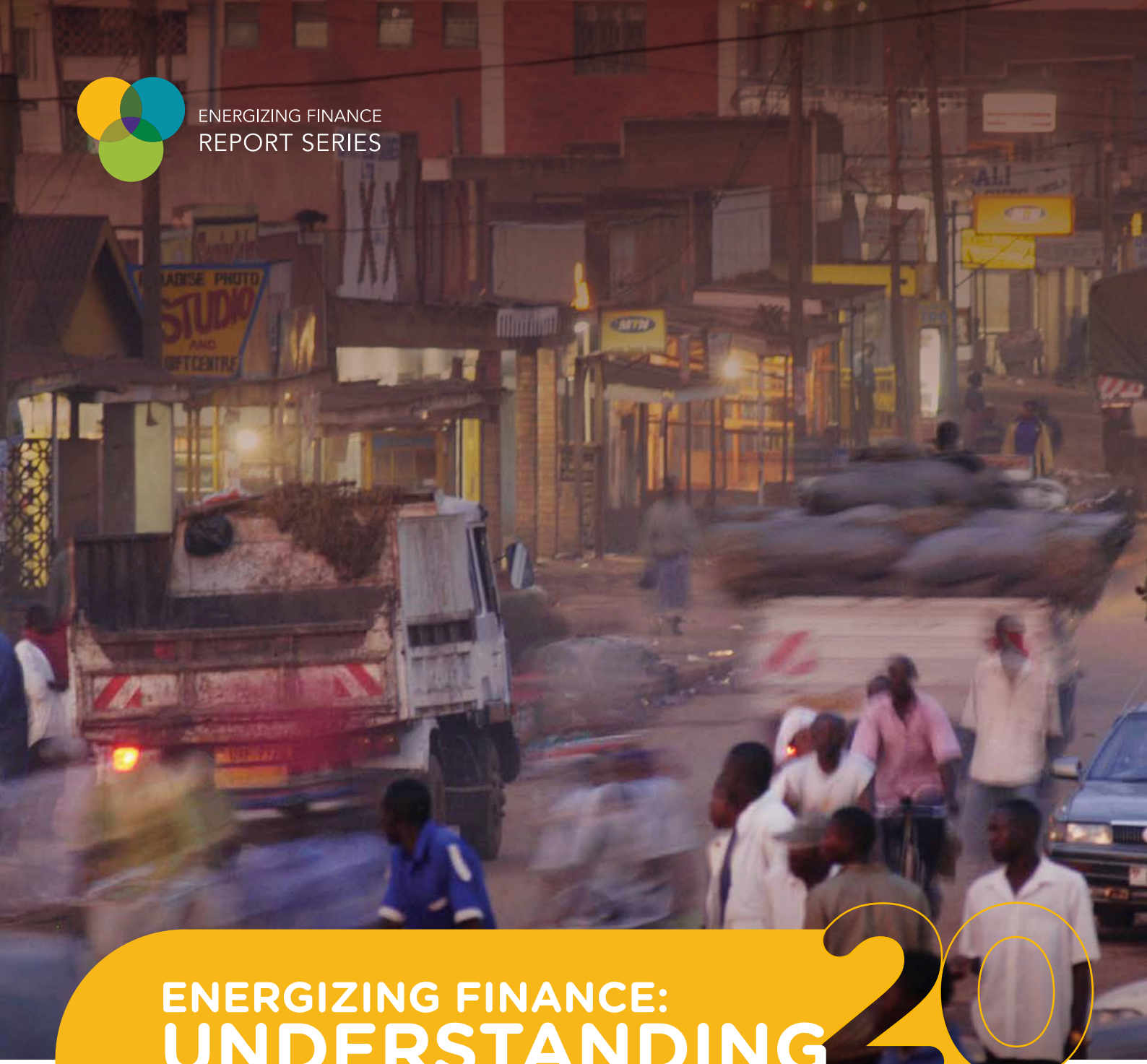

ENERGIZING FINANCE
REPORT SERIES

ENERGIZING FINANCE: UNDERSTANDING THE LANDSCAPE 2018

CLIMATE POLICY INITIATIVE

SUSTAINABLE ENERGY FOR ALL

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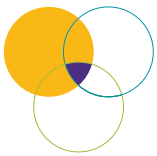

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To view this full report and the Energizing Finance report series online, please visit SEforALL.org/EnergizingFinance.

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ENERGIZING FINANCE FOREWORD

With just over a decade left to meet the Sustainable Development Goals (SDGs), including Sustainable Development Goal 7, which aims to ensure universal access to affordable, reliable, sustainable and modern energy, the release of our 2018 report, Energizing Finance: Understanding the Landscape 2018, comes at a critical juncture.

The prognosis is troublesome, especially given the large access gap that continues to exist: globally there are currently almost one billion people without access to electricity, and three billion people who lack access to clean cooking.

Our report categorically demonstrates that financial commitments to achieve universal access to electricity and clean cooking are still falling far short of where they need to be, both in terms of the level of committed funding, and in the technology and country recipients of this funding – it simply is not reaching where it is needed most. There must be a sharp increase in energy access investments in the 20 high-impact countries that account for nearly 80% of people across the world living without access to energy.

While at first glance some of the numbers may seem promising, committed finance stands at only half of the USD 52 billion that is needed annually to achieve universal electricity access. When we look at clean cooking, the picture is even more bleak. Already abysmal levels of clean cooking funding have declined, and now account for less than one percent of the projected funding needed to end the several millions of deaths caused annually from traditional biomass cooking.

With each year that countries fail to meet the annual investment levels needed, opportunities for growth and development remain out of reach for hundreds of millions of people, and the world falls further and further behind in achieving the commitments of the SDGs.

It is also critically important that financing for electricity and clean cooking access flows to the countries where it is needed most. At present, 80% of total financing goes to just four countries. Seven countries in Sub-Saharan Africa, where financing could potentially have the highest impact, have seen financing commitments cut by half. Universal energy access will not be achieved if 16 countries where 460 million people live without electricity, receive only 14% of committed finance.

It is discouraging to see large amounts of funding being committed to grid-connected projects powered by fossil fuels, and a significant rise in investments in coal. This increase is particularly disappointing in light of the recently issued Intergovernmental Panel on Climate Change (IPCC) Special Report Global Warming of 1.5°C, which calls for coal use to be cut by 2050. The benefits of clean energy are clear: it helps countries combat climate change, the price is competitive with that of coal, and it prevents additional costs down the line related to air quality and health.

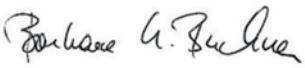
What then is to be done?

Firstly, some of the more encouraging developments in energy access should be taken as examples. Our e report's findings show that some

governments have made closing the electricity access gap a priority and have promoted clean cooking by adopting proactive policies, offering fiscal incentives, setting ambitious renewable energy targets and making available increased budgetary allocations. The report takes a deep-dive into what has worked in India, where clearly articulated government policy combined with ambitious renewable energy investment goals are resulting in increasing amounts of private finance supporting renewable energy solutions, and into what has worked in Indonesia, where government support has accelerated the adoption of LPG fuel for cooking. These two case studies serve as models to increase investment in other high-impact countries and raise confidence in private sector funding.

Secondly, we must work to improve the quality of information for policymakers and investors working to scale up energy access finance. Clear information about finance, such as that given in this report, is critical to build on the limited success that some countries have had. At the same time, data coverage and tracking of finance flows need to be further expanded to fill crucial gaps at the national level and around specific technologies and uses. Improving tracking can help countries better measure their progress, and, ultimately, optimize the deployment of public resources in a way that can effectively and efficiently unlock investment at the transformational scale needed.

We hope that, through this report, a critical message will be sent to decision-makers in donor governments, the development finance community, the private sector, and recipient countries to ensure that future financial commitments are focused on ensuring access to sustainable energy for all. Urgent action is needed now to trigger more investment in this critical sector over the next 12 years, to keep the promise of the Sustainable Development Goals—to leave no one behind.



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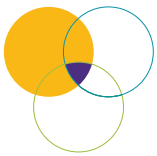


EXECUTIVE SUMMARY

Access to sustainable energy underpins many aspects of a healthy, sustainable economy. It is a child's ability to turn on lights to study at night and connect to the internet, a family's ability to cook indoors without inhaling smoke, and a business's ability to operate and grow, creating jobs and opportunities.

Recognizing this, governments worldwide have set global targets for energy access in Sustainable Development Goal 7, which aims to ensure "universal access to affordable, reliable, sustainable and modern energy for all" by 2030. Today, with twelve years to go to achieve the goals, almost one billion people still lack electricity and almost three billion people lack access to clean cooking (Tracking SDG7: The Energy Progress Report 2018).

There are proven technologies and business models that can increase access to clean, affordable and reliable energy to help achieve the goals and spur sustainable development. However, financing these projects and enterprises continues to be a persistent challenge.

Sustainable Energy for All's Energizing Finance series is the first, and only, in-depth attempt to capture multiple years of data on investment for the two key areas of energy access: electrification and clean cooking. It focuses on public and private finance commitments in 20 developing countries – known as the high-impact countries – that together are home to nearly 80% of those living without access to sustainable energy (See Map ES 1 and Map ES 2). Building upon the first 2017 report that examined financing flows during 2013-14 (averaged annually), this latest report updates these findings with energy access finance commitments from 2015-16, meaning that, for the first time, policy makers and investment leaders can begin to track progress, or lack thereof, in scaling up finance for energy access since agreement on the Sustainable Development Goals.

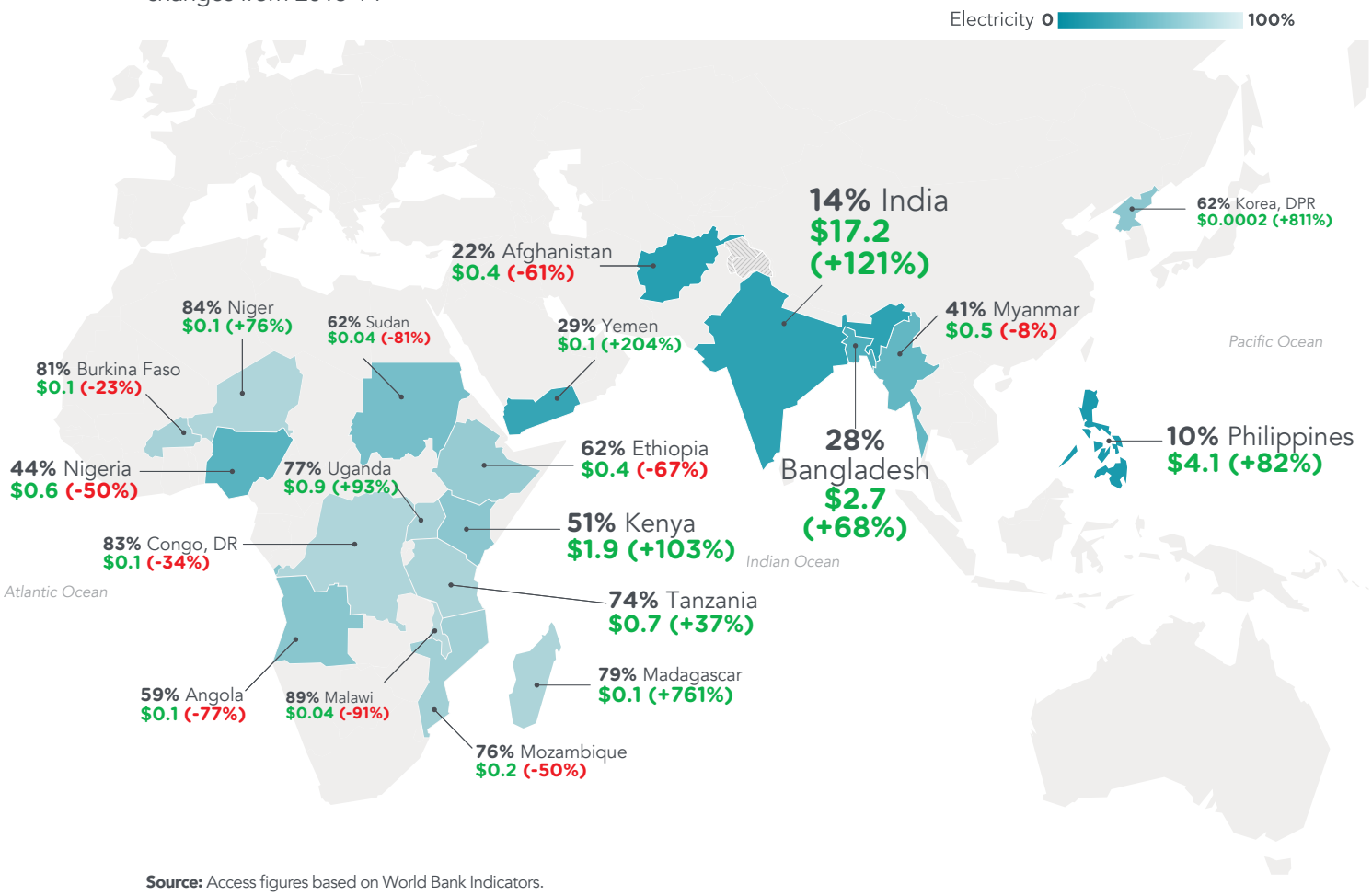
OVERALL, INVESTMENTS IN BOTH ELECTRICITY AND CLEAN COOKING CONTINUE TO FALL FAR SHORT OF WHAT IS NEEDED TO CLOSE THE ENERGY ACCESS GAP. IN SOME COUNTRIES, INVESTMENT HAS DROPPED BY 50% FROM THE PREVIOUS REPORTING PERIOD. MORE NEEDS TO BE DONE, PARTICULARLY FOR AND BY THOSE COUNTRIES WHERE INVESTMENTS HAVE INCREASED ONLY INCREMENTALLY OR NOT AT ALL, SUCH AS SOME COUNTRIES OF FOCUS IN SUB-SAHARAN AFRICA. THE GLOBAL COMMUNITY CAN, HOWEVER, LOOK TO THE FEW BRIGHT SPOTS WHERE GAINS HAVE BEEN MADE TO FURTHER SCALE UP AND TARGET FINANCE FOR ENERGY ACCESS WHERE IT IS NEEDED MOST, AND LEARN LESSONS FROM THEIR APPARENT SUCCESS.


BrightLight
SAVE TIME
CONVENIENCE
PORTABLE & DURABLE
EASY TO USE & CLEAN
HEALTH
CLEANER KITCHEN
HEALTHIER FAMILY

MAP ES 1

Finance for electricity access in the 20 high-impact countries

Percentage of population without access to electricity, total finance tracked in 2015-16 (in USD billion) and changes from 2013-14



Source: Access figures based on World Bank Indicators.

ELECTRICITY FINDINGS

WHILE THERE HAS BEEN A DRAMATIC AND ENCOURAGING INCREASE IN ELECTRICITY ACCESS INVESTMENTS OVER THE LAST FOUR YEARS OVERALL IN THE 20 HIGH-IMPACT COUNTRIES, THE ELECTRIFICATION INVESTMENT GAP REMAINS LARGE WHERE IT IS MOST NEEDED AND ITS URGENCY IS INTENSIFYING.

Globally, for the 20 high-impact countries, there was a 56% increase in overall electrification finance commitments, from USD 19.4 billion in 2013-14 to USD 30.2 billion in 2015-16 (see Figure 2.1 for an illustrative depiction of providers, instruments, geographies, recipients, uses, sectors, and access).

International finance for energy access overall remained steady between 2013-14 and 2015-16, at an average of USD 11.7 billion committed per year. While international public finance declined to USD 8.8 billion in 2015-16 from USD 10.5 billion in 2013-14, international private finance more than doubled from the 2013-14 amount to reach USD 2.9 billion in 2015-16.

Domestic private finance, largely located in India, however, increased threefold from 2013-14, and represents roughly half of all electricity access finance flows tracked. This finding corroborates the case study analysis of India (see ES Box 1).

Despite the overall increase in electricity finance, the total amount committed falls well short of the estimated USD 52 billion per year (IEA 2017) needed to provide electricity to all by 2030. At USD 30.2 billion per year, this means we are only reaching just over half of this goal, and with each passing year, falling further behind.

