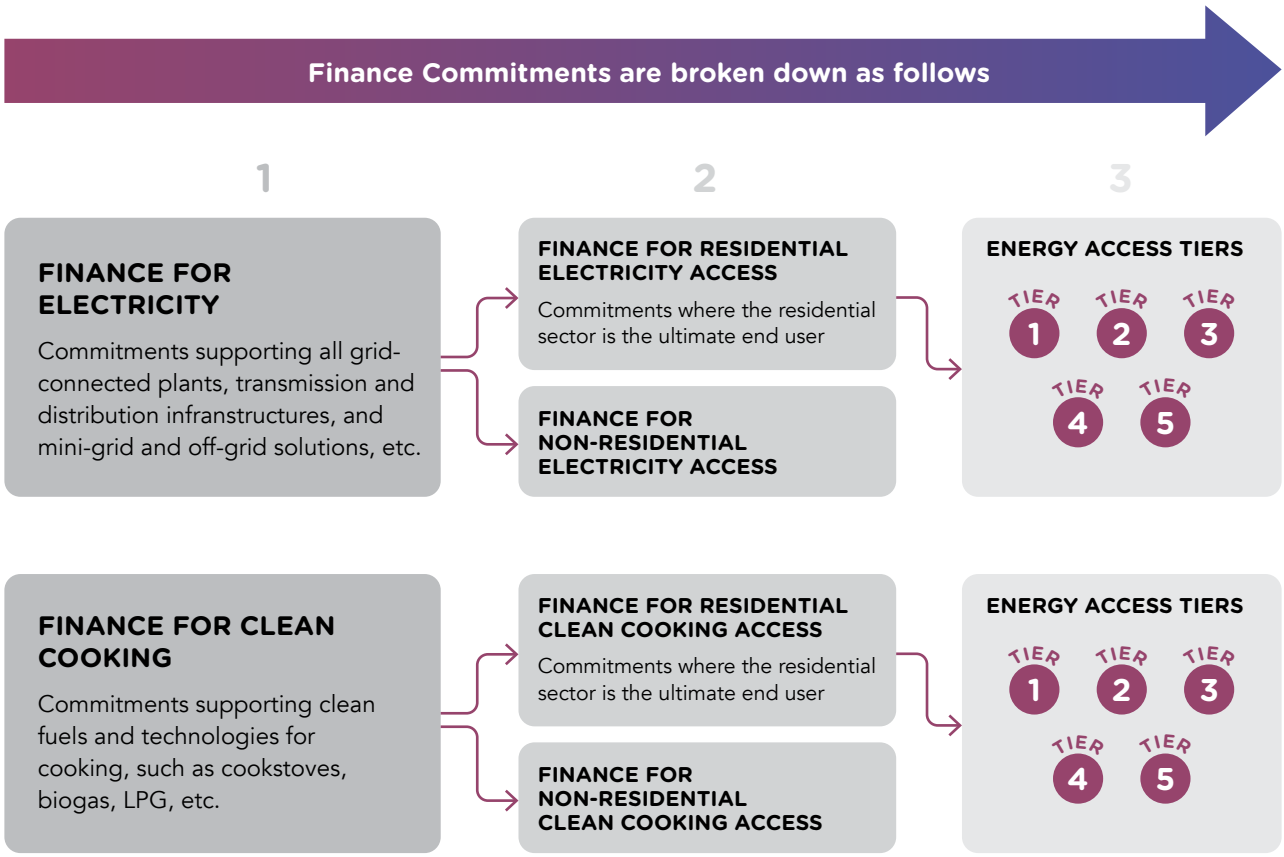
Country	ELECTRICITY	COOKING	Region	Population without electricity access (in million)	Population without clean cooking access (in million)	% of population without access to electricity	% of population without access to clean cooking solutions
Afghanistan		●	South Asia		24		68%
Angola	●		Sub-Saharan Africa	17		57%	
Bangladesh	●	●	South Asia	24	130	57%	80%
Burkina Faso	●		Sub-Saharan Africa	17		86%	
Chad	●		Sub-Saharan Africa	14		88%	
China		●	East Asia and Pacific		544		39%
DPR Korea	●	●	East Asia and Pacific	13	23	52%	90%
Congo (DR)	●	●	Sub-Saharan Africa	68	76	81%	96%
Ethiopia	●	●	Sub-Saharan Africa	60	98	55%	95%
Ghana		●	Sub-Saharan Africa		21		76%
India	●	●	South Asia	64	727	5%	55%
Indonesia		●	East Asia and Pacific		74		29%
Kenya	●	●	Sub-Saharan Africa	13	44	25%	90%
Madagascar	●	●	Sub-Saharan Africa	19	25	74%	99%
Malawi	●		Sub-Saharan Africa	15		82%	
Mozambique	●	●	Sub-Saharan Africa	20	28	69%	96%
Myanmar	●	●	East Asia and Pacific	18	41	34%	77%
Nepal			South Asia				
Niger	●		Sub-Saharan Africa	18		82%	
Nigeria	●	●	Sub-Saharan Africa	85	173	43%	93%
Pakistan	●	●	South Asia	61	113	29%	58%
Philippines		●	East Asia and Pacific		58		56%
Sudan	●	●	Sub-Saharan Africa	17	21	40%	54%
Uganda	●	●	Sub-Saharan Africa	25	41	15%	99%
United Republic of Tanzania	●	●	Sub-Saharan Africa	36	54	64%	97%
Vietnam		●	East Asia and Pacific		37		39%
Yemen	●		Middle East	11		38%	