POLICYMAKERS AND INVESTMENT LEADERS SHOULD BE ASKING WHETHER INVESTMENT IS FLOWING TO THE APPROPRIATE TECHNOLOGIES AND CONSUMERS TO MEET UNIVERSAL CLEAN ENERGY ACCESS GOALS.

Investment **heavily favors non-residential customers** (e.g. industrial, commercial, and public sector) over residential customers. Just over a quarter of all electricity finance in the high-impact countries – roughly 28%, or USD 8.6 billion – is being used to support new or improved access for residential consumers of electricity. The major share, on the other hand – 72% of finance – is going toward expanding electricity supply to non-residential consumers, and to support wider growth in the economy.

In terms of technologies, more than half of the finance for electricity committed in 2015-16 (USD 16.2 billion, or 54%) was channeled into grid-connected renewable technologies, with finance for solar PV increasing dramatically by nearly five times. While this is good news, the global community may be concerned to note that investment in grid-connected fossil fuel plants accounted for USD 8 billion a year, or 27% of finance for electricity in 2015-16, doubling the 2013-14 levels.

Figure ES 2

Sources of finance for electricity across the 20 HICs (USD billion)

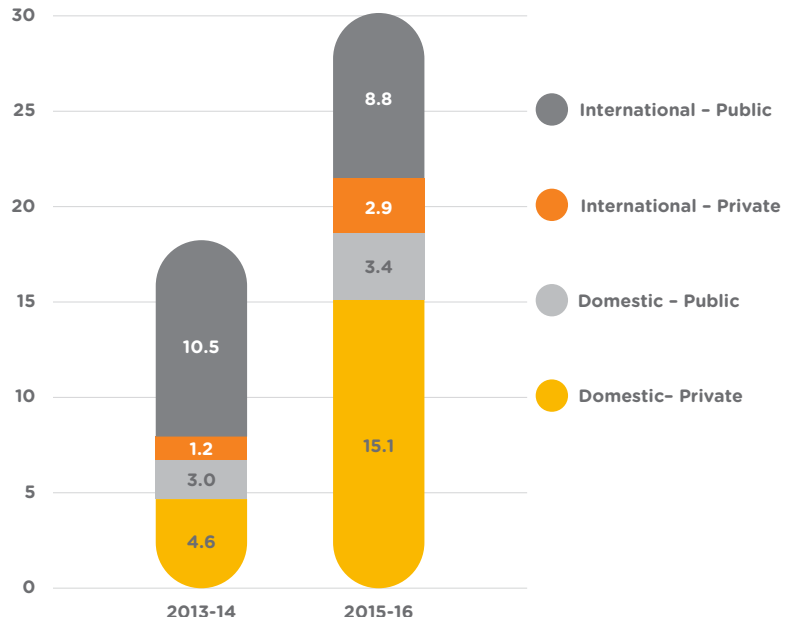
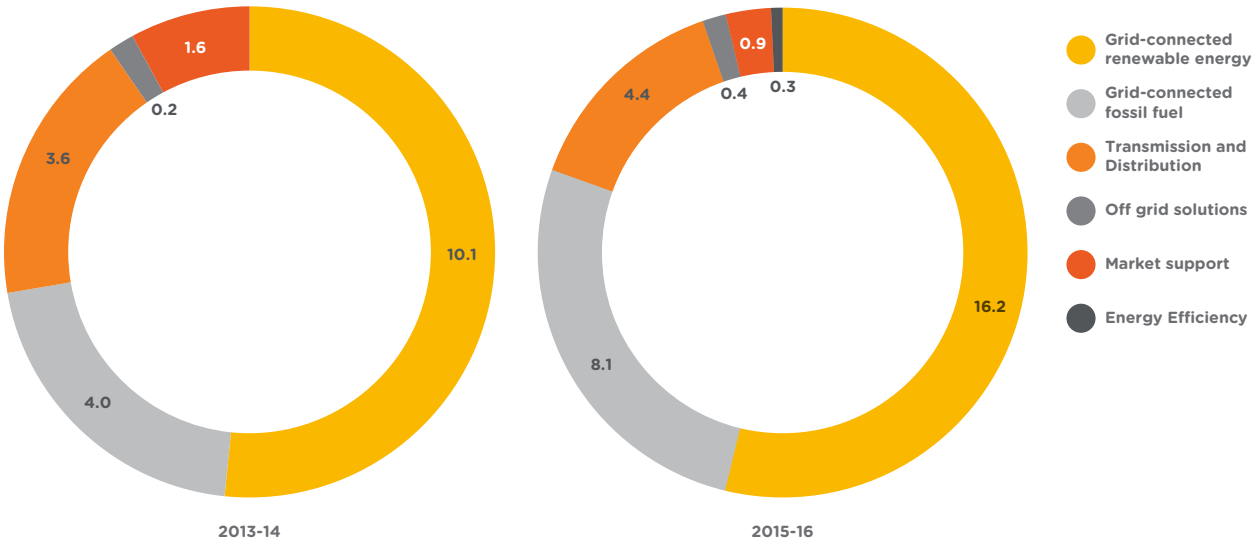


Figure ES 3

Share of finance for electricity by technology type (USD billion)



Note: Grid connect nuclear investments are excluded, as no investments were identified in 2015-16.

Coal plants, in particular, received two and a half times as much investment in high-impact countries, growing from USD 2.8 billion in 2013-14 to USD 6.8 billion in 2015-16, when 17 coal plants were financed across the 20 high-impact countries. Philippines, India and Bangladesh are the top three countries receiving financing commitments for coal with Kenya coming in fourth due to one large investment commitment (USD 1 billion) in 2015-16. While fossil fuel energy-based projects contribute to increasing electricity into grids, they do little to address access for those beyond and below the power lines, and these facilities lock in high-carbon assets for 30 years or more. The benefits they may bring in terms of energy access are countered by the negative impacts on human health and their contributions to global climate change. They also pose a "stranded asset risk" to the global financial system, due to increased environmental scrutiny and long-term climate risks.

Investments in off-grid solutions (OGS) also require a close examination; a **growing number of policy makers and experts consider OGS to be among the most cost-effective and quickest ways of providing energy access, especially in rural terrains.** It is therefore encouraging to see that finance commitments for off-grid solutions, including mini-grid technologies, nearly doubled between 2013-14 and 2015-16, growing from USD 210 million to USD 380 million per year on average. While a positive trend, these investments remain a small portion (1.3%) of the total finance tracked.

This low level of finance for OGS is substantiated by the report's findings on finance for the quality and availability of electricity access, as defined by the Multi-Tier Framework (MTF). The largest portion of finance commitments for residential electricity access (96%, or an annual average of USD 8.2 billion), supported a medium or higher tier of electricity access (Tiers 3, 4, and 5) in 2015-16 – i.e. it provided at least enough electricity to sustain medium power appliances and guaranteed a minimum of eight hours of electricity supply a day. Very little finance was allocated to Tiers 1 and 2, the lower access tiers associated with basic energy connections. It is these basic energy connections, often off-grid or decentralized solutions, that can represent an important step forward for increased quality of life and bring electricity access relatively quickly and cost-effectively to rural communities.

THERE IS A PERSISTENT GEOGRAPHICAL IMBALANCE IN THE DISTRIBUTION OF FINANCE FLOWING FOR ENERGY ACCESS, WITH SUB-SAHARAN AFRICA FALLING FURTHER AND FURTHER BEHIND.

The 2013-14 analysis showed that about 60% of the total finance flows over that period went to three countries in Asia: Bangladesh, India and Philippines. In 2015-16, Kenya joined this small group, driven by investment in a large coal plant, with the four countries receiving a collective average of USD 26 billion a year, or 86% of the annual finance commitments for electricity access.

On the other hand, each of the other 16 high-impact countries—mostly located in Sub-Saharan Africa—received less than USD one billion in annual commitments. These countries are home to more than 460 million people without any access to electricity. Seven of these countries (Afghanistan, Angola, Ethiopia, Malawi, Mozambique, Nigeria and Sudan) reported a decline of more than 50% in their electricity finance.

BOX ES 1

Case Study Analysis: India

A DEEP DIVE IN INDIA: A BRIGHT SPOT FOR ELECTRICITY ACCESS, WITH INCREASING PRIVATE FINANCE DRIVEN BY STRONG RENEWABLE ENERGY TARGETS AND PUBLIC SUPPORT

India presents an interesting case study for electricity access finance. The case study analysis on India shows a tremendous increase in private domestic investments by corporations and project developers, from USD 1.6 billion a year in 2013-14 to USD 10 billion a year in 2015-16, substantiating the findings of the report's global analysis. Of this amount, about 87% of investment in 2015-16 was allocated to grid connected solar and wind projects. In parallel, commitments to eight coal powered plants in 2015-16 were identified, of which only one commitment was made by a private sector company. However, India has stated there are no further coal-based capacity additions on top of those that are already under construction to meet its energy demand through 2022.

In April 2018, India's Ministry of Power announced that 100% of its villages, comprising 85% of its population, had gained some form of access to electricity under a national rural electrification program.

While 22 million households (roughly 130 million people) still remain without access to electricity, the marked increase in electricity access finance, especially for renewable sources and the resulting increase in energy access, is notable. To fill the remaining electricity access gap, India needs to utilize well-calibrated, multi-pronged approaches to efficiently use centralized and off-grid electricity technologies, the latter of which is particularly critical.

Largely driven by India's aggressive policy target of 175GW of renewable energy generation by 2022 and the private sector's growing certainty around renewable technologies with more predictable cash flows, India represents a bright spot in the energy access landscape that other countries can learn from.

A STRONGER UNDERSTANDING OF WHERE FINANCE IS COMING FROM AND HOW IT IS BEING CHANNELED MAY OFFER CLUES FOR THE GLOBAL COMMUNITY LOOKING TO BETTER TARGET ELECTRICITY ACCESS FINANCE IN FUTURE YEARS.

These trends confirm that Sub-Saharan Africa, with an already low share of commitments, is falling even further behind. The IEA forecasts that 95% of the additional investment in electricity required to achieve universal electrification – or approximately USD 50 billion per year – will need to be in Sub-Saharan Africa. However, only 17% (or USD 5 billion) of total electricity finance occurred in Sub-Saharan Africa in 2015-16. This is a USD one billion decrease from the previous reporting period (2013-14).

Furthermore, even the finance that is reaching Sub-Saharan Africa appears to be supporting dirtier forms of energy. The majority of finance commitments in Sub-Saharan Africa supported fossil fuels plants (USD 1.6 billion per year on average), predominantly coal-powered (90%), in Kenya, Nigeria and Tanzania. At the same time, large scale, grid-connected renewable energy saw a USD 2 billion decrease in Sub-Saharan Africa between 2013-14 and 2015-16.

Right now, a small handful of providers is responsible for the majority of electricity finance. China remains the single largest provider of bilateral finance for electricity, accounting for 23% of total international finance to high-impact countries in the 2015-16 reporting period, up 2% from 2013-14. China's investments are second only to the group of multilateral financial institutions that together provide one third of total finance for electrification. **China also committed 20% of all fossil-fuel related electricity investments, an increase of USD 1 billion compared to 2013-14.**

Based on case study analyses of India and Indonesia (see Box ES 1 and Box ES 2), there is evidence that domestic public budgets have played a key role in unlocking greater finance overall, including from the private sector and from international sources, both public and private. Efficiently using these budgets in a way that can both leverage investment from other sources, but also be phased down, will be critical to long-term sustainability.

However, this report shows evidence that the very sources of finance that are considered by experts as most efficient for unlocking greater capital – that is, concessional development finance sources – are decreasing rather than increasing at this critical stage along the path to SDG7. Concessional development finance for electrification decreased by 7% to USD 4.8 billion. The drop was concentrated in the South Asia region, which saw a 38% decrease compared to 2013-14, while concessional finance for Sub-Saharan Africa increased by 7% to USD 1.8 billion in 2015-16. Debt, at around USD 15 billion a year in 2015-16, remained the predominant mode of providing finance for electricity access – 53% of total finance, compared to 66% in 2013-14.

CLEAN COOKING FINDINGS

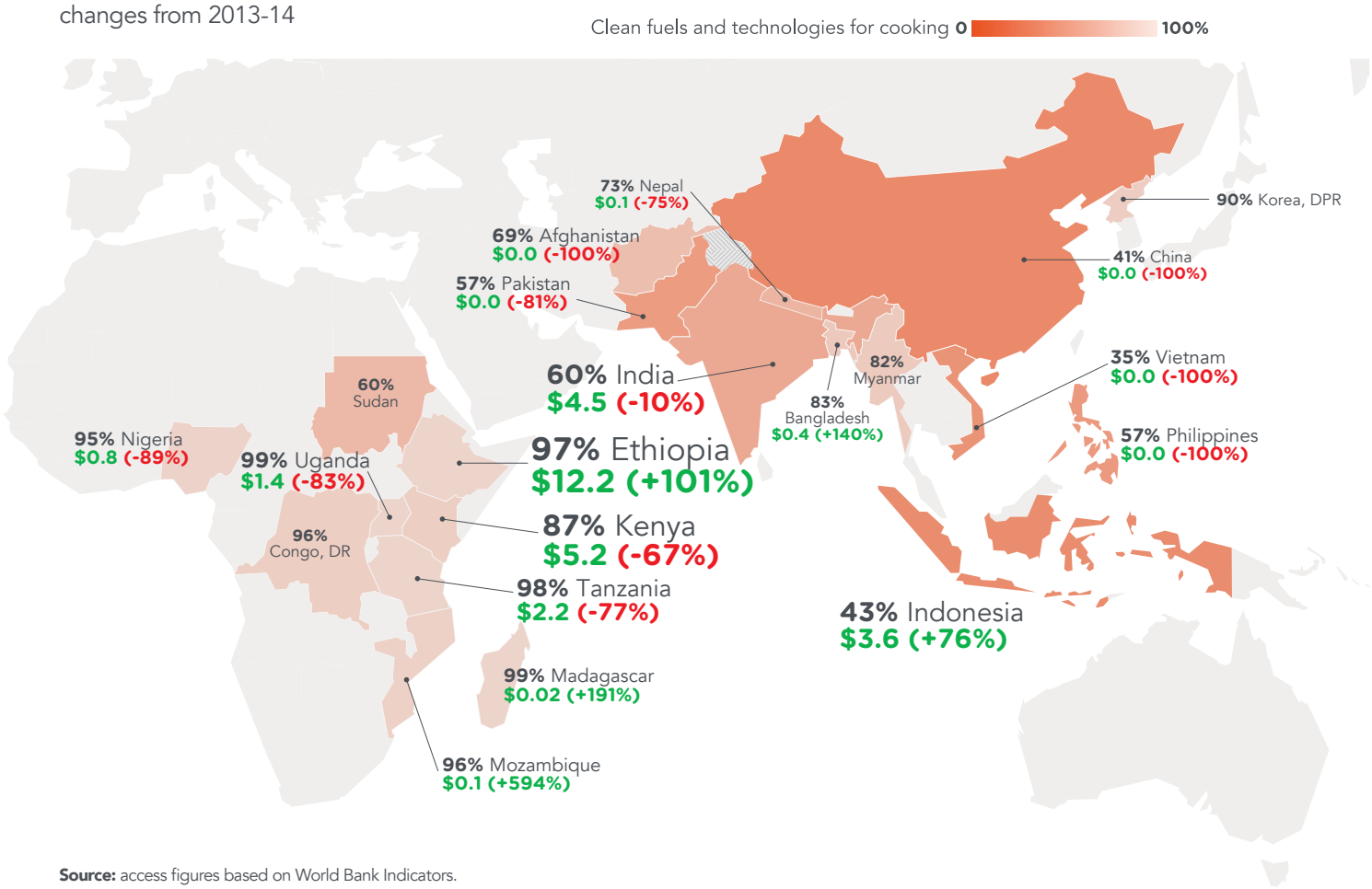
FINANCE FOR CLEAN COOKING REMAINS ABYSMALLY LOW AND HAS ACTUALLY DECREASED OVER TIME.