Tracking Methodology

The report follows a three-step approach to map commitments intended to increase access to electricity and to clean cooking solutions across the 20 HICs (Figure A.4):

1. Tracking finance for electricity and clean cooking, with a focus on commitments.
2. Estimating the portion of finance for residential energy access
3. Applying the MTF to identify the type of energy access provided.

FIGURE A.4
Methodology Summary



STEP 1: TRACKING FINANCE FOR ENERGY ACCESS FOR ELECTRICTY AND CLEAN COOKING

Building on the methodology developed by SEforALL, CPI and the World Bank in the first edition of *Energizing Finance: Understanding the Landscape* and CPI's *Global Landscape of Climate Finance 2019* methodology, the report begins by tracking public and private finance commitments[70] to any project that enhances energy access to electricity and clean fuels and technologies for cooking. These commitments include support for capacity-building measures as well as for the development and implementation of policies.

The report considers only collected information that was available at the project level, disregarding aggregate (regional or global), unverifiable figures, and top-down estimates, which may lead to underreporting of total finance

[70] Commitments represent a firm obligation by the means of Board decisions on investment, closure of a financing contract or similar actions, and backed by the necessary funds, to provide specified assistance/financing to a project, recipient country, or any other partner organization.

received by the HICs. For instance, USD 9.3 billion in finance commitments to electricity was tracked for 2018 that was aggregated at the regional or global level and therefore was not included in this analysis. Of that USD 9.3 billion, USD 1.9 billion was to Sub-Saharan Africa, USD 1.8 billion was to Central Asia and Eastern Europe, USD 860 million was to East Asia and the Pacific, USD 10 million was to Middle East and North Africa, USD 1.4 billion was to South Asia, and USD 3.3. billion was to unspecified transregional destinations.

The report tracks commitments according to the following dimensions:

A. TECHNOLOGIES

Electricity technologies tracked in the report include electricity generation technologies and the transmission and distribution network.[71] Specifically, the following technologies are included, as either electricity generating or facilitating the final consumption of electricity:

- Grid-connected electricity-generating assets, including renewable energy (solar PV, wind, small and large hydro, biomass and waste, biofuels, geothermal), fossil fuels (coal, oil, gas), and nuclear technologies.
- Transmission and distribution networks (including grid extensions and connections).
- Mini-grids including renewable energy assets, fossil fuel assets and hybrid solutions (a mix of renewable and fossil fuel energy).
- Off-grid assets including solar (solar home systems, solar lanterns) and non-solar technologies.
- Energy-efficiency investments that support energy conservation and demand reduction, including building and industry upgrades, smart grids, metering, tariffs, improvements in lighting, appliances and equipment that increase the quality of electricity grids and infrastructure.
- Market support activities, including capacity building, technical assistance and institutional support for energy reforms.

Terminology in the clean and improved cooking sector is variable. This report considers the following technologies and initiatives:

- Stoves and fuels – advanced biomass, ethanol, biogas, improved biomass, electric, LPG, natural gas.
- Fuel infrastructure – investments in clean cooking fuel infrastructure (LPG, natural gas, and ethanol-cooking technologies) that target no more than two distribution levels away from final end use. This includes LPG storage facilities and cylinder bottling plants.

B. SOURCES

Public sector institutions include:

- Multilateral development finance institutions (DFIs) including climate funds and EU institutions, where the institution has multiple shareholder countries.
- Bilateral DFIs, where a single country owns the institution
- National DFIs, including public banks and local public sector providers of debt instruments
- Export credit/promotion agencies
- Government international, refers to bilateral Official Development Assistance (ODA) and Other Official Flows (OOF)
- Government domestic, domestic financing through public budgets carried out by central, state or local governments and their agencies

Private sector institutions include:

- Corporate actors and project developers designing, commissioning, operating and maintaining energy projects, such as private sector utilities and energy companies, independent power producers

[71] Infrastructure and pipelines for supplying LNG to power generation plants are excluded.

- Commercial financial institutions providing private debt capital, such as commercial and investment banks and micro-financial institutions
- Commercial finance, including asset managers and early-stage investors (private equity, impact investors, venture capital and infrastructure funds)
- Philanthropic foundations
- Households, i.e. family-level economic entities, high-net-worth individuals and their intermediaries (for example, family offices investing on their behalf)

C. FINANCIAL INSTRUMENTS

The report tracks:

- Grants
- Project-level debt (both concessional and commercial), where debt relies on a project's cash flow for repayment
- Project-level equity, equity investment relying on the project's cash flow for repayment
- Balance sheet financing (i.e. a direct debt or equity investment by a company or finance institution)
- Other instruments like crowdfunding.

The report does not track disbursements and policy-induced revenue support mechanisms such as feed-in tariffs, secondary market transactions, or other public subsidies (except in the case studies). Feed-in tariffs, for example, pay back investment costs, so including them would constitute double counting. Similarly, guarantees are only exercised in particular circumstances, and there might never be any outflow from the guarantor. Secondary-market transactions, such as the reselling of stakes, are only tracked if they do not constitute double counting with other areas of the data collection.

STEP 2: ESTIMATING THE FINANCE COMMITMENTS FOR RESIDENTIAL ENERGY ACCESS

Once finance commitments for energy access are identified, the portion specifically referring to residential energy access is determined. For example, a grid-connected wind farm is likely to supply electricity to residential, commercial and industrial consumers, and therefore only a proportion of the value of the wind farm should be recognized as granting residential electricity access.

Unless project-specific information is available, assumptions are made at country/technology level, more specifically:

- If part of the capacity of a specific technology in a country is used for energy exports, the investment value is discounted by the share of exports.
- The remaining value is then discounted by the existing share of consumption going to non-residential sectors (commercial, industrial, public sector). From a methodological standpoint, it would be preferable to use the marginal consumption, for example, how one extra unit of electricity in a country is consumed across the various sectors. Given that these data are largely absent, existing consumption shares have been used as a proxy, available from the IEA.

Commitments towards market support activities and energy efficiency are excluded from this step as they render benefits to both residential and non-residential users, and it is difficult to isolate the impact on each category.

STEP 3: ALLOCATING THE ESTIMATED FINANCE COMMITMENTS FOR RESIDENTIAL ENERGY ACCESS TO TIERS

Not all residential energy access is the same. In the case of electricity, for example, some systems may only be available for certain hours of the day or may produce limited power. Recognizing the reality of different energy access service levels,[72] the World Bank developed the MTF to measure levels of energy access for electricity and for clean cooking. The MTF considers "the ability to obtain energy that is adequate, available when needed, reliable, of good quality, affordable, legal, convenient, healthy, and safe for all required energy applications across households, productive engagements, and community facilities." This approach allows the report to rate energy access from tier 0 (no access) to tier 5 (very high level of access) (Bhatia and Angelou 2015).

The report uses technology-specific ranges of attribution as an initial starting point for allocating technologies to energy access Tiers. Figure A.5 and Figure A.6 illustrate those used for electricity and cooking, respectively. Where a technology covers more than one tier, specific attributes based on the MTF are used to determine specific allocation. For example, in the case of central grid-connected plants — ranging between tiers 3 and 5 — country-specific data were applied on the reliability of the grid in that country to determine the final Tier of allocation. Figure A.5 summarizes technology-specific assumptions used for the estimates of consumption shares across sectors and allocation to tiers.

For this edition of the report, World Bank and ESMAP teams have provided the results of the MTF surveys about the existing status of electricity access in four HICs: Bangladesh, Ethiopia, Kenya and Myanmar. Replacing the simplified methodology (summarized in Figure A.7) with real-world information collected through household surveys ensures greater accuracy in quantifying the impact of different financing types across service levels (energy access tiers), and across the various consumer sectors (residential and non-residential).

[72] Factors that determine the level of energy access could include, in the case of electricity, the wattage available, for how many hours electricity is available, and so on.

FIGURE A.5
The Multi-Tier Framework for Measuring Access to Electricity

ATTRIBUTES		TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
Capacity	Power capacity ratings (W or daily Wh)	Less than 3 W	At least 3 W	At least 50 W	At least 200 W	At least 800 W	At least 2 kW
		Less than 12 Wh	At least 12 Wh	At least 200 Wh	At least 1 kWh	At least 3.4 kWh	At least 8.2 kWh
	Services		Lighting of 1,000 lmhr per day	Electrical lighting, air circulation, television, and phone charging are possible			
Availability	Daily Availability	Less than 4 hours	At least 4 hours and less than 8 hours	At least 4 hours and less than 8 hours	At least 8 hours and less than 16 hours	At least 16 hours and less than 23 hours	At least 23 hours
	Evening Availability	Less than 1 hour	At least 1 hour and less than 2 hours	At least 2 hours and less than 3 hours	At least 3 hours and less than 4 hours	4 hours	4 hours
Reliability		More than 14 disruptions per week				(More than 3 and up to 14 disruptions per week) or less than or equal to 3 disruptions per week with more than 2 hours of outage	At most 3 disruptions per week with total duration of less than or equal to 2 hours
Quality		Voltage problems does damage to appliances				Voltage problems do not affect use of appliances	
Affordability		Cost of a consumption package of 365 kWh per year is more than or equal to 5% of household income			Cost of a consumption package of 365 kWh per year is less than 5% of household income		
Formality		Bill is not paid				Bill is paid to the utility, prepaid card seller, or authorized representative	
Health and Safety		Electricity-related accidents in last one year				No electricity-related accidents in last one year	

Source: World Bank, ESMAP, SREP, SEforALL 2020 updating Bhatia and Angelou 2015.
Note: Colours signify tier categorization.