The report's analysis shows that finance for clean cooking dropped 5% from USD 32 million in 2013-14 to USD 30 million in 2015-16. This investment is a tiny percentage of the USD 4.4 billion annual investment needed by 2030 to address a problem faced by three billion people, highlighting the pressing need for dedicated and accelerated action. (See Figure 2.16 for an

MAP ES 2

Finance for clean cooking access in the 20 high-impact countries

Percentage of population without access to clean cooking, total finance tracked in 2015-16 (in USD million) and changes from 2013-14



Source: access figures based on World Bank Indicators.

illustrative depiction of providers, instruments, geographies, recipients, uses, sectors, and access.)

The 5% decrease is in spite of increasing global awareness of the health and climate benefits of clean cooking technologies and fuels, which may have translated to an increase in the number of total clean cooking transactions; these rose from 119 in 2013-14 to 178 in 2015-16. The majority of the related commitments financed biogas digesters (55%), followed by improved biomass cookstoves (27%).

Nearly all finance for clean cooking originated from international sources (92%), a similar portion and amount as in 2013-14 (94%). The public sector remains the largest source of financing (69% of total finance), with private finance increasing from 19% in 2013-14 to 31% in 2015-16. Nearly all public funding was committed in the form of grants, while equity investments were the predominant instrument of private actors.

Sub-Saharan African countries received most of the funding (72%, or USD 22 million) tracked in 2015-16, largely going to Ethiopia and Kenya. Several countries with low access to clean cooking solutions, such as the Democratic Republic of Congo, Madagascar and Mozambique, received very little to no funding.

In addition to accelerated action on clean cooking, there is also an important role for greater transparency and better data on finance in this sector. Overall, while methodology and data sources have improved since the first (2013-14) review of clean cooking finance, the flows tracked in the report through the

BOX ES 2

Case Study Analysis: Indonesia

A DEEP DIVE IN INDONESIA: HOW GOVERNMENT SUBSIDIES CAN ACCELERATE ACCESS TO CLEAN COOKING FUELS.

In Indonesia, government subsidies have been crucial to accelerate the adoption of LPG cooking solutions in millions of households spread across thousands of islands, replacing kerosene as the main cooking fuel, and resulting in important health and carbon benefits. As part of a countrywide cooking fuel conversion program that started in 2007 to phase out kerosene and other traditional cooking methods, the Indonesian government spent an annual average of USD 1.8 billion on subsidies to support LPG use over the 2015-16 period. The program reduced kerosene use from a 36.6% share in 2007 to 3.8% in 2016 and increased LPG use from a 10.6% share in 2007 to 72.4% in 2016.

The analysis of clean cooking financing in Indonesia shows the crucial importance of domestic public budgets, which, in some cases, may far outweigh spending by international partners or the private sector captured in this global analysis. In fact, between 2013 and 2016, just USD 9.3 million was identified as committed by international partners for clean cooking solutions in Indonesia, mainly for biogas digesters and advanced biomass stoves.

global tracking methodology still represent a likely underestimation of the global finance for clean cooking; this field is impacted by a severe lack of investment data and complex methodological issues, resulting in the underrepresentation of two key areas: domestic public subsidies for liquid fuels used for cooking, and the LPG supply chain. A different picture emerges when looking at the country level, as evidenced by the Indonesia case study.

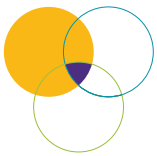
CONCLUSION

Overall, finance for sustainable energy access is still not on track to meet universal energy access needs. Indeed, with each passing year, the gap between investment needed and investment committed is getting bigger. There is increasing urgency for action on clean cooking and off-grid solutions for residential consumers, especially in Sub-Saharan Africa.

These findings should serve as a sobering reality check and be an urgent call to action to the global community as well as countries themselves to further scale up targeted action and finance for energy access in those high-impact countries where financing needs are falling behind. Urgent actions include setting ambitious national targets that give the private sector confidence to invest – particularly in underserved countries, increasing domestic investment in energy access solutions, accelerating policy reform to create markets for energy access solutions, increasing concessional finance across the board, putting more into off-grid solutions, and creating a community of practice to address data and tracking gaps.

ABBREVIATIONS

CGTMSE	Credit Guarantee Fund Trust for Micro and Small Enterprises
CRS	Creditor reporting system
DAC	Development Assistance Committee
DESCO	Distributed energy service companies
DFIs	Development finance institutions
DISCOM	Distribution company (India)
ESCO	Electricity service companies
ESMAP	Energy Sector Management Assistance Program
GACC	Global Alliance for Clean Cookstoves
GOGLA	Global association for the off-grid solar energy industry
GTF	Global tracking framework
GW	Gigawatts
HICs	High-impact countries
IDBP	Indonesian Domestic Biogas Programme
IEA	International Energy Agency
kWh	Kilowatt-hours
LCOE	Levelized cost of electricity
LNG	Liquefied natural gas
LPG	Liquefied petroleum gas
MFIs	Multilateral financial institutions
MNRE	Ministry of New and Renewable Energy
MTF	Multi-Tier Framework
MW	Megawatts
OECD	Organisation for Economic Co-operation and Development
OGS	Off-grid solutions
OPIC	Overseas Private Investment Corporation
PAYG	Pay-as-You-Go
RBF	Results-based financing
SHS	Solar home systems
SMEs	Small and medium enterprises
Solar PV	Solar photovoltaic
T&D	Transmission and distribution
USD	United States dollars
USICEF	US-India Clean Energy Finance Facility
WLPGA	World Liquefied Petroleum Gas Association
Wp/kWp	Watt-peak/kilowatt-peak



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, alcohol stoves and fuel infrastructure, biogas digesters, electric stoves, improved biomass stoves, LPG stoves and fuel infrastructure, natural gas stoves and fuel infrastructure, and solar cookers. These are referred to as "clean cooking solutions" or "clean fuels and technologies for cooking" throughout the report.

Export Import (EXIM) Banks or Export Credit Agencies: public agencies and entities that provide government-backed loans, guarantees, and insurance to corporations from their home country that seek to do business overseas in developing countries and emerging markets.

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

Commitments: a firm pledge to provide funds to a specific investment project with the expectation that the project will go ahead.

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 is primarily based in the country where the project is being developed or constructed. Includes both public and private institutions.

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 2014, but the project can only commence construction in 2015, funds transferred to the projects' builders and consultants in 2015 are classed as disbursements.

Energy access: the ability of the end user 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, transportation of clean cooking fuels or cooking itself.

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.

Financial value: the value of something in U.S. dollars at the time of measurement.

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 2015 Global Tracking Framework (IEA and the World Bank, 2015). For electricity access, the countries are: Afghanistan, Angola, Bangladesh, Burkina Faso, Congo (DR), Ethiopia, India, Kenya, Korea (DPR), Madagascar, Malawi, Mozambique, Myanmar, Niger, Nigeria, Philippines, Sudan, Tanzania, Uganda, and Yemen. For clean cooking access, the countries are: Afghanistan, Bangladesh, China, Congo (DR), Ethiopia, India, Indonesia, Kenya, Korea (DPR), Madagascar, Mozambique, Myanmar, Nepal, Nigeria, Pakistan, Philippines, Sudan, Tanzania, Uganda, and Vietnam. More details about the high-impact countries can be found in Annex 1.

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. Includes both public and private institutions.

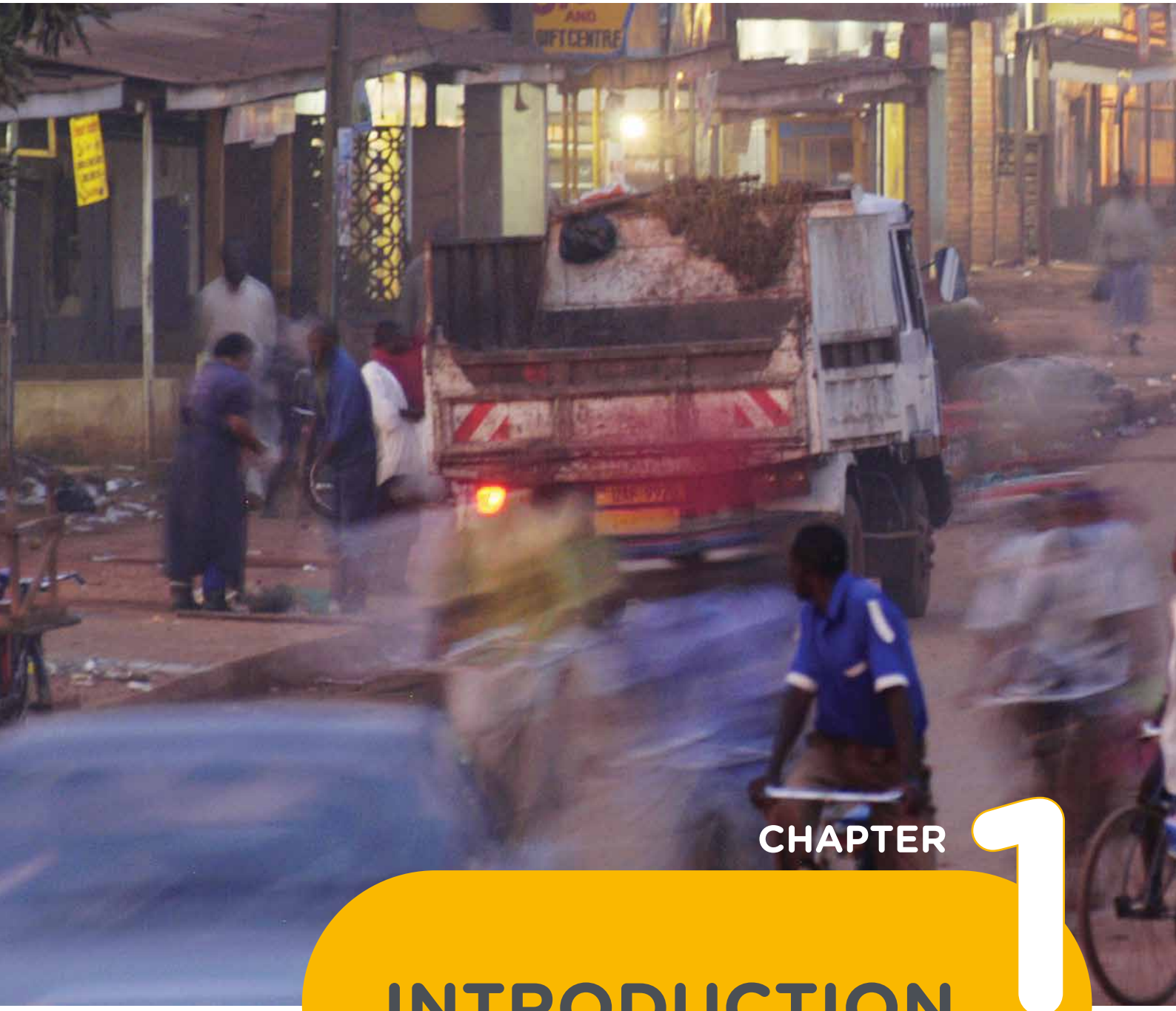
Multi-Tier Framework (MTF): measures the level of energy access provided by energy finance to residential consumers. Rather than using binary measures of energy access (having or not having a household electrical connection) that do not consider the quality, regularity, or affordability of service, the 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 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 Annex 1.

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

Off-grid 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 (2018), 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.



CHAPTER 1

INTRODUCTION

1.1 CHALLENGES TO SUSTAINABLE ENERGY ACCESS

Globally, almost one billion people live without access to electricity, and three billion lack access to clean fuels and technologies for cooking (Tracking SDG7: The Energy Progress Report 2018). Universal access to affordable, reliable, sustainable, and modern energy by 2030 is key to fulfilling the other 2030 Sustainable Development Goals (SDGs) – including those for health, education, food security, gender equality, poverty reduction, employment, and climate change. This report looks at financial commitments in the 20 high-impact countries with the largest electricity and clean cooking access deficits, collectively representing approximately 80% of the global access shortfall (see Table 1)[1].

[1] Latin American and Caribbean countries do not appear among the list of 20 countries with the largest electricity and clean cooking access deficits. However, this does not mean that energy access in the region is universal. In 2016, more than 16 million people still required electricity connections and more than 80 million people lacked access to clean cooking solutions and fuels.

Table 1

Energy access in the high-impact countries

	Electricity	Clean Cooking
Total population without access (million)	**946**	**3,027**
Population without access in the high-impact countries (million)	**723**	**2,462**
Population without access in the high-impact countries as a share of total population without access (%)	**76%**	**81%**

Note: Population and access levels are expressed as averages over 2015-16 using data based on World Bank indicators.

According to the International Energy Agency (IEA), achieving universal electrification requires an additional USD 52 billion per year of investment between 2018 and 2030. To achieve universal clean cooking by 2030, the additional investment required is USD 4.4 billion annually, less than one-tenth of what is needed for universal electricity access (IEA, 2017).

This research indicates that, although investments have increased since 2013-14, they are not keeping pace with the needs. Predicted population growth and industrialization in developing countries will further intensify energy demand, increasing the investment gap and jeopardizing the possibility to meet Sustainable Development Goal 7 (SDG7) in particular, and as a result, risk attainment of the overall SDG goals.

1.2 SUMMARY OF METHODOLOGY

In this report, finance for energy access is approached by capturing data on financial commitments for 20 high-impact countries from several publicly and privately accessible international databases. Results are reported on an aggregate level for the 20 high-impact countries, and are especially influenced by flows to larger countries, such as India and Bangladesh.

This exercise allows for a broad picture of the global situation and is particularly effective at capturing international public finance for large-scale projects. The main disadvantage of this method is a more limited coverage of domestic finance, which is a significant share of overall financing flows to the sector.[2] While data on domestic private finance is available in some cases (generally large-scale electricity generation and transmission projects), it is limited in the cases of government-level spending and energy budgets. Accessing this level of data requires conducting complex surveys in each country. To address these methodology limitations and present a more comprehensive overview of finance for energy access, additional data on domestic finance and government expenditures are provided in the India and Indonesia case studies in Chapters 3 and 4.

It is also important to note that financial *commitments* do not automatically translate to electricity generation or cooking assets. Because of lags in disbursements, changing currency values, and changing project costs, commitments are unlikely to equate directly to realized asset values (Missing the Mark, SEforALL and AfDB, 2017). This means that a financial commitment of USD 1 billion is highly unlikely to correspond to USD 1 billion in energy infrastructure on the ground.

At a more detailed level, we take the following approach for specific allocations:

1. Annual allocations: A variety of data sources is used to identify finance committed in the 20 high-impact countries in both 2015 and 2016 rel-

[2] It could amount to 20-40% of the total, based on complementary, case study analysis for specific countries.

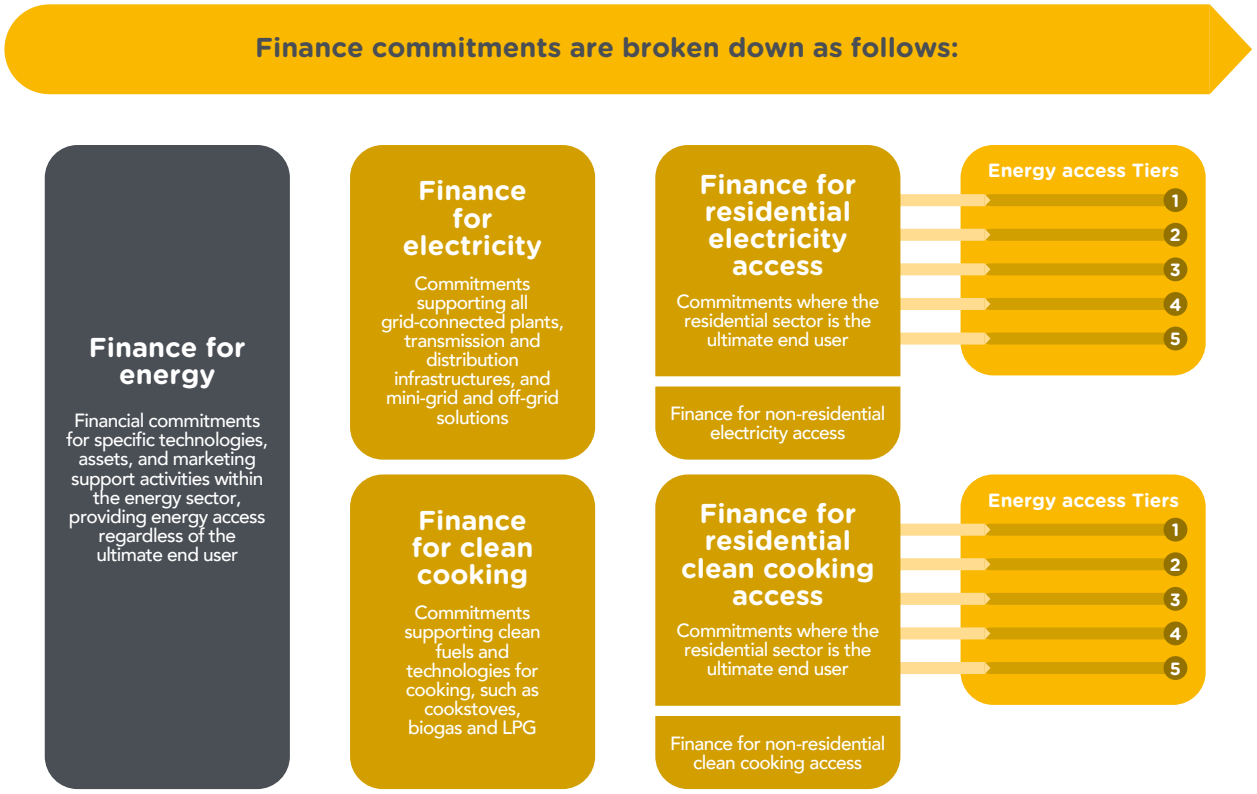
evant to clean cooking and electricity access. As the time period evaluated covers two years, average annual figures are presented throughout the report. If, for example, USD 100 million of financial commitments were identified over 2015-16, this is presented as an average of USD 50 million per year. The annual average figure enables meaningful comparisons of estimates throughout the report and with investment estimates from other sources. Using average figures also evens out the effects of large, one-off transactions.

2. **Residential allocations:** A large power plant financed by a tracked commitment is likely to produce electricity consumed by both residential and non-residential consumers (such as businesses, grid exports, and government institutions). Therefore, having identified total finance commitments relevant to clean cooking and electricity access in the high-impact countries, a share of those commitments is allocated to residential consumption using assumptions about the relative shares of power consumption in the country in question, detailed in Annex 1.

3. **Tier allocations:** The previous steps yield the total finance commitments relevant for residential electricity and clean cooking access. As the final step, the residential element of the finance commitment is allocated to the correct energy access Tier, using the World Bank's MTF. The MTF—set out in more detail in Section 1.3 and summarized in Figures 1.2 and 1.3,—attempts to quantify the level of electricity or clean cooking service provided.

Figure 1.1

Methodology summary



Note: Diagram is not to scale

Figure 1.2

The Multi-Tier Framework for measuring access to household electricity supply

ATTRIBUTES		TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
Capacity	Power capacity ratings (in 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[a]	Daily Availability	Less than 4 hours	At least 4 hours		At least 8 hours	At least 16 hours	At least 23 hours
	Evening Availability	Less than 1 hour	At least 1 hours	At least 2 hours	At least 3 hours	At least 4 hours	
Reliability		More tahn 14 disruptions per week			At most 14 disruptions per week or at most 3 disruption per week with total duration of more than 2 hours	(>3 to 14 disruptions / week) or 3 disruptions / week with > 2 hours of outage	At most 3 disruptions per week with a total duration of less than 2 hours
Quality		Householding experiences voltage problems that demage appliances				Voltage problems do not affect the use of desired appliances	
Affordability		Cost of a standard consumption package of 365 kWh per year is more than 5% of household income			Cost of a standard consumption package of 365 kWh per year is less than 5% of household income		
Formality		No bill payments made for the use of electricity				Bill is paid to the utility, pre-paid card seller, or authorized representative	
Health & Safety		Serious or fatal accidents due to electricity connection				Absence of past accidents	

[a] Previously referred to as "Duration" in the 2015 Beyound Connections report, this MTF attribute is now referred to as "Availability", examining access to electricity through levels of "Duration" (day and evening). Aggregate tier is based on lowest tier value across all attributes
**Color signifies tier categorization.*

Source: World Bank, ESMAP, SREP, SEforALL, 2018 updating Bhatia and Angelou, 2015

Figure 1.3

The Multi-Tier Framework for measuring access to cooking solutions

ATTRIBUTES		TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
Cooking Exposure[a]	Emission: Fuel	Firewood, dung, twigs, leaves, rice husks, processed biomass pellets or briquettes, charcoal, kerosene				Biogas, ethanol, high quality processed biomass pellets or briquettes	At least 2 kW
	Emission: Stove Design	Three-stone fire, tripod, flat mud ring, traditional charcoal stove	Conventional or old generation ICS	ICS + chimney, rocket stove or ICS + insulation	Rocket stove with high insulation or with chimney, advanced insulation charcoal stoves	Rocket stove with chimney (well sealed), Rocket Stove gasifier, Advanced secondary air charcoal stove, forced air	Electricity, solar LPG
	Ventilation: Volume of Kitchen[b]	Less than 5 m^2	More than 5 m^2	More than 10 m^2	More than 20 m^2	More than 40 m2	Open air
	Ventilation: Structure	Not opening except for the door	1 window	More than 1 window	Significant openings (large openings below or above height of the door)	Veranda or a hood is used to extract the smoke	Open air
	Ventilation: Level	Bad			Average	Good	
	Contact Time[c]	More than 7.5 hours	Less than 7.5 hours	Less than 6 hours	Less than 4.5 hours	Less than 3 hours	Less than 1.5 hours
		Bad			Average	Good	
Cookstove Efficiency	ISO's Voluntary Performance Targets (TBC)	Less than 50%	More than 10%	More than 20%	More than 30%	More than 40%	More than 50%
Convenience	Fuel acquisition (through collection or purchase) and preparation time (hours per week)	More than 7 hours		Less than 7 hours	Less than 3 hours	Less than 1.5 hours	Less than 0.5 hours
	Stove preparation time (minutes per meal)	More than 15 minutes		Less than 15 minutes	Less than 10 minutes	Less than 5 minutes	Less than 2 minutes
Safety of Primary Cookstove		Serious accidents over the past 12 months				No serious accidents over the past year	
Affordability[d]		Levelized cost of cooking sollution (fuel) more than 5% of household income				Levelized cost of cooking sollution (fuel) less than 5% of household income	
Fuel Availability		*Primary fuel available less than 80% of the year*				Primary fuel is readily available 80% of the year	Primary fuel is readily available throughout the year

[a] Determined by combination of fuel and stove design, ventilation of cooking space, and contact time. [b] Not used in the analysis of Cooking Exposure in Cambodia. [c] Not used to calculate an individual stove's tier for Cooking Exposure but used to weight each stove's tier for Cooking Exposure in the calculation of a household's tier for Cooking Exposure. [d] In this report, cookstove cost was not considered when calculating the Affordability tier due to data limitations which hindered making this calculation.

Source: World Bank, ESMAP, SREP, SEforALL, 2018 updating Bhatia and Angelou, 2015

1.3 MEASURING THE LEVEL OF ENERGY ACCESS THROUGH THE MULTI-TIER FRAMEWORK

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 importance of different energy access service levels,[3] 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 for a rating of energy access from Tier 0 (no access) to Tier 5 (very high level of access) (Bhatia and Angelou, 2015).

Country and technology assumptions are used to allocate financial commitments to the different Tiers of the MTF in this report. For example, grid-connected electricity capacity typically delivers electricity access between Tiers 3 and 5, depending on the grid reliability of the country in question. Therefore, this report assesses grid reliability based on the frequency of outages, and assigns a given finance flow to a Tier on this basis. Separate assumptions exist for mini-grids, solar home systems, fuels and technologies for cooking, and other variables. The following assumptions are made:

- That grid-connected electricity assets generate electricity access between Tiers 3 and 5, depending on grid reliability. Similar considerations are applied to transmission and distribution infrastructure. Data tracking systems do not currently allow a distinction between financing completely new connections (from no access to Tier 1, for example) and improving or maintaining existing connections (upgrading Tier 3 access to Tier 4, for example).
- That mini-grids generate electricity services between Tiers 3 and 4, depending on the hours of energy availability per day.
- That biogas digesters for clean cooking generate Tier 3 clean cooking access based on efficiency, safety, and affordability criteria.
- That investments in LPG stoves and fuel infrastructure generate Tier 3 access, based on similar metrics as for biogas digesters.
- That market support shall not be allocated to a Tier due to a lack of information. For example, funding to support renewable energy policy development could ultimately indirectly result in various Tiers of access. As a result, market support is classified as finance for electricity access, but this support is not allocated to a specific Tier.
- This year, real-world information on the existing state of energy access Tiers through MTF surveys was obtained from the World Bank for electricity in five countries (Bangladesh, Cambodia, Ethiopia, Myanmar and Rwanda). However, allocation of finance to the different access Tiers in those countries should only be seen as indicative, as broad assumptions were often required in the analysis. The intention is not to precisely allocate financial commitments to the Tiers, but to provide an indication of the energy access Tier that a given investment is likely to generate.

For the full methodology and data sources, please refer to Annex 1.

1.4 IMPROVEMENTS FROM THE 2017 EDITION

The current report improves upon the first edition in the following ways:

- **Expanded data coverage:** more thorough data gathering was carried out in the sectors that the previous report identified as having poor financial data coverage, like off-grid electricity production

[3] Factors which 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.

and clean cooking solutions. To address this issue, a larger range of data sources and alternative ways of capturing data were reviewed, including dedicated surveys of relevant actors (particularly philanthropic organizations and impact investors). Valuable partners, including GOGLA and the Global Alliance for Clean Cookstoves (GACC), have also contributed their updated and expanded datasets to the project.

- **Strengthened link with the World Bank's MTF:** this year, the MTF survey results for electricity in five countries (Bangladesh, Cambodia, Ethiopia, Myanmar and Rwanda) were obtained. This ensures improved, but not perfect, accuracy in quantifying the impact of different financing types across service levels (energy access Tiers), and across the various consumer sectors (residential, commercial, industrial).[4] However, more work is needed to integrate the MTF into the finance tracking methodology.

- **Country deep dives:** additional research and data gathering was undertaken for India and Indonesia (Chapters 3 and 4), to provide key insights of barriers and solutions to scale up domestic finance for energy access in these countries. This aims to put the global finance tracked in Chapter 2 in a more tangible perspective, providing tailored recommendations for policymakers.

- **Tracking best practices:** to advance awareness of tracking and reporting finance for energy access, structured interviews were carried out with international financial institutions to better understand their monitoring, reporting, and evaluation best practices, as well as the metrics used to assess impact and effectiveness of their energy access activities. This piece will be published as a separate annex.

1.5 STRUCTURE OF THE REPORT

This report provides an overview of finance committed for access to electricity and clean cooking solutions in the 20 countries, known as high-impact countries, with the largest populations in the world without access to electricity and clean cooking solutions.[5]

Chapter 2 looks at energy finance commitments from international and domestic public and private finance providers between 2015-16, across the 20 high-impact countries. Section 1 looks at finance for electricity, and Section 2 looks at finance for clean cooking.

Data from several public and private sources were used to analyze almost 3,600 financial commitment transactions over 2015-16, focusing on international commitments and capturing all available information on domestic commitments.[6] The chapter also includes estimates of the portion of finance flowing to residential energy access, as well as the Tier of access generated. By examining commitments, it is possible to identify:

- The main sources and actors involved in financing increased energy access, the instruments they use, and the technologies and geographies they invest in.

- How different technologies are increasing and extending energy access.

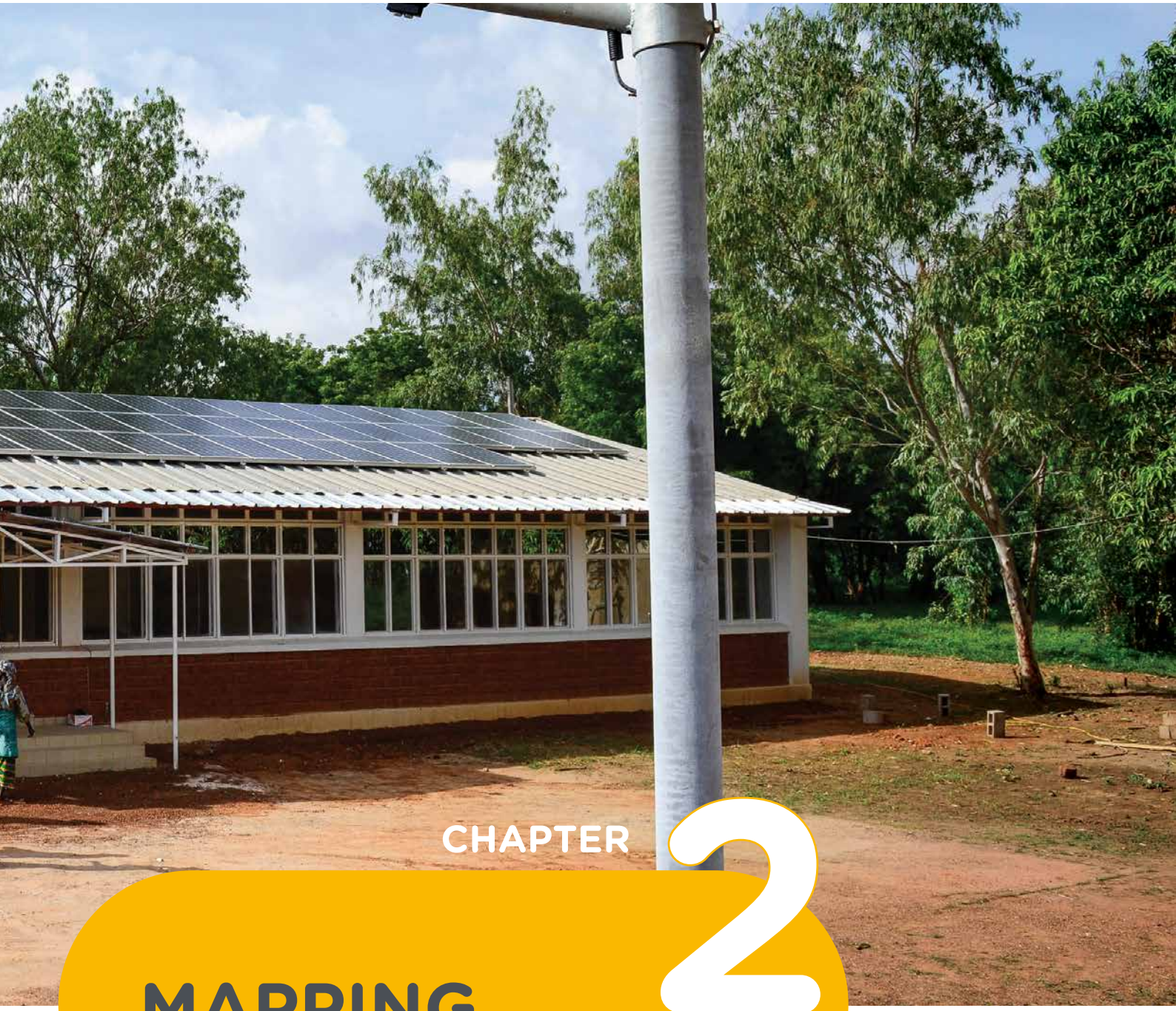
- Finance gaps in certain sectors, technologies, instruments, and geographies.

Chapters 3 and **4** provide insights for electrification in India and clean cooking in Indonesia, respectively.

[4] For electricity only. More details in the methodology annex.

[5] To enhance comparability across years, countries analyzed in the report are the same as in the 2017 edition. These were identified in the 2015 edition of the Global Tracking Framework, (GTF) (IEA and the World Bank, 2015), which was the latest available when the 2017 report was commissioned. The GTF reports (now called Tracking for SDG 7) track the global energy access status and annually update the list of high-impact countries, therefore resulting in a minor misalignment with the HICs analyzed in this report. See Annex 1 for details.

[6] Precisely 3,406 finance commitments for electricity and 178 for clean cooking.