FIGURE A.6
The Multi-Tier Framework for Measuring Access to Modern Energy Cooking Solutions

ATTRIBUTES		TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
Cooking Exposure	Emission Stove desi SO›s voluntary performance targets (Default Ventilation) PM2.5 (mg/Mjd) CO (g/Mjd) gn	>1030 >18.3	≤1030 ≤18.3	≤481 ≤11.5	≤218 ≤7.2	≤62 ≤4.4	≤5 ≤3.0
	High Ventilation PM2.5 (mg/Mjd) CO (g/Mjd)	>1489 ≥26.9	≤1489 ≤26.9	≤733 ≤16.0	≤321 ≤10.3	≤92 ≤6.2	≤7 ≤4.4
	Low Ventilation PM2.5 (ng/Mjd) CO (g/Mjd)	>550 >9.9	≤550 ≤9.9	≤252 ≤5.5	≤115 ≤3.7	≤32 ≤2.2	≤2 ≤1.4
Cookstove Efficiency	ISO's voluntary performance targets	≤10%	>10%	>20%	>30%	>40%	>50%
Convenience	Fuel acquisition and preparation time (hours per week)	≥7		<7	<3	<1.5	<0.5
	Stove preparation time (minutes per meal)	≥15		<15	<10	<5	<2
Safety		Serious Accidents over the past 12 months				No serious accidents over the past year	
Affordability		Fuel cost ≥5% of household expenditure (income)				Fuel cost <5% of household expenditure (income)	
Fuel availability		Primary fuel available less than 80% of the year				Available 80% of the year	Readily available throughout the year

Source: World Bank, ESMAP, SREP, SEforALL 2020 updating Bhatia and Angelou 2015.

FIGURE A.7
Approaches used to estimate consumption shares and tier allocation

Technology type	Approach used to estimate technology/ country specific breakdown by target sector (export, residential, commercial, industrial, other)	Estimate for Tiers linkage (incl. rural/ urban split)
Residential electricity		
Grid-connected fossil fuels and renewables	**Sector-specific breakdown** To allocate investment to the different sectors, the report looks at the composition of both electricity supply and demand as per country-specific electricity balances for the years 2018 using IEA (2020) for the majority of HICs, examining export data, as well as consumption data from the residential and non-residential sectors. For countries not covered by IEA, other sources were used. Sector-specific figures and export figures are then presented as a % of domestic generation.	**Tier allocation** Grid-connected capacity typically ranges between tiers 3 and 5 according to IEA and WB (2015) and World Bank (2020). To reflect country-specific circumstances, the report allocates investment to Tiers within this range, based on available aggregate country-level data matching Tier attributes identified as per MTF methodology (Bhatia and Angelou 2015). In the absence of reliable sources at country level on power capacity available for individual residences via grid-connected plants (and associated transmission investment), the report looked at country-specific "reliability" of grid electricity supply, measured with frequency of disruptions occurring in a country, using World Bank (2017) national data on "Power outages in firms in a typical month (number)", as a conservative proxy for disruptions for the residential sector. More specifically, the report applied: - Tier 5, if disruptions per week ≤ 3 - Tier 4, if disruptions per week > 3 and ≤ 14 - Tier 3, if disruptions per week > 14
Transmission and distribution (extensions and unspecified)		
Mini-grids, fossil fuels and renewable/hybrid	**Sector-specific breakdown** Although there are no specific geographic limits on the boundaries of a mini-grid, the report assumed that mini-grid generation would serve only a concentrated local area (village, group of villages, small island) with zero exports. While mini-grids would not support the same level of energy-intensive heavy industry as a national or regional grid, evidence from the literature suggests that — on top of residential and commercial use — a significant share of mini-grid generation is for industrial applications, and indeed that industrial "anchors" on mini-grids such as factories or telecom towers may in many cases be necessary to sustain the network and subsidize residential mini-grid connections. Project-specific data also confirm this finding.[73]	**Tier allocation** Mini-grid capacity ranges between tiers 3 and 4 according to IEA and World Bank (2015, Figure A2.3). In the absence of reliable sources at country level on power capacity made available to individual residences via mini-grid plants, the report looked at country-specific availability (duration) of resources for each technology type. Due to a lack of data on storage capacity, the report looked at availability during the 24 hours only as defined in the MTF methodology (Bhatia and Angelou 2015). The report then applied: - Tier 4, if hours of availability per day ≥ 16 - Tier 3, if hours of availability per day <16

[73] For example, in Nigeria, the overwhelming majority of the identified capacity additions for 2013-15 consist of mini-grid capacity for coastal refineries, presumably with little or no surplus generation available for residences.

Technology type	Approach used to estimate technology/ country specific breakdown by target sector (export, residential, commercial, industrial, other)	Estimate for Tiers linkage (incl. rural/ urban split)
	The residential share for investments in mini-grid installation reflects electricity consumption patterns for residential, commercial and industrial use observed in the grid — excluding exports from the equation — on the assumption that region-specific usage is similar to usage observed at the national level.	Hours of availability were estimated applying capacity factor figures to the hours of maximum continuous operation of a plant. Figures with capacity factors for renewable energy technologies in specific countries were obtained primarily from BNEF.
Other off-grid	**Sector-specific breakdown** The report assumes the larger off-grid generators (1kW – 15 MW) are used for industrial and commercial use. Smaller off-grid generators (<1kW) are used both for residential and commercial uses in developing countries, as the latter are usually run at family level. The residential share for investments in off-grid installation (<1kW) reflects electricity consumption patterns for residential and commercial use observed in the grid, on the assumption — in the absence of more specific data — that usage of off-grid electricity is similar to usage observed at national level.	**Tier allocation** Off-grid capacity ranges between tiers 1 and 4 according to IEA and WB (2015, Figure A2.1 and Figure A2.3). Tier allocation is defined by technology types, following the approach suggested for mini-grids. The report applies: - Tier 4, if hours of availability per day ≥ 16 - Tier 3, if hours of availability per day ≥ 8 and <16 - Tier 2, if hours of availability per day < 8.
Off-grid: Solar home systems and solar lanterns	**Residential shares** – GOGLA impact metrics use a conservative estimate of 10% as the default coefficient indicating the proportion of customers using solar for business purposes – with the balance of 90% of output used for residential purposes.	**Tier allocation** The report allocates investments to tiers based on GOGLA (2016), estimating how sales volumes can be attributed to the different tiers per the MTF as part of this assessment of the social, environmental impact of off-grid lanterns. The suggested approach is focusing on technology types: - Solar lanterns increase access to tier 1, - SHSs increase access to tier 1 for systems with PV panel capacity between 11 and 20 Wp, and tier 2 for systems with PV panel capacity above 20Wp.
Energy Efficiency	Case by case analysis to allocate to the specific sector. When information was missing, assumed targeting the residential sector by default.	Not allocated. Further work is needed to develop an adequate methodology for the sector.
Market support (incl. technical assistance)	Not applicable.	Not applicable.

Technology type	Approach used to estimate technology/ country specific breakdown by target sector (export, residential, commercial, industrial, other)	Estimate for Tiers linkage (incl. rural/ urban split)
Cooking		
Advanced biomass (Stoves and fuel and infrastructures)	**Determination of % units (# individual assets) applied to residential vs. non-residential sector:** Financial commitments to advanced biomass stoves were approximated at 100% to the residential sector based on market knowledge and in consideration of the data source.	The report used aggregate indoor emissions and efficiency data Tiers provided by GACC per technology type. It then mapped these to MTF indications, whereby tier 1 efficiency requirements enable Level 1 services, and so forth. This same logic was applied for aggregate Indoor air quality metrics received. The report then used a combination of secondary data and internal analysis over the remaining five MTF attributes to arrive at the maximum potential level of service that may be delivered by a particular solution. As per the MTF, the lowest level applied for any individual attribute comprises the highest potential Tier of access that may be delivered through a given solution. Indoor Emissions (per GACC): 2; Efficiency (per GACC): 2; Convenience (Internal Analysis): 5; Safety (Internal Analysis): 4; Affordability (World Bank, 2015a): < 4; Quality of Primary Fuel (Internal Analysis): < 4; Availability of Primary Fuel (Internal Analysis): < 4. Overall tier used in databases: split between Tier 2, 3 and 4.
Ethanol (stoves and fuel and infrastructures)	**Determination of % units (# individual assets) applied to residential vs. non-residential sector:** Financial commitments to ethanol stoves were approximated at 100% to the residential sector based on market knowledge and in consideration of the data source.	Same approach as above. Indoor Emissions (per GACC): 4 or 5; Efficiency (per GACC): 1; Convenience (Internal Analysis): 5; Safety (Internal Analysis): 4; Affordability (World Bank, 2015a): < 4; Quality of Primary Fuel (Internal Analysis): 4; Availability of Primary Fuel (Internal Analysis): 4. Overall tier used in databases: split between Tier 3 and 4.
Biogas digesters	**Determination of % units (# individual assets) applied to residential vs. non-residential sector:** Financial commitments to biogas digesters were approximated at 100% to the residential sector based on a review of the specific transactions included.	Same approach as above. Indoor Emissions (per GACC): 4 or 5; Efficiency (per GACC): 3; Convenience (Internal Analysis): 3; Safety (Internal Analysis): 4; Affordability (World Bank, 2015a): < 4; Quality of Primary Fuel (Internal Analysis): < 4; Availability of Primary Fuel (Internal Analysis): 4. Overall tier used in databases: split between tier 3 and 4.