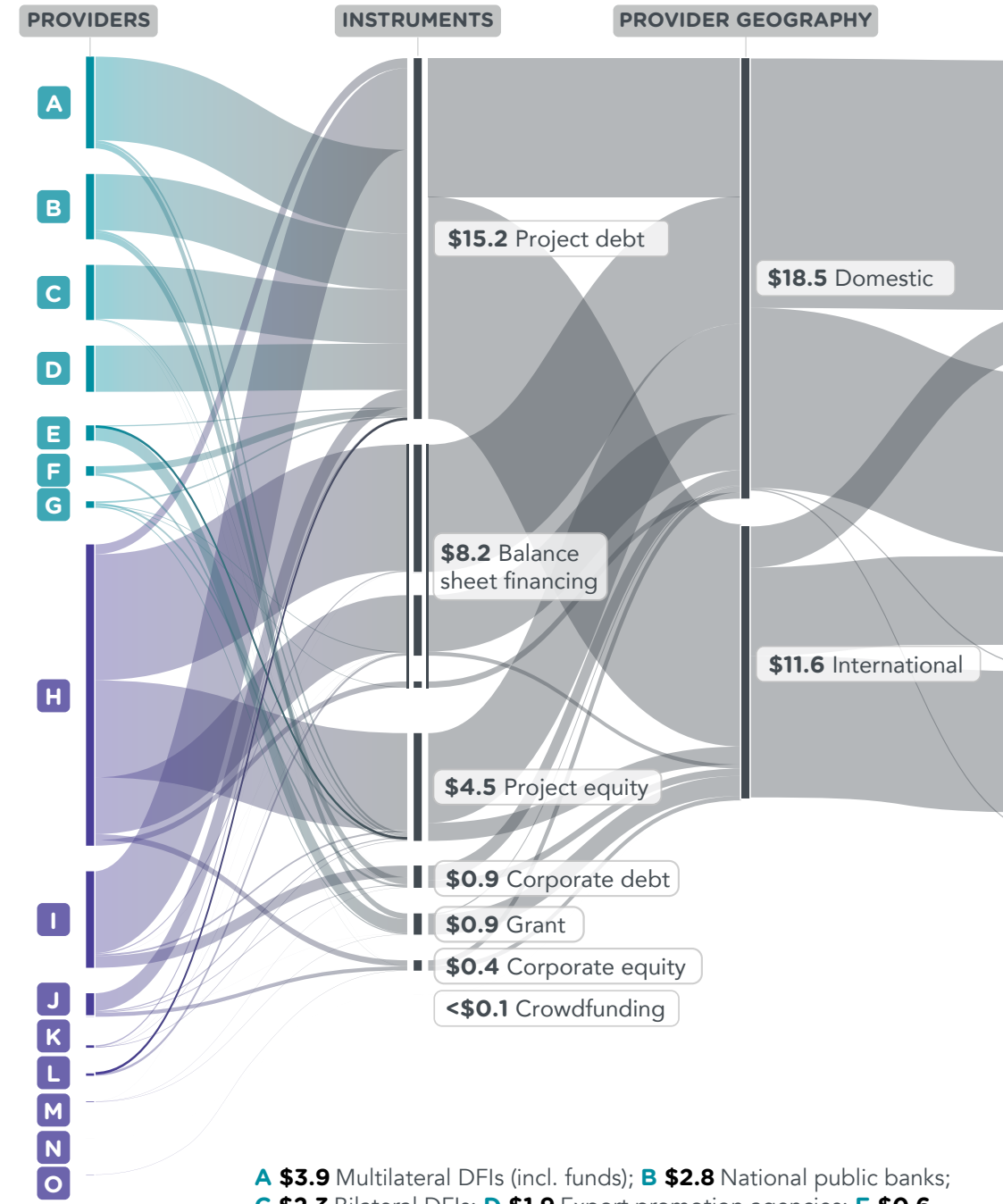
CHAPTER 2

MAPPING FINANCE FOR ENERGY ACCESS

Figure 2.1

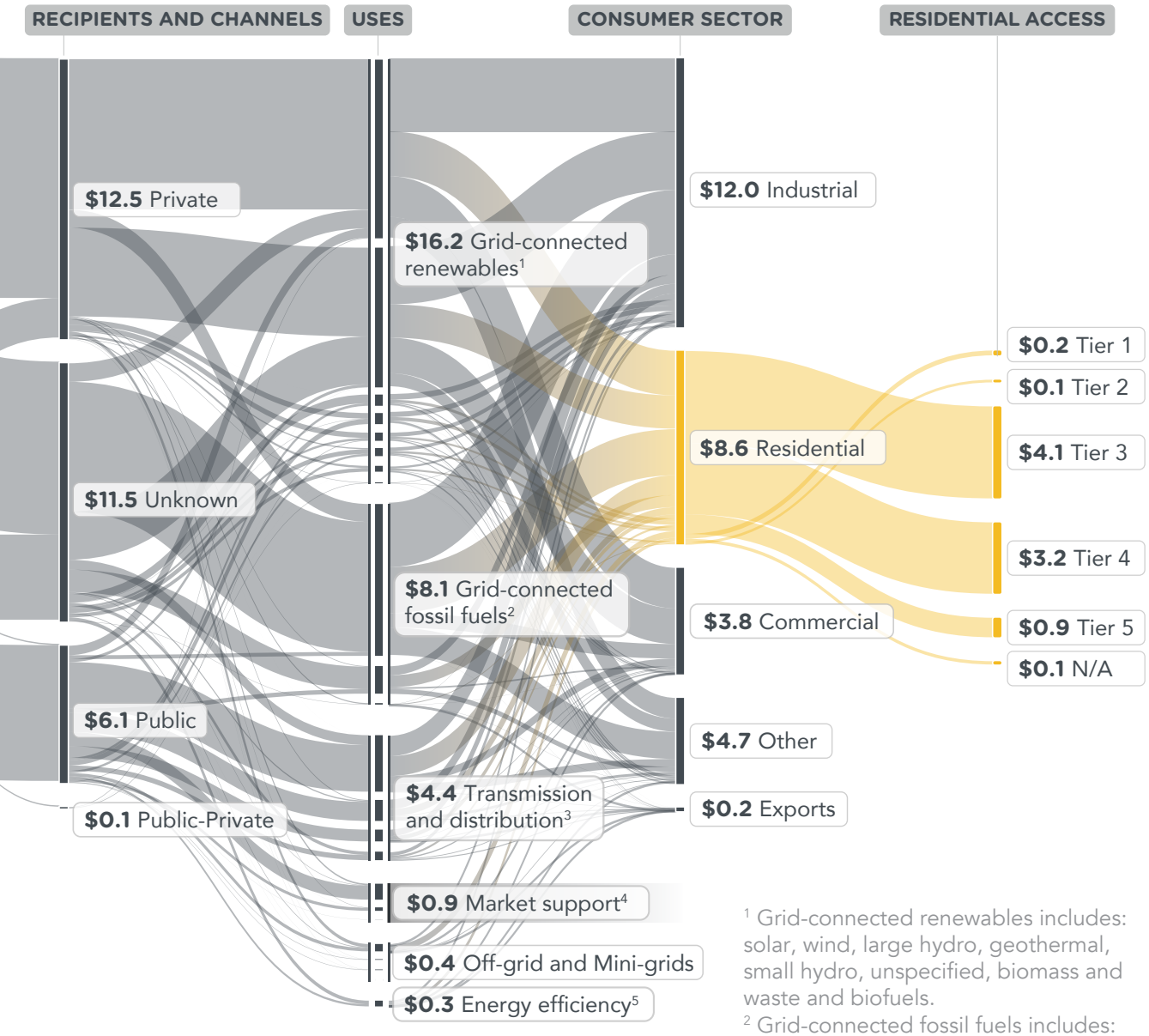
Finance for electricity in 2015-16

Average Annual Finance for Electricity Access Committed in 2015 and 2016 in High-Impact Countries ($, Billion).



A **$3.9** Multilateral DFIs (incl. funds); **B** **$2.8** National public banks; **C** **$2.3** Bilateral DFIs; **D** **$1.9** Export promotion agencies; **E** **$0.6** International governments; **F** **$0.4** National DFIs; **G** **$0.3** Domestic governments; **H** **$12.7** Corporates and project developers; **I** **$4.1** Commercial banks; **J** **$1.0** Commercial finance (Imp. In./VC/II); **K** **$0.1** Institutional inverstors; **L** **$0.1** Households (savings); **M** **<$0.1** Philanthropic foundations; **N** **<$0.1** Crowdfunding; **O** **<$0.1** Unknown

$30.2BN
Total committed per year



NB: Values may not add up due to rounding

[1] Grid-connected renewables includes: solar, wind, large hydro, geothermal, small hydro, unspecified, biomass and waste and biofuels.
[2] Grid-connected fossil fuels includes: coal, gas and oil
[3] Transmission and distribution includes: Transmission, Distribution, Unspecified T&D
[4] Market support flows were not assigned to any specific consumer sector
[5] Energy efficiency flows for residential consumptions were not assigned to any specific tier

2.1 FINANCE FOR ELECTRICITY

WHILE FINANCE FOR ELECTRICITY IN THE 20 HIGH-IMPACT COUNTRIES HAS INCREASED FROM 2013-14, SUBSTANTIALLY MORE IS NEEDED TO PROVIDE UNIVERSAL ELECTRICITY ACCESS BY 2030.

Finance for electricity in the 20 high-impact countries averaged USD 30.2 billion per year over 2015-16, a USD 10.8 billion increase from the annual investment in 2013-14. However, this figure remains lower than the required annual investment of USD 52 billion needed to provide universal electricity access by 2030, of which 95% needs to be realized in Sub-Saharan Africa (IEA, 2017). See Figure 2.1 for an illustrative depiction of providers, instruments, geographies, recipients, uses, sectors, and access.

2.1.1 Providers

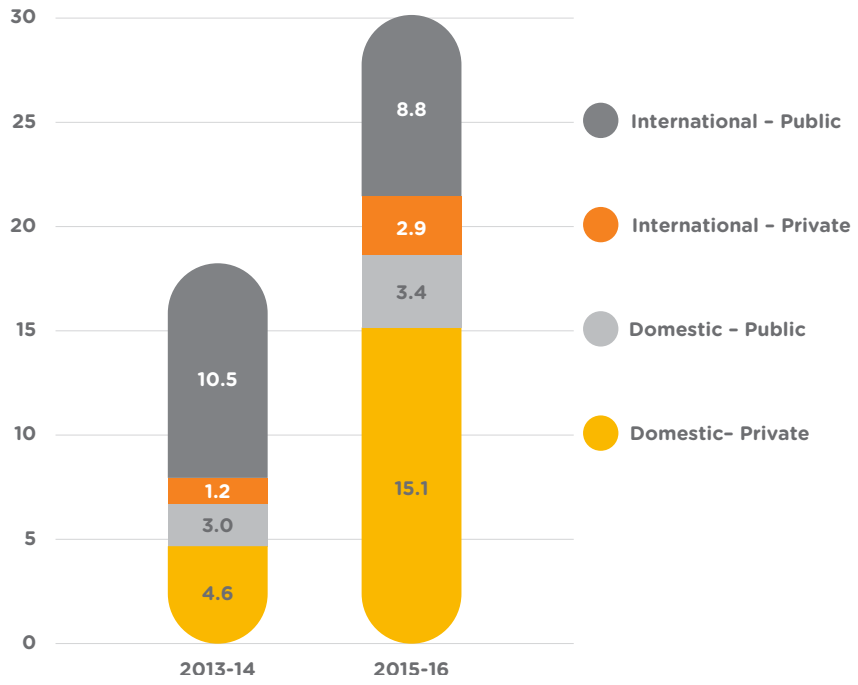
About 61% of electricity finance in 2015-16 was from domestic sources, mainly the private sector, a 22% increase from 2013-14. Overall, international finance remained the same between 2013-14 and 2015-16 at USD 11.7 billion, with the increase in electricity finance attributed solely to domestic finance.[7] This increased the share of domestic finance to an average of 60% for 2015-16, compared to 40% in 2013-14 (Figure 2.2).

However, public international finance declined from USD 10.5 billion in 2013-14 to USD 8.8 billion in 2015-16, while private international finance more than doubled from the 2013-14 amount to reach USD 2.9 billion in 2015-16. Roughly 57% of this amount, USD 1.7 billion is attributable to international financing of coal plants in Kenya and the Philippines.[8]

[7] Domestic finance refers to finance flows committed from institutions that are primarily based in the country where the project is being developed or constructed.
[8] International finance for coal power generation plants increased from USD 220 million in 2013-14 to USD 1.8 billion in 2015-16.

Figure 2.2

Sources of finance for electricity across the 20 HICs (USD billion)



It is important to note that the report's coverage of domestic finance, especially government budgets, is limited, and these reported figures are likely to be higher. In fact, for this report only domestic finance data in 10 out of the total 20 high-impact countries is tracked. Generally, these represent investments made by local utilities or co-financing from local banks for the creation of large scale, grid-connected projects.

The increase in domestic financing was led by private sector organizations, mainly project developers and corporations, which have increased their financing by almost five times from 2013-14, to reach USD 11.8 billion. Consequently, **the share of private funding in the overall electricity finance commitments almost doubled, from an average of 36% in 2013-14 to 60% in 2015-16** (Figure 2.3). Given that private sector transactions are covered from comprehensive data sources such as Bloomberg New Energy Finance and IJ Global amongst others, this increase is primarily attributed to new capacity additions rather than from improvements in data collection.

Within the public sector, international financing from various institutions in absolute terms remained broadly the same over 2013-14 and 2015-16, changing only in the overall percentage of electricity finance, given the increased private financing (Figure 2.4). **Multilateral development finance institutions (DFIs) remained the largest provider of public finance, with 13% in 2015-16** (21% in 2013-14). These are followed by bilateral DFIs and export promotion agencies/EXIM banks with 8% and 6%, respectively.

Figure 2.3

Public and private sector share in providing finance for electricity across the 20 HICs (in USD billion and total %)