Technology type	Approach used to estimate technology/ country specific breakdown by target sector (export, residential, commercial, industrial, other)	Estimate for Tiers linkage (incl. rural/ urban split)
Electric stoves	**Determination of % units (# individual assets) applied to residential vs. non-residential sector:** Financial commitments to electric stoves were approximated at 100% to the residential sector based on market knowledge and in consideration of the data source.	Same approach as above. Indoor Emissions (per GACC): 4 or 5; Efficiency (per GACC): 4 or 5; Convenience (Internal Analysis): 5; Safety (Internal Analysis): 5; Affordability (World Bank, 2015a): <4; Quality of Primary Fuel (Internal Analysis): <4; Availability of Primary Fuel (Internal Analysis): <4. Overall Tier used in databases: split between tier 4 and 5.
Improved biomass (stoves)	**Determination of % units (number of individual assets) applied to residential vs. non-residential sector:** Financial commitments to improved biomass stoves were allocated at either 100% or 70% to the residential sector. Allocations of 100% were based on a review of specific transactions. Allocations of 70% residential/30% non-residential were applied to vendors that commercialize both residential and institutional size stoves, based on a benchmark provided by the Paradigm Project Kenya (ERMC 2016)	Same approach as above. Indoor Emissions (per GACC): 1; Efficiency (per GACC): 1; Convenience (Internal Analysis): 2; Safety (Internal Analysis): < 4; Affordability (World Bank, 2015a): < 4; Quality of Primary Fuel (Internal Analysis): < 4; Availability of Primary Fuel (Internal Analysis): 4. Overall Tier used in databases: split between tier 1 and 2.
LPG (stoves and fuel infrastructures)	**Determination of % units (# individual assets) applied to residential vs. non-residential sector:** Financial commitments to LPG were allocated to the residential sector by reviewing the details of each project. When available, IEA consumption shares for LPG were used (IEA 2020).	Same approach as above. Indoor Emissions (per GACC): 4 or 5; Efficiency (per GACC): 3; Convenience (Internal Analysis): 5; Safety (Internal Analysis): < 4; Affordability (World Bank, 2015a): < 4; Quality of Primary Fuel (Internal Analysis): 4; Availability of Primary Fuel (Internal Analysis): <4. Overall Tier used in databases: 4.
Natural gas (stoves and fuel)	**Determination of % units (# individual assets) applied to residential vs. non-residential sector:** Financial commitments were allocated to the residential sector based on a share of consumption (in TJ) as provided by IEA indicators.	Same approach as above. Indoor Emissions (per GACC): 4 or 5; Efficiency (per GACC): 3; Convenience (Internal Analysis): 5; Safety (Internal Analysis): 4; Affordability (World Bank, 2015a): < 4; Quality of Primary Fuel (Internal Analysis): 4; Availability of Primary Fuel (Internal Analysis): 4. Overall Tier used in databases: 4.
Natural gas (infrastructure)	**Determination of % units (# individual assets) applied to residential vs. non-residential sector:** For the one identified transaction, sector allocation was made based on IEA (2017b) indicators for natural gas in India.	Same approach as above. Indoor Emissions (per GACC): 4 or 5; Efficiency (per GACC): 3; Convenience (Internal Analysis): 5; Safety (Internal Analysis): 4; Affordability (World Bank, 2015a): < 4; Quality of Primary Fuel (Internal Analysis): 4; Availability of Primary Fuel (Internal Analysis): 4. Overall tier used in databases: 4.

Technology type	Approach used to estimate technology/ country specific breakdown by target sector (export, residential, commercial, industrial, other)	Estimate for Tiers linkage (incl. rural/ urban split)
Solar cooking (stoves)	**Determination of % units (# individual assets) applied to residential vs. non-residential sector:** Financial commitments to solar cooking stoves were approximated at 100% to the residential sector based on market knowledge and in consideration of the data source.	Same approach as above. Indoor Emissions (per GACC): 4 or 5; Efficiency (per GACC): 4 or 5; Convenience (Internal Analysis): 3; Safety (Internal Analysis): 4; Affordability (World Bank, 2015a): < 4; Quality of Primary Fuel (Internal Analysis): < 4; Availability of Primary Fuel (Internal Analysis): < 4. Overall Tier used in databases: split between tier 4 and 5.
Market support	Not applicable.	Not applicable.

Data Sources and Treatment

Figure A.8 provides the list of various public and private data sources used for tracking commitments in the 20 HICs in 2018, followed by a discussion on data treatment issues.