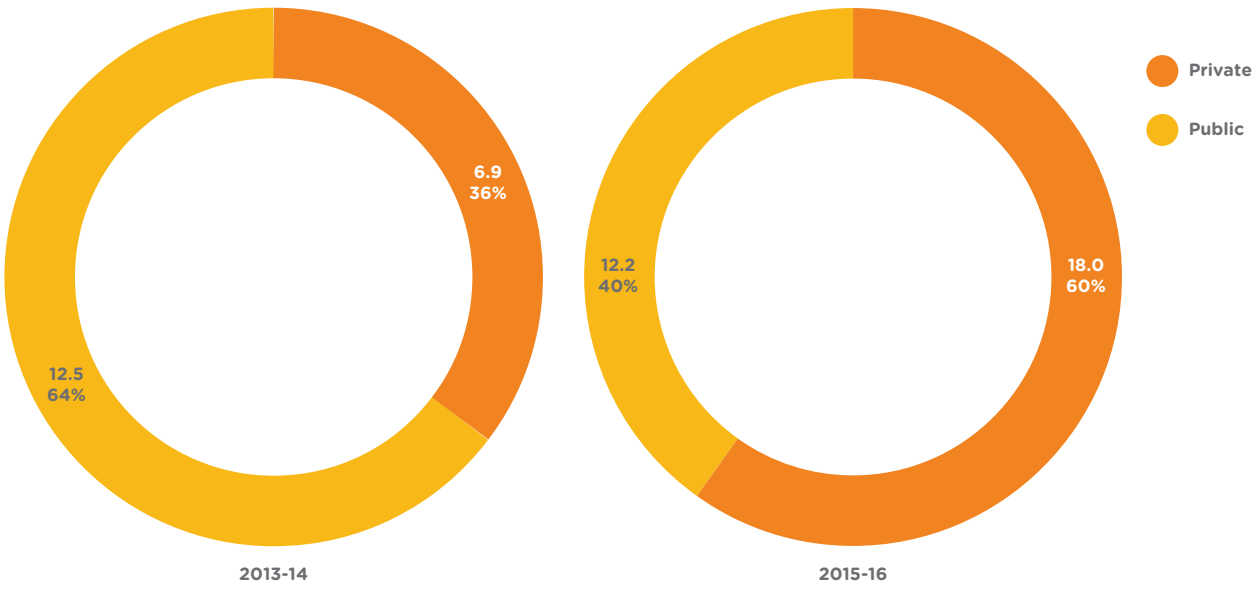
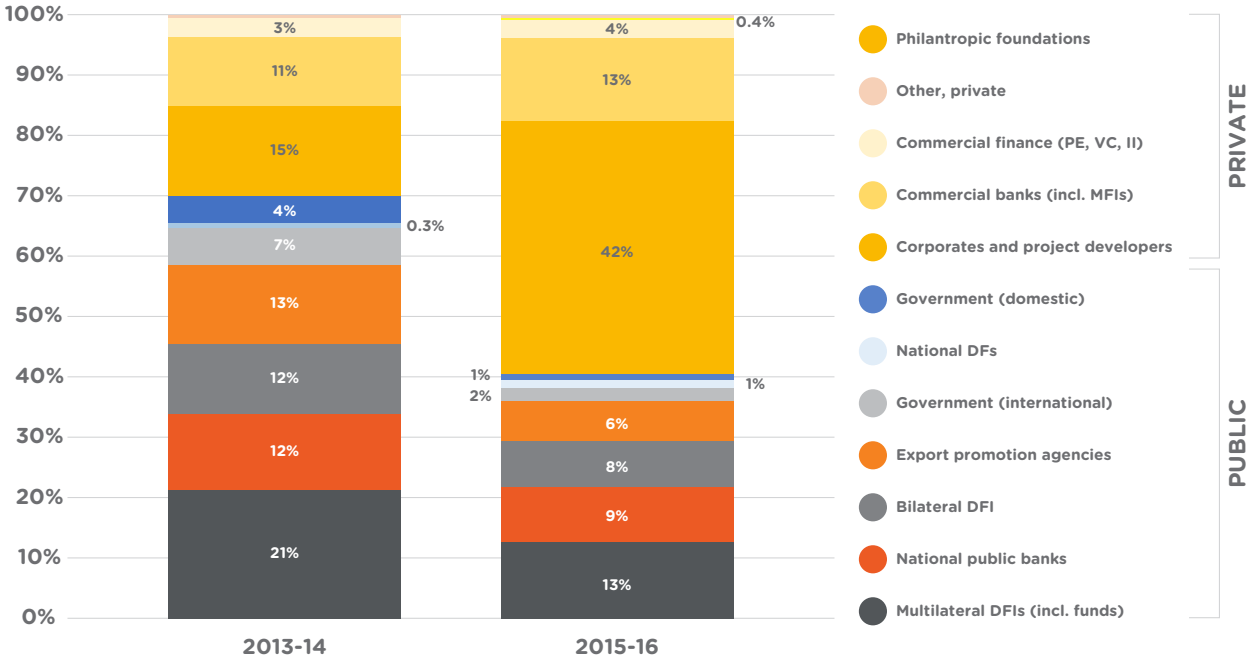


Figure 2.4

Public and private institutions providing finance for electricity across the 20 HICs (%)



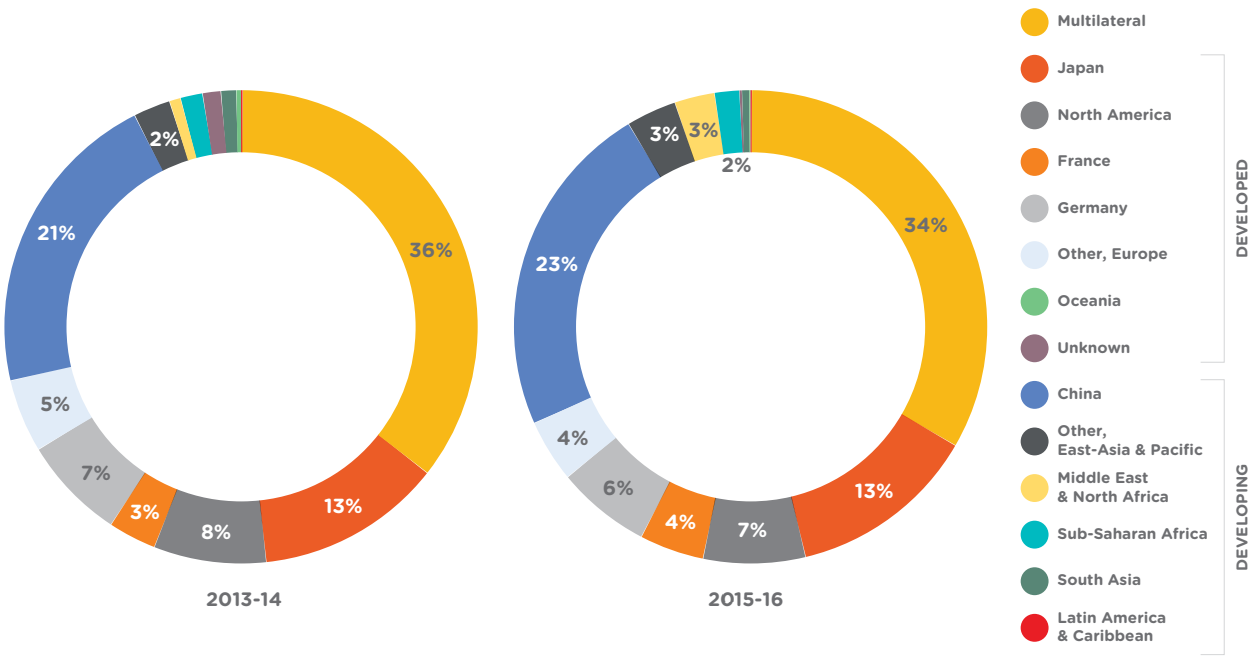
Corporate entities and project developers increased their financing by 4.4 times, to USD 12.7 billion in 2015-16 compared to USD 2.9 billion in 2013-14, accounting for 42% of all finance flows in the electricity sector. About 81% of these investments, or USD 10.3 billion, were in grid connected renewable projects. 87%, or USD 9 billion, of all corporate and private developers' investments in grid connected renewables were in India, which indicates its effectiveness in mobilizing investment at scale through various regulatory reforms and the promotion of renewable energy. India-specific trends are discussed in Chapter 3, which provides a detailed analysis of electricity access and financing in the country.

Financing from commercial banks (mostly through project debt) almost doubled, reaching USD 4.1 billion in 2015-16, from USD 2.2 billion in 2013-14. Interestingly, lending by international commercial banks increased by more than eight times, from USD 224 million a year in 2013-14 to USD 1.9 billion in 2015-16.

CHINA CONTINUES TO BE THE SINGLE LARGEST PROVIDER OF BILATERAL FINANCE FOR ELECTRICITY, ACCOUNTING FOR 23% OF TOTAL INTERNATIONAL FINANCE (USD 2.6 BILLION). CHINA ALSO FINANCED 20% (OR USD 1.6 BILLION) OF ALL FOSSIL FUEL RELATED INVESTMENTS IN THE 20 HIGH-IMPACT COUNTRIES.

Figure 2.5

Sources of international finance commitments for electricity to the 20 HICs (%)



Approximately two-thirds, or USD 2.7 billion, of all the finance from commercial banks (both domestic and international), was committed to grid-connected, fossil fuel projects. Of this, 47%, or USD 1.3 billion, of the commercial lending was in Philippines. Chinese banks' financing for international electricity projects accounted for USD 860 million in 2015-16, mainly in Kenya (80%) and Philippines (20%). This trend indicates that the lending norms of global and domestic commercial banks have yet to fully align with the Paris Climate Agreement (RAN, 2018).

In recent years, China has grown into a major provider of finance for large-scale power infrastructure projects in overseas markets, but detailed information on its international financing remains elusive, and is not fully captured in this report.[9] Like all emerging and developing countries, China is not required to report its activities to international institutions such as the OECD, hence it is difficult to accurately track Chinese investments (SEforALL, CPI and WB, 2017).

[9] Chinese loans committed to Africa in 2015 for all sectors totaled USD 13 billion and USD 30 billion in 2016. In September 2018 at the Forum on China-Africa Cooperation (FOCAC), the Chinese president Xi Jinping pledged USD 60 billion for new projects in Africa, including infrastructures and green renewable energy (CARI, 2018).

Interestingly, 50% (USD 1.3 billion) of the tracked Chinese commitments were for projects in Bangladesh alone, followed by Kenya (29% or USD 765 million), and then three other African countries. This is in stark contrast to 2013-14, when Chinese investments were more widespread across 10 countries, primarily in Sub-Saharan Africa (91%). China also accounts for the vast majority of all South-South investment that we tracked; 86% of all international investment provided by emerging and developing countries to the 20 high-impact countries was from China.

The share of other contributing countries and regions stayed mostly the same between 2013 and 2016 (Figure 2.5). Multilateral institutions provided 33% of all international financing for electricity in 2015-16, and Japan ranked third with 13%.

For this report, the state of funding to energy access from philanthropic foundations and impact investors is reviewed in greater detail. This year, a survey with 20 organizations was piloted to directly collect their financial data. The survey data are supplemented with publicly available data from other foundations' websites, annual reports, and other databases, in-

cluding GOGLA, OECD, and GACC. (See Box 2 for details).

In the report's analysis, it is observed that philanthropic foundations and impact investors committed, on average, USD 26 million and USD 7 million a year in 2015 and 2016, respectively. It is likely that contributions from these organizations remain underrepresented, as transactions are often not disclosed publicly, and only a handful of organizations responded to the survey. However, preliminary information obtained from a similar exercise conducted by the Shine Campaign seems to confirm the magnitude of energy access funding from philanthropic foundations. In 2017, Shine tracked USD 108 million in grants that were committed by the philanthropic community worldwide, doubling the 2015 figure of USD 54.1 million.

There is a broader data gap for impact investment, although it comes with an encouraging message. Shine identified USD 320 million of impact investment worldwide deployed since 2015, and 10 new dedicated energy access funds that have already raised USD 520 million, and seek to attract a total of USD 1.5 billion. These signals indicate that energy access investment opportunities are seen as growing, and the market as becoming more mature.[10]

2.1.2 Instruments

Debt, both at the project and corporate level, remained the predominant mode of finance for electricity access, at USD 16.1 billion a year during 2015-16 (Figure 2.6). The report found that 38% of all debt-based finance was concessional debt for 2015-16. However, overall, concessional development finance decreased by 7% to USD 4.8 billion in 2015-16, mostly concentrated in the South Asia region (which dropped by 38% from 2013-14), while concessional finance for the electrification of Sub-Saharan Africa increased by 7%.[11]

As in 2013-14, 74% of the total international public finance in 2015-16 had concessional terms in the form of concessional loans (87%) and grants. It is important to consider that, even if DFIs provide loans on a commercial basis, they render other important benefits which are concessional in nature, including longer maturities and lower tenors, which are better suited for infrastructure projects and other riskier investment environments.

In 2015-16, grants from multilateral and bilateral organizations to high-impact countries plummeted to USD 800 million per year, about half the amount tracked in 2013-14. In fact, grants decreased in all high-impact countries except Madagascar and Yemen.

While most international public finance was concessional in 2015-16, private finance at the domestic level was invested almost entirely with the expectation of earning commercial returns, particularly through project finance (debt and equity) for grid-connected electricity generation. Project-level debt accounts for 50% of the total flows, or USD 15.2 billion, compared to USD 12.6 billion in 2013-14 (65% of total flows). Project-level equity accounted for 15% of financing in 2015-16 (the same as in 2013-14), and remained the third largest financing instrument after balance sheet financing.

Companies' balance sheet financing accounted for 27% of total finance for electricity access, up from 7% in 2013-14.[12]

International guarantees and other risk mitigation instruments, which play an important role in improving the viability of projects and unlocking overseas private capital, accounted for about USD 150 million of financing per year in 2015-16, but this is likely to be underrepresented.

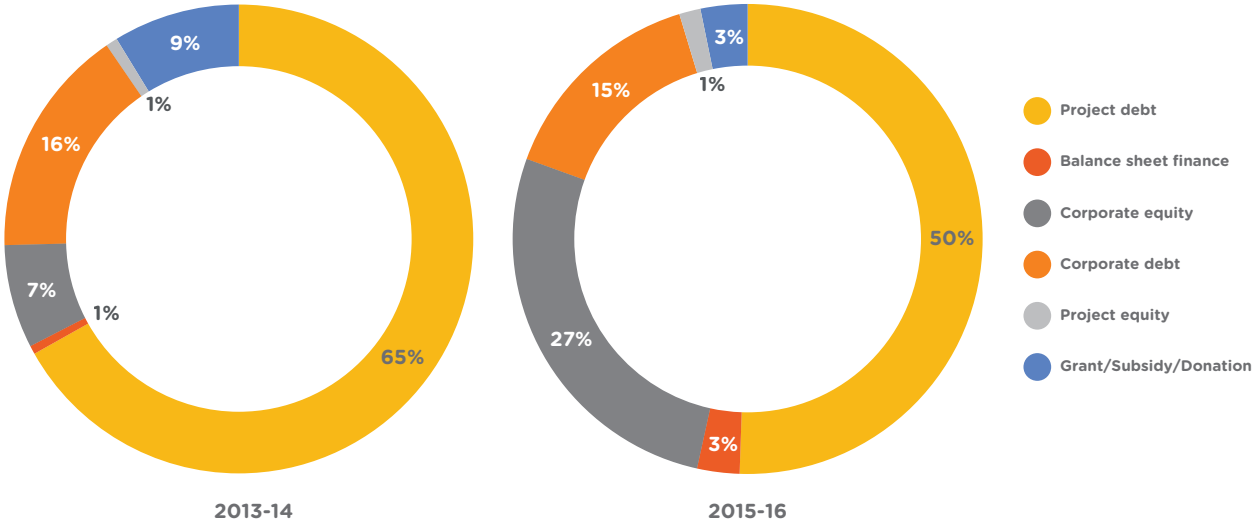
[10] Personal communication. See https://www.shineinvest.org/

[11] This figure is mostly derived from information contained in the OECD CRS database. A portion of international financing, especially South-South commitments, is likely to be on concessional terms, but there are few disclosed details to confirm this.

[12] Assumptions of realistic debt to equity ratios were applied to balance sheet financing, which is a default classification used by data providers when information on financing details is missing. Structures of 70:30 are common for financing large scale wind and solar PV projects in India, for example.

Figure 2.6

Finance for electricity by instrument type



Note: Average over 2013-14 (total of USD 19.4 billion) and 2015-16 (total of 30.2 billion). A further annual average of USD 150 million in guarantees and risk mitigation instruments is not included in the chart.

BOX 1

Data Coverage and Gaps

This report examines available data sources to identify primary financial transactions at the project level (see Annex 1 for more details). There are, however, several important data gaps identified through this tracking exercise which need to be addressed to allow for a more comprehensive and granular picture. These include:

South-South finance. Data on international public investments in grid-connected generation, transmission, and distribution is generally comprehensive and reliable. However, there is uncertainty over projects solely financed with overseas finance from non-OECD countries (so called "South-South" financing) as these are not systematically tracked by official international systems like the OECD Development Assistance Committee (DAC) Creditor Reporting System (CRS). These projects are only tracked by countries that report development assistance voluntarily to the OECD CRS, such as Korea, DPR and UAE. As a result, they exclude projects from a major player, namely China.

Domestic public finance. Tracking data on domestic public finance across developing countries is generally challenging due to a number of factors, such as lack of consistent methodologies and guidelines, data gaps, and insufficient institutional capacity at the ministerial level. This is a major limitation for this report.

Private investment detail. International and domestic private sector investment for grid-connected generation, transmission, and distribution are well covered through various data sources. However, transaction details are often confidential.

Energy efficiency. This report tracks energy efficiency investment for the first time ever (energy efficiency was not tracked for the 2013-14 period), although

only data on projects financed through international public sources were available. In general, these projects represent a minor portion of the overall energy efficiency market. Moreover, the figure is relatively rough, as the data sources available lack sufficient details to identify and separate energy efficiency from other energy investment.

Off-grid solutions. Data on capital raised by solar companies located in the high-impact countries are available from GOGLA and BNEF. We have also collected data on a portion of off-grid financing through surveys to philanthropic foundations and impact investors. (See Box 2).

Information on dedicated international aid programs is generally available through public data sources (like OECD DAC CRS). However, these databases are not designed to allow for a precise distinction between technologies. For example, it is difficult to identify and separate solar off-grid projects from other solar PV projects. The OECD-DAC is currently revising energy codes to allow for better tracking of development finance for SDG7, in particular, as far as clean cooking and off-grid energy sources are concerned, pending approval from its members (personal communication with OECD staff, September 2018).

Data on private-sector expenditures for diesel generators are unavailable, which makes it inherently difficult to quantify the extent of the gap between data stated in the report and the actual levels of finance committed to the sector.

Distinguishing between upgrading existing grid-connections and new grid connections. The data do not typically contain sufficient detail to distinguish between improvements to existing connections (for example, improving Tier 3 access to Tier 4 access) and entirely new connections, which could potentially move a residential consumer from Tier 0 access to Tier 4 access. Estimating the number of people affected by the financial commitment tracked is also not possible at country level.

SEforALL is committed to improving this aspect in future iterations of the report.

Market support and domestic policies. Data on international aid supporting energy market reforms and capacity building are available from the OECD DAC CRS, but data on domestic energy budgets are not readily available and have to be collected through in-country efforts (see Chapters 3 and 4 for details).

BOX 2

Building Better Data

The 2017 "Understanding the Landscape" report clearly highlighted the lack of comprehensive data on financing deals for off-grid electricity generation and clean cooking, and this 2018 report corroborates this finding. (See Box 1).

With the objective of expanding our data coverage in these sectors, this year our financial commitment tracking exercise was complemented through the following two improvements, paving the way for even better data and coverage in future years.

1. Surveys to philanthropic foundations and impact investors: Philanthropic foundations, family offices, and impact investors are key players in the

energy access finance landscape, but their impact is largely underreported due to lack of available, centralized, and comparable data. Foundations, in particular, are characterized by the private nature of their operations financed mainly through grants that are not reported though development aid databases. Impact investments are generally targeting good financial returns as well as measurable positive social impact.

For this report, our data for these players were expanded through tailored surveys sent to philanthropic foundations and impact investors that actively finance off-grid electricity solutions and clean cooking activities in Africa and Asia. Dedicated surveys were sent out to 20 foundations and impact investors identified as relevant players by the OECD's Private Philanthropy for Development program and the Global Impact Investment Network (GIIN), and six responded: Acumen, DOEN Foundation, Good Energies, IKEA Foundation, Omidyar Network, and the Rockefeller Foundation. Surveys were complemented with project level data from other organizations gathered from websites/annual reports, where available.

Of the respondents, three financed both off-grid electricity solutions and clean cooking activities, while three financed electricity only. Collectively, an average of USD 33 million per year was committed in 2015-16 by these institutions for activities relevant to electrification and clean cooking access. These commitments were split almost equally between grants and debt.

It is important to note that these figures cover only a limited number of foundations and impact investors that are actively involved in financing energy access relevant activities, providing a first yet partial estimate of their impacts. It is also important to note that careful considerations were made to avoid double counting with other areas of this report, in particular with the datasets provided by GOGLA and GACC (see Box 5), which also partially track these actors.

2. Partnering with GOGLA: This year, new data on finance for off-grid solar were obtained from GOGLA, the global association of the off-grid solar energy industry. Representing over 135 members, GOGLA contributed financial transactions data on pico-solar products and plug-and-play solar home systems for 2015 and 2016. This dataset includes only publicly available data, without any confidential information, and therefore represents a conservative view of the overall financing for solar off-grid solutions. In some cases, when financing was raised by solar companies operating in one or more of the high-impact countries, the investment amounts were spread equally across these countries. The investments marked as global had to be excluded, as specific investments in high-impact countries could not be identified.

GOGLA has been aggregating data on product sales, consumer impact, and investment trends from its member companies since 2014 and will be working to expand its data collection and reporting services further through, inter alia, research into efficient appliances and financing for productive use assets. GOGLA's goal is to build a robust and broad evidence base for the global standalone solar industry.

2.1.3 Recipients

TWO THIRDS OF ALL ELECTRICITY FINANCE TRACKED (USD 17.2 BILLION) WAS CONCENTRATED IN SOUTH ASIA, MAINLY IN INDIA, WHILE 12 HIGH IMPACT COUNTRIES EACH RECEIVED LESS THAN USD 500 MILLION A YEAR.

Investment in South Asia increased by USD 10 billion, on average, across 2015-16, accounting for almost 67% of the total financing (domestic and international) in the electricity sector, up from 53% in 2013-14. This increase was led by renewable energy financing in India, which reported a staggering USD 10 billion increase from 2013-14, bringing the annual average commitments for electricity to USD 17.2 billion in 2015-16 (Figure 2.7). More information on India's electrification progress is presented in Chapter 3.

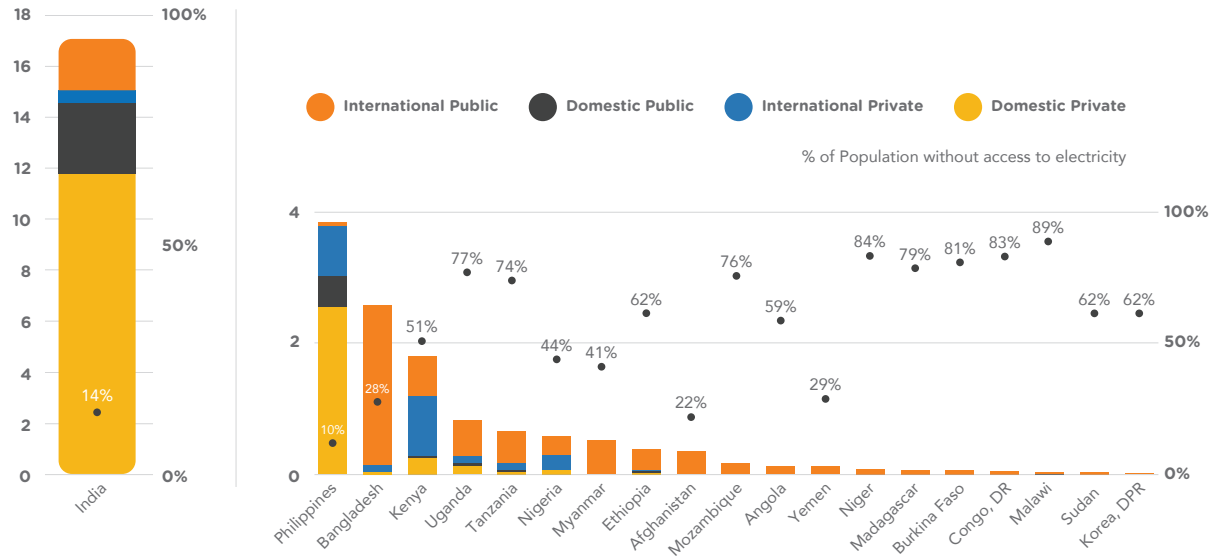
Philippines and Bangladesh remained the second and third most favored countries for investment, both reporting higher amounts in 2015-16 than in 2013-14 (an increase of USD 1.8 billion and USD 1.1 billion, respectively). Together, these three countries – India, Philippines and Bangladesh – received an average of USD 24 billion a year, or 79% of the total finance for electricity.

Investment in Sub-Saharan African countries reached USD 5 billion, accounting for 17% of the total electricity finance in 2015-16. This has decreased from the 32% (or USD 6.1 billion) in 2013-14, given that eight out of the 13 African countries reported a decline in electricity investments. Among Sub-Saharan African countries, Kenya stands out with double the investment in 2015-16 than in 2013-14, an almost USD 1 billion increase, followed by Uganda with a USD 500 million increase (see Box 3).

Excluding the top four (India, Bangladesh, Philippines, and Kenya), each of the other 16 high-impact countries, mostly located in Sub-Saharan Africa, received less than USD 1 billion dollars in annual commitments. These countries are home to more than 460 million people without any access to electricity.

Figure 2.7

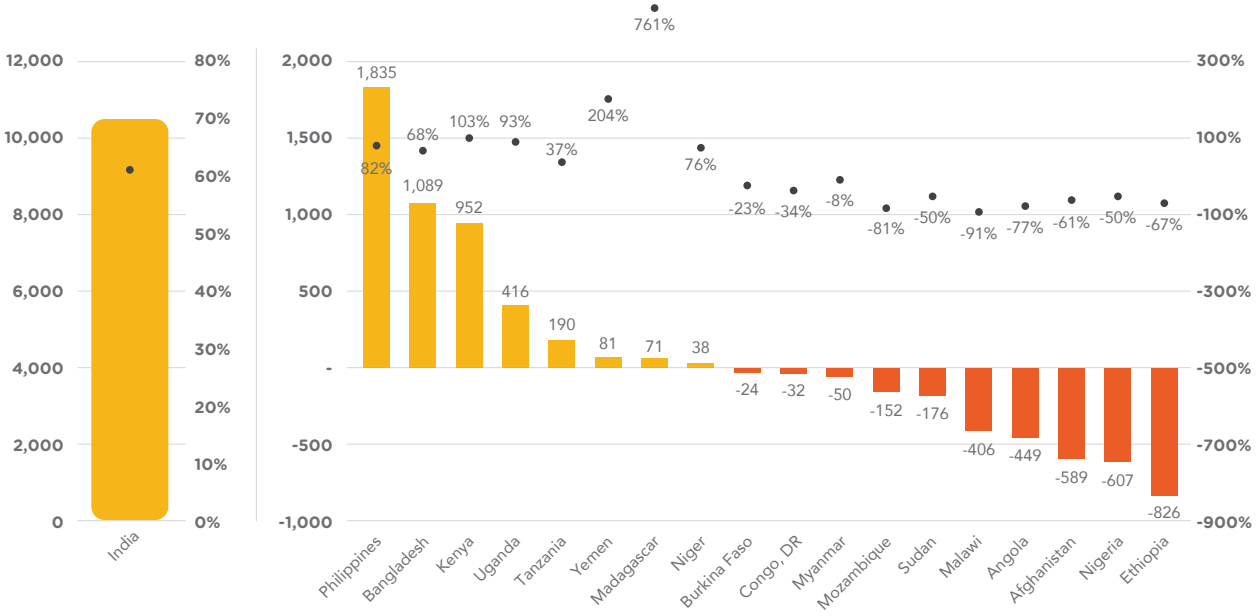
Distribution of finance for electricity across the high-impact countries (USD billion)



Note: Average over 2015-16.

Figure 2.8

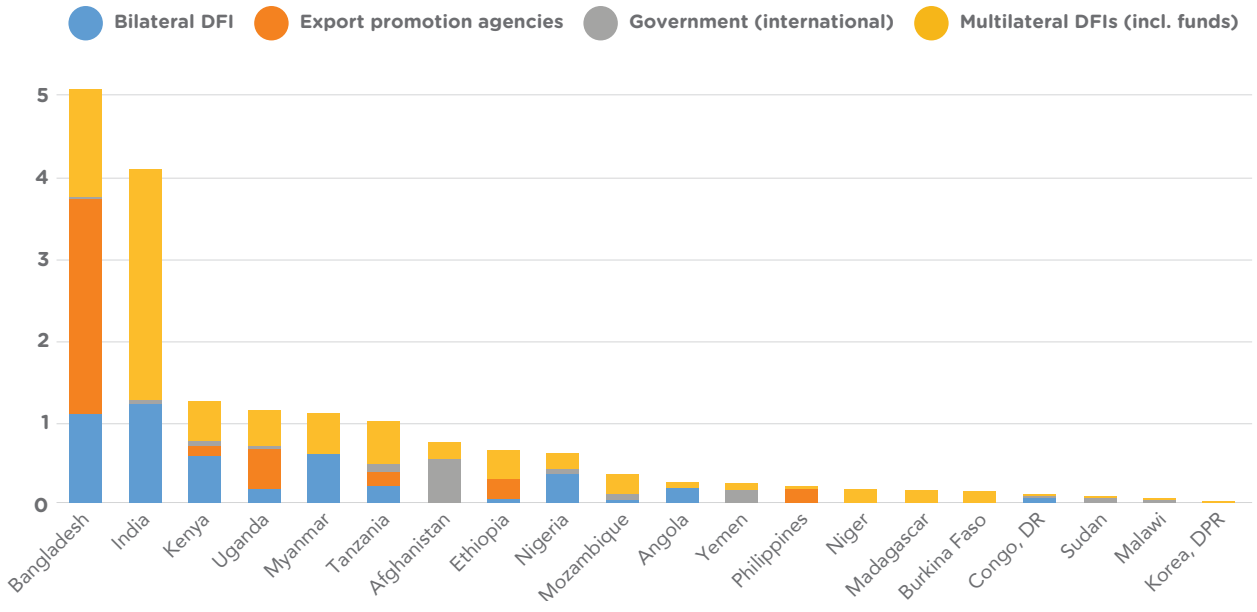
Difference in electricity financing across the high-impact countries between 2013-14 and 2015-16 (USD million, y-o-y change)



Note: North Korea is not included in the chart due to negligible amounts tracked.

Figure 2.9

Recipients of international public finance by provide type (USD billion)



Note: Average over 2015-16.

Afghanistan, Angola, Ethiopia, Malawi, Mozambique, Nigeria and Sudan all witnessed a decline of more than 50% in their electricity finance between 2013-14 and 2015-16. This is a discouraging trend given that these countries, together, house more than 200 million people without electricity (Figure 2.8). It is important to note that finance committed to North Korea is negligibly covered in the dataset, impeding a separate analysis.

The report's analysis of different sources of financing shows that only India and Philippines received domestic financing from private sources, mainly from corporate and private developers. In the Philippines the majority of domestic financing supported commitments to coal investments. However, it is important to note that severe underreporting, given the limited tracking of domestic finance across other high-impact countries, may be the reason for the witnessed trend. Of the top five countries with the highest number of people without electricity (India, Nigeria, Ethiopia, Congo and Bangladesh), only India and Bangladesh are in the top three recipients of domestic private finance commitments. This is indicative of a clear gap between required and actual investments, and the need for higher investments to accelerate the pace of electricity access.

Focusing on international public finance only (multilateral and bilateral development finance institutions and promotion agencies), the ranking of recipient countries does not change drastically. Bangladesh received the most development finance for electrification in absolute terms, followed by India, Kenya, and Uganda (Figure 2.9).

However, when finance is weighted for the countries' population without access to electricity, the study reveals a much different scenario. Sub-Saharan African countries received a much lower level of financing than most Asian countries. Philippines, for example, received a small amount of international development finance in absolute terms, but the highest amount across all 20 high-impact countries on a per capita basis—four times higher than Nigeria, the first African country in the ranking. (See Box 3 for more detailed information on energy access finance in Sub-Saharan Africa.)

SUB-SAHARAN AFRICA – A CRITICAL REGION FOR ENERGY ACCESS – IS FALLING BEHIND.

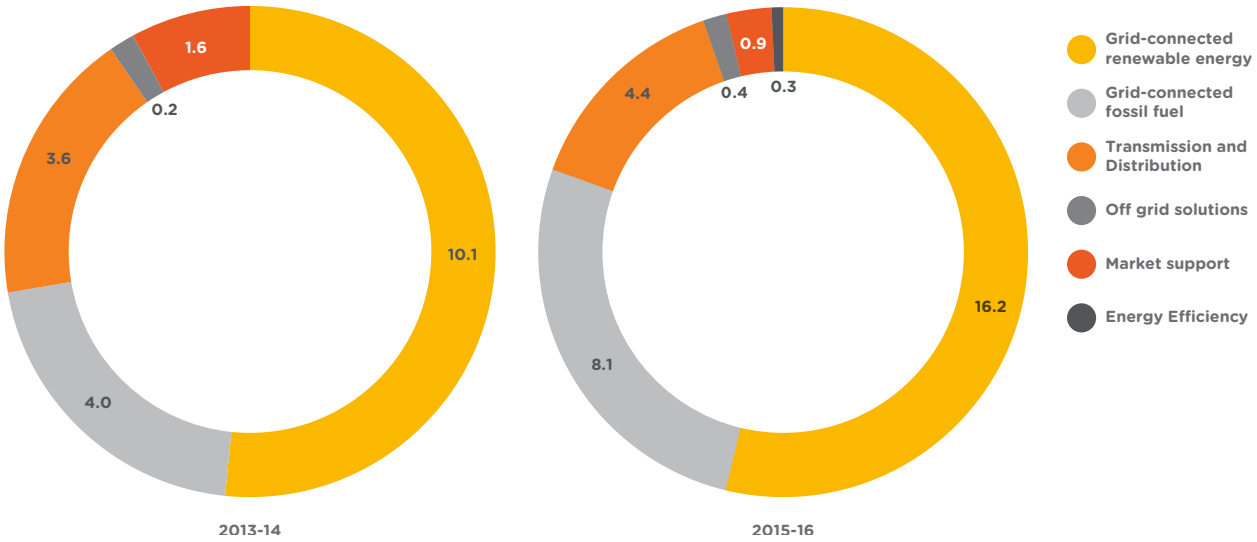
SEforALL highlighted the importance of redirecting development finance to where it is needed most in its 2017 "Missing the Mark" report, which showed that only about a quarter of electricity access finance between 2011 and 2015 went to high-impact countries. Less than 10% went to Sub-Saharan Africa. To further complicate matters, delays and under-disbursement affects 69% of finance committed in high-impact countries for which complete data is available (SEforALL and AfDB, 2017).