FIGURE A.8

List of data sources used to track financial commitments

Source name	Description	Sector relevance	International/ Domestic	Additional comments
Organisation for Economic Co-Operation and Development (OECD)	Data on international aid for project and market support from bilateral and multilateral donors, publicly available from the OECD DAC Creditor Reporting System (CRS)	Electricity and Cooking	International	As information was not directly available, a "key words" search was performed to identify and separate off-grid, smart grid and clean cooking activities
Bloomberg New Energy Finance (BNEF)	Asset finance database for grid-connected renewable energy Contains data on finance raised by solar companies	Electricity – grid- connected renewable generation (excluding large hydro) and off-grid solar	International and domestic	Main reference for finance for grid connected renewable energy VC/PE financing deals for solar companies located in the 20 HICs
Climate Policy Initiative	Project-level data from DFIs (MDBs and IDFC members) collected during the Global Landscape of Climate Finance	Electricity and Cooking	International	Additional data for bilateral and multilateral DFIs that include guarantees, risk mitigation instruments and non-concessional finance not reported in OECD DAC CRS
Climate Funds Update	Additional data on national and multilateral Climate Funds' commitments	Electricity – grid- connected and off-grid renewable generation	International	Complements data on international and domestic public finance for electricity projects
Clean Cooking Alliance	Venture investment database	Cooking	International and domestic	Contributes data on financing raised by clean cooking companies
GOGLA	Database on financing raised from GOGLA's member organizations	Electricity – off-grid solar	International and domestic	Financing raised by solar off-grid companies located or operating in HICs
SEforALL surveys	Surveys sent to 5–6 DFIs	Electricity – off-grid solutions Cooking – all	International	Data were collected at the project level and complemented with websites and annual reports

IJGlobal	Energy and infrastructure finance database	Electricity – grid- connected generation (fossil fuel, nuclear and large hydro) and transmission and distribution Cooking – LNG distribution	International and domestic	Main reference for grid-connected fossil fuel and LNG distribution projects
Boston University China Global Energy Finance	Tracks overseas development finance in the energy sector provided by China's two global policy banks	Electricity – grid- connected renewable and fossil fuel generation	International	Complements coal finance data
S&P Global Market Intelligence	Tracks private equity investments in Asia-Pacific and Africa in the Energy and Utilities sectors	Electricity – mini-grids and grid- connected renewable generation	International	Complements mini-grid and grid- connected renewable finance data
Foundation Grant Self-Reporting	Tracks grant funding from philanthropies to energy access	Electricity – mini-grids, off-grid, market support and energy efficiency	International	Complements CPI tracking of foundation finance flows (DOEN Foundation, IKEA Foundation, Shell Foundation. Mott Foundation, and Fundación Netri)
International Trade Centre	Tracks LPG cylinder imports by HICs	Cooking – LPG	International	Captures the financial value of LPG cylinder imports
UNFCCC CDM Registry	Tracks issuance of carbon finance projects	Cooking – all	International	Captures carbon finance projects under the official regime
Gold Standard Impact Registry	Tracks issuance of carbon finance projects	Cooking – all	International	Captures carbon finance projects for the voluntary markets

Addressing double counting and data treatment across different databases: To avoid double counting when aggregating data from different sources, some financial data from select sources and secondary market transactions were excluded. Specifically, the report excluded external resources that DFIs manage on behalf of third parties, governments' contributions to DFIs or climate funds, bilateral climate funds' commitments, and DFIs' contributions to projects reported by BNEF or IJ Global.

Multi-country or regional level projects: these projects are often marked as regional or global in the data sources, which makes it difficult to identify what portion flows to the 20 HICs. Two approaches were taken to address it:

- OECD CRS: to be conservative in tracking, financing attributed to 'Africa and Asia, regional' and 'global' (some of which is plausibly going to the HICs) was not included in the analysis.
- Data from GOGLA and other surveys: funds going to companies that operate regionally were allocated equally across the countries of operations.

Private sector transactions: assumptions were taken to estimate a realistic debt to equity ratio for projects with undisclosed financial information. For most renewable energy projects, a gearing ratio of 70:30 (debt to equity) was assumed, except for wind projects in China, assumed 80:20. For transactions with multiple debt and/or equity providers with limited information on financing provided by each provider, the financing amount was split equally.