In 2015-16, about 70% of total international public financing reached the recipient countries through various public-sector entities, including government budgets and local accredited agencies of international financial institutions, as compared to 81% in 2013-14.[13] Investment in electricity access through private channels increased more than three times, raising its share from a mere 4% of total international public finance in 2013-14 to 14% in 2015-16. Details on the recipients are not consistently reported across various data sources used to construct the database. As observed in the previous edition, the channels for 15-17% of international public finance remain unknown.

[13] This "blending" of international flows into governments' budgets is difficult to track and allocate to specific organizations without counting the same funding twice.

Figure 2.10

Share of finance for electricity by technology type (USD billion)



Note: Grid connect nuclear investments are excluded, as no investments were identified in 2015-16.

WHILE MORE THAN HALF OF THE FINANCE FOR ELECTRICITY WAS CHANNELED INTO GRID-CONNECTED RENEWABLE TECHNOLOGIES -- PRIMARILY SOLAR PHOTOVOLTAIC (PV), INVESTMENT IN GRID-CONNECTED FOSSIL FUEL PLANTS -- PRIMARILY COAL PLANTS -- DOUBLED BETWEEN 2013-14 AND 2015-16.

2.1.4 Sectors

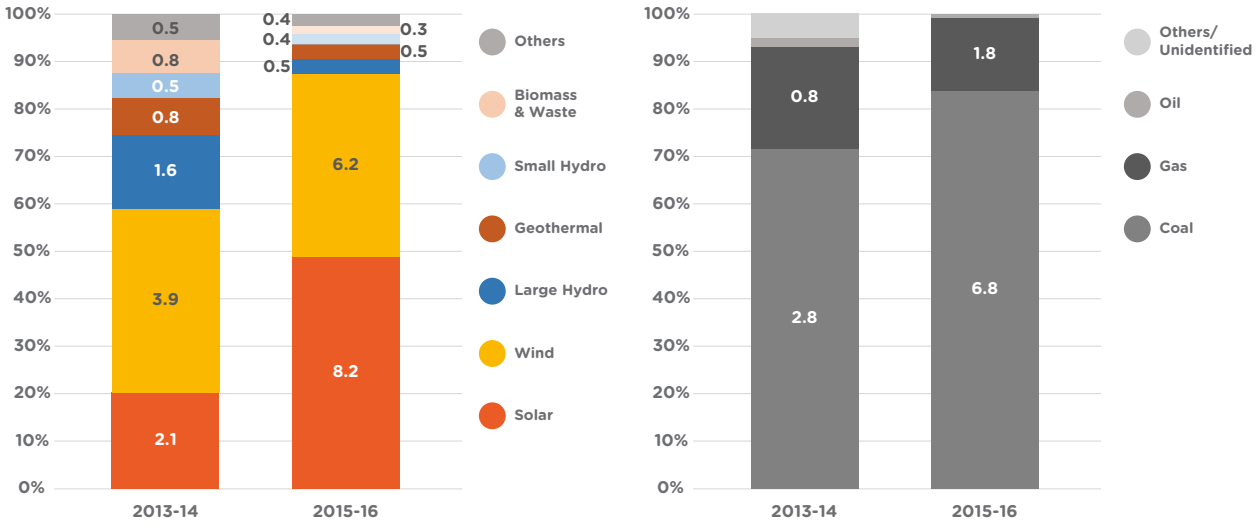
The majority of the electricity finance commitments in 2015-16 was directed to centralized electricity technologies, as was the case in 2013-14 (Figure 2.10). Grid-connected renewable energy plants[14] accounted for 54% (USD 16.2 billion) of the total amount of electricity finance, an increase of USD 6 billion a year compared to 2013-14. Within grid connected renewables, solar PV attracted over USD 8 billion a year, almost a fivefold increase compared to 2013-14. This was primarily driven by the falling cost of solar PV modules, which are currently 80% cheaper than they were in 2009 (World Energy Council, 2016), with a resultant three-quarters decrease in the cost of electricity from solar PV between 2010-2017. Investments in large hydro plants reported a steep decline from USD 1.6 billion a year in 2013-14 to 500 million USD in 2015-16, in part due to changes in long-term hydrological conditions arising from climate change (International Hydropower Association, 2016).

Investments in grid-connected fossil fuel plants doubled to USD 8 billion a year in 2015-16, representing an even higher proportion of the overall electricity finance we tracked (27% in 2015-16 from 20% in 2013-14) (Figure 2.11). In particular, investments in coal plants increased by 2.4 times to reach an annual average of USD 6.8 billion in 2015-16. Over 2015-16, 17 coal plants were financed across the 20 high-impact countries, eight of these were in India, and five were in Philippines (see Table 2).

[14] Includes large hydro.

Figure 2.11

Breakdown of grid connected investments by non-fossil fuel and fossil fuel sub-technology (USD billion, %)



Note: Average over 2013-14 and 2015-16.

Table 2

Total coal financing tracked in 2015-16

	Total financing (USD billion) across 2015 and 2016	Number of plants
Philippines	**5.5**	**5**
India	**4.0**	**8**
Bangladesh	**2.1**	**3**
Kenya	**2.0**	**1**

INVESTMENTS IN OFF-GRID SOLUTIONS HAVE ALMOST DOUBLED COMPARED TO 2013-14, YET STILL REMAIN A SMALL PROPORTION (1.3%) OF THE TOTAL ENERGY ACCESS FINANCE TRACKED.

Two-thirds of all coal financing was sourced from private companies, almost equally split between project debt from commercial banks and equity from project developers. On the public side, half of the financing tracked originated from national public banks, while the Chinese EXIM Bank funded two plants in Bangladesh with USD 1.6 billion in 2016. The lending by commercial banks and project developers is surprising given that renewable energy has a lower levelized cost of energy (LCOE) than fossil fuels in many markets.

Investments in off-grid solutions, including mini-grid technologies, grew to about USD 400 million per year for 2015-16. Different factors are behind this increase, for example the increasing maturity of solar off-grid markets, especially in Eastern Africa, better data coverage in this year's report, and growing international support of these technologies. While grid connected access provides the lowest-cost options in urban, peri-urban areas, and areas of concentrated population, it is the mini-grid and off-grid systems that are the most cost-effective way to expand electricity access in remote areas, as well as in urban areas with unreliable grids (IEA, 2017). Almost all financing for mini-grids and off-grid solutions was from international sources, mainly DFIs (bilateral and multilateral), private equities, and venture capitalists.

Investments in energy efficiency in 2015-16 were also tracked,[15] including projects in support of energy conservation and demand reduction, including building and industry upgrades, smart grids, metering, and tariffs, which increase the quality of electricity grids and infrastructure, and consequently, improve the Tier of energy access. Energy efficiency amounted to about USD 260 million, or 0.8% of all tracked finance for electricity, financed mainly (87%) from international public sources. The energy efficiency figure is only partial and impacted by data gaps. (See Box 1 for more details).

A further 8% of the total finance tracked, all provided by public sector sources, was directed to market support activities, including capacity building, technical assistance, and institutional support for energy reforms, amongst other activities. These were supported by both grants and project debt.

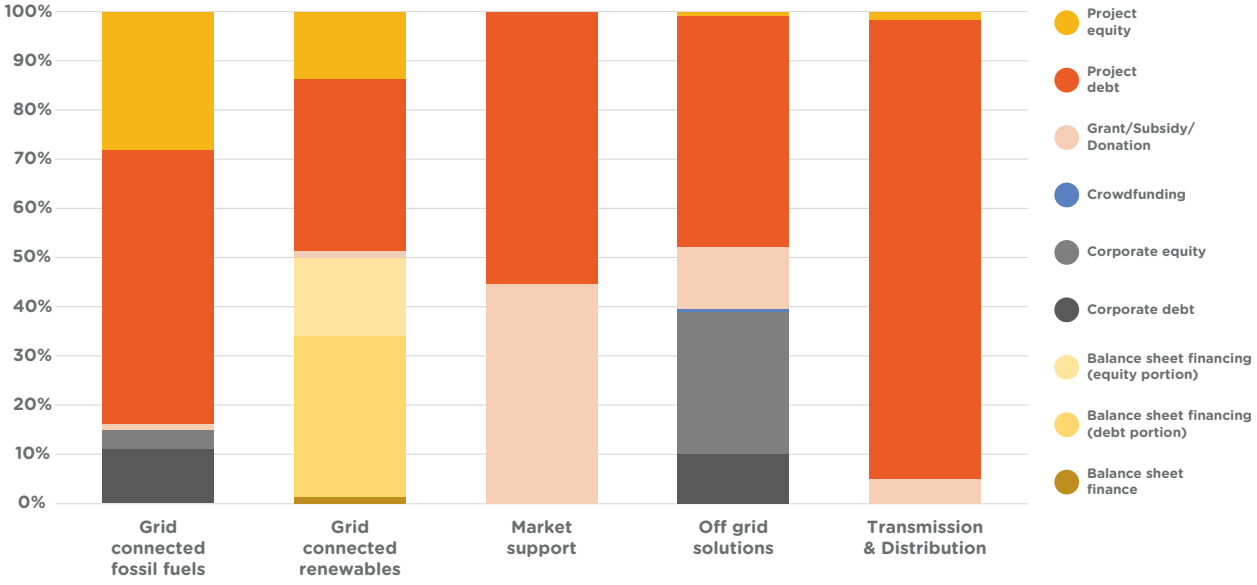
2.1.5 Uses

While grid-connected generation and distribution technologies receive the most funding, their contribution to increase electricity access for residential users can be lower per unit of capital invested when compared to off-grid technologies. The residential sector, for example, consumed only 28%, on average, of the grid-level electricity produced across

[15] SDG 7.3 calls for doubling the global rate of improvements in energy efficiency by 2030. On average, energy intensity – the ratio of energy used per unit of GDP – declined globally to 2.2% per year over 2010-2015, but progress still falls short of the 2.6% yearly decline needed to achieve the target. Without intensifying efforts and increased investment, the pace of improvement is not expected to exceed 2.4% during 2016-2030 (IEA, World Bank, IRENA, 2018).

Figure 2.12

Type of financing by preferred type of technology



Note: Average over 2015-16.

the 20 high-impact countries.[16] By applying the consumption shares to the finance tracked for electricity (Figure 2.13) it can be seen that, on average, USD 8.6 billion per year has been contributed to increase residential access to electricity across the 20 high-impact countries.

Commercial and industrial players are estimated to consume more than half of the grid electricity in the countries observed (corresponding to USD 15.8 billion of investment per year, on average), while 16% is used by other community and economic activities (such as street lighting, hospitals, schools, and for military use), or is energy that is exported. This is not to discount the role of grid-connected generation and transmission, which benefits a wide range of end users and typically provides higher Tiers of residential electricity access.

For off-grid solutions, an average electricity consumption of 85% by residential users is observed, with the rest going to mostly commercial uses. However, such impact is limited to just 1.3% of the total finance tracked across the 20 high-impact countries.

Having identified the proportion of finance committed to electricity that targets residential consumers, financial commitments are allocated to Tiers of electricity access based on the technology and the reliability of the country's grid (Figure 2.14). Limitations in available data mean it is not possible to ascertain whether commitments provide improved electricity access for consumers who already have some access to electricity, for example, bringing a residential consumer from Tier 2 to Tier 3, or provide entirely new access to electricity, such as bringing a residential consumer from Tier 0 to Tier 3. Estimating the number of people affected by the financial commitment tracked is also not possible, given the quality of data available.

The report estimates that the majority of finance (48%) providing residential electricity access (an average of USD 4.1 billion per year) is to support Tier 3 access. This provides energy services that support medium power appliances and guarantee a minimum of eight hours of electricity supply a day. Tiers 4 and 5 entail greater availability of electricity services; Tier 5, for example, requires electricity access of at least 23 hours a day with no more than three disruptions a week. These Tiers (4 and 5) accounted for an average financial commitment of USD 3.2 and USD 0.9 billion, respectively, over 2015-16. Tiers 3, 4, and 5 are usually—though not exclusively—associated with a connection to a central grid, which in most countries—though by no means all—ensures a higher availability, reliability, and quality of electricity. However, grid connections often fail to reach populations living without access to electricity in rural areas, and those without access to electricity in the high-impact countries live disproportionately in rural areas.

A small portion of overall finance (about USD 300 million per year) supports Tier 1 and 2 access. Tiers 1 and 2 provide solar lanterns and solar home systems, and/or other often off grid solutions, which are critical to allow the expansion of residential electricity access for rural populations whose locations make grid extension difficult. While small compared to overall commitments, the amount tracked for these Tiers for 2015-16 is three times larger than what was tracked in 2013-14.

MOST INVESTMENT GOES TO MEDIUM OR HIGHER LEVELS, TIERS 3-5, OF ENERGY ACCESS.

[16] Estimates of electricity consumption by sector across the high-impact countries is based on analysis including, but not limited to, country-specific grid supply and demand and technology-specific considerations for off-grid technologies. The detailed methodology is in Annex 1.

Figure 2.13

Estimated finance for electricity commitments by end user across the 20 high-impact countries (USD billion)

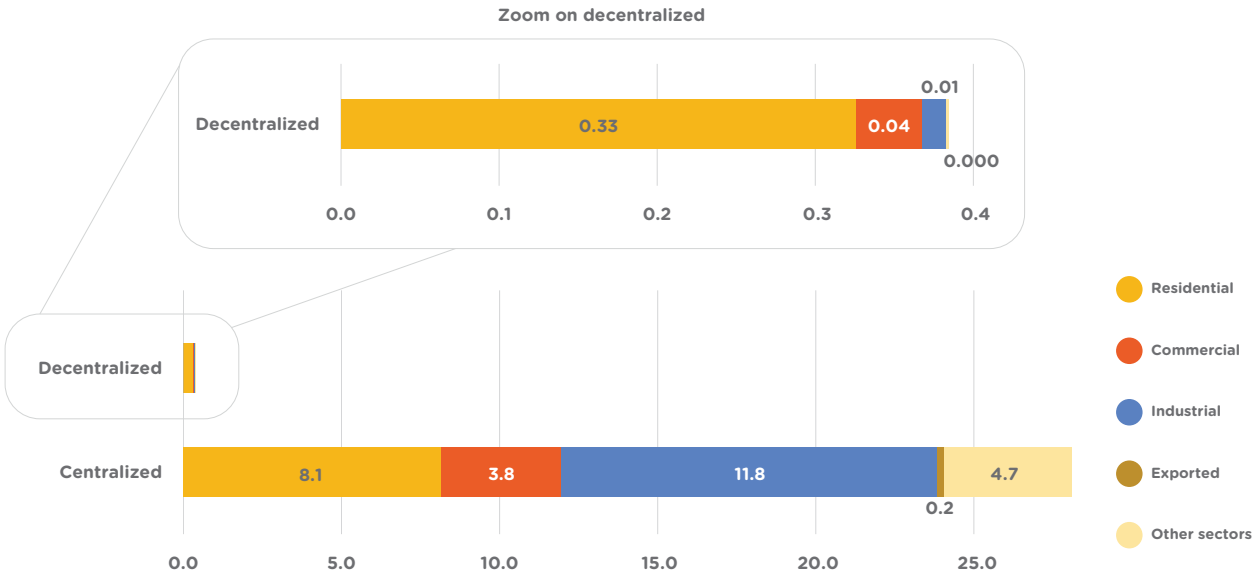