ABBREVIATIONS

CDM	Clean Development Mechanism
CRS	Creditor Reporting System (of the OECD)
DAC	Development Assistance Committee (of the OECD)
DFIs	Development finance institutions
ERPA	Emissions Reduction Purchase Agreement
ESMAP	Energy Sector Management Assistance Program
GLPGP	Global LPG Partnership
GW	Gigawatts
HICs	High-impact countries
ICS	Improved cookstoves
KETS	South Korean Emissions Trading Scheme
kWh	Kilowatt-hours
LNG	Liquefied natural gas
LPG	Liquefied petroleum gas
MECS	Modern Energy Cooking Services
MFIs	Multilateral financial institutions
MTF	Multi-Tier Framework
MW	Megawatts
NDC	Nationally determined contributions
ODA	Overseas development assistance
OECD	Organisation for Economic Co-operation and Development
SSA	Sub-Saharan Africa
SHS	Solar home systems
SMEs	Small and medium-sized enterprises
Solar PV	Solar photovoltaic
T&D	Transmission and distribution
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollars
VER	Voluntary emissions reduction

GLOSSARY OF TERMS

Asset: a resource with economic value owned by an individual, company, or country; for example, an onshore wind farm.

Centralized electricity solutions: extensions of a country's electricity grid and/or power sources connected to a country's existing electricity grid.

Clean and improved fuels and technologies for cooking: The report tracks financial commitments for: advanced biomass stoves and fuel infrastructure, ethanol stoves, biogas digesters, electric stoves, improved biomass stoves, LPG stoves, natural gas stoves, and solar cookers. These are referred to as "clean cooking solutions" or "clean fuels and technologies for cooking" throughout the report.

Finance for clean cooking: the portion of energy finance commitments supporting clean and improved fuels and technologies for cooking.

Commitments: a firm obligation by the means of Board decisions on investment, closure of a financing contract or similar actions, and backed by the necessary funds, to provide specified assistance/financing to a project, recipient country, or any other partner organization. Financial resources committed record the full amount of expected transfer, irrespective of the time required for the completion of disbursement. The focus on commitments rather than disbursements may affect the magnitude of overall financing, given that committed amounts are often disbursed over a number of years.

Concessional finance: finance where the investing or lending party provides financing at rates and/or terms better than or below standard market rates/terms. Often concessional finance is provided in exchange for non-financial goals such as promoting low-carbon investment.

Domestic finance: finance where the funding institution (either publicly- or privately-owned) is primarily based in the country where the project is being developed or constructed.

Disbursements: funds that are actually transferred to a project after a commitment is made. For example, when a funder commits to invest in a project in 2017, but the project can only commence construction in 2018, funds transferred to the projects' builders and consultants in 2018 are classed as disbursements.

Energy access: the ability of the households to utilize energy supplies; used here to cover both access to electricity and to clean fuels and technologies for cooking.

Finance for energy: investment commitments for specific technologies, assets and market support activities within the energy sector, regardless of the ultimate end user of the energy supply.

Energy infrastructure: any assets used in the generation or transmission of electricity or transportation of clean cooking fuels

Finance for electricity: the portion of energy finance commitments supporting all grid-connected generation plants, electricity transmission and distribution infrastructure, and mini-grid and off-grid solutions.

High-impact countries: the 20 countries with the highest absolute gaps in access to electricity and/or clean fuels and technologies for cooking, measured by population, as identified in the Tracking SDG7 2020 report (IEA et al. 2020). (See Box 1 for more details.)

Finance for residential clean cooking access: the estimated portion of finance for clean cooking for which the residential sector is the ultimate end user, that is, finance that can be considered as increasing residential access to clean and improved fuels and technologies for cooking.

Finance for residential electricity access: the estimated portion of finance for electricity where the residential sector is the ultimate end user. For example, finance that can be considered as increasing residential access to electricity.
International finance: finance where the funding institution is primarily based outside the country where the project is being developed or constructed.

Modern Energy Cooking Services (MECS): Refers to a household context that has met the standards of tier 4 or higher across all six measurement attributes of the Multi-Tier Framework: convenience, (fuel) availability (a proxy for reliability), safety, affordability, efficiency, and exposure (a proxy for health related to exposure to pollutants from cooking activities).

Multi-Tier Framework (MTF): measures the level of energy access provided by energy finance to residential consumers. Rather than using binary measures of energy access (having or not having a household electrical connection) that do not consider the quality, regularity, or affordability of service, the MTF instead recognizes that access to electricity is a continuum. Finance is therefore allocated to five "tiers," from tier 0 (no access) to tier 5 (very high level of access), based on the Multi-Tier Framework (MTF) developed by the World Bank (Bhatia and Angelou, 2015) and supported by SEforALL. The MTF is explained in more detail in Chapter 1 and Methodology.

Non-concessional finance: finance provided on market terms and rates.

Decentralized solutions: provision of electricity that does not take place through a country's centralized grid. Examples of off-grid solutions would include off-grid solar home systems and local mini-grids not connected to the main electricity grid.

Public finance/private finance: whether a finance flow is classed as public or private is determined by who is undertaking a project. In alignment with the OECD definitions, finance qualifies as public if carried out by central, state, or local governments and their agencies at their own risk and responsibility.

Residential consumers: all consumers in a country, aside from any business or government consumers. The intention is to broadly capture residential consumption, discounting business consumption where businesses are run from households, where possible.

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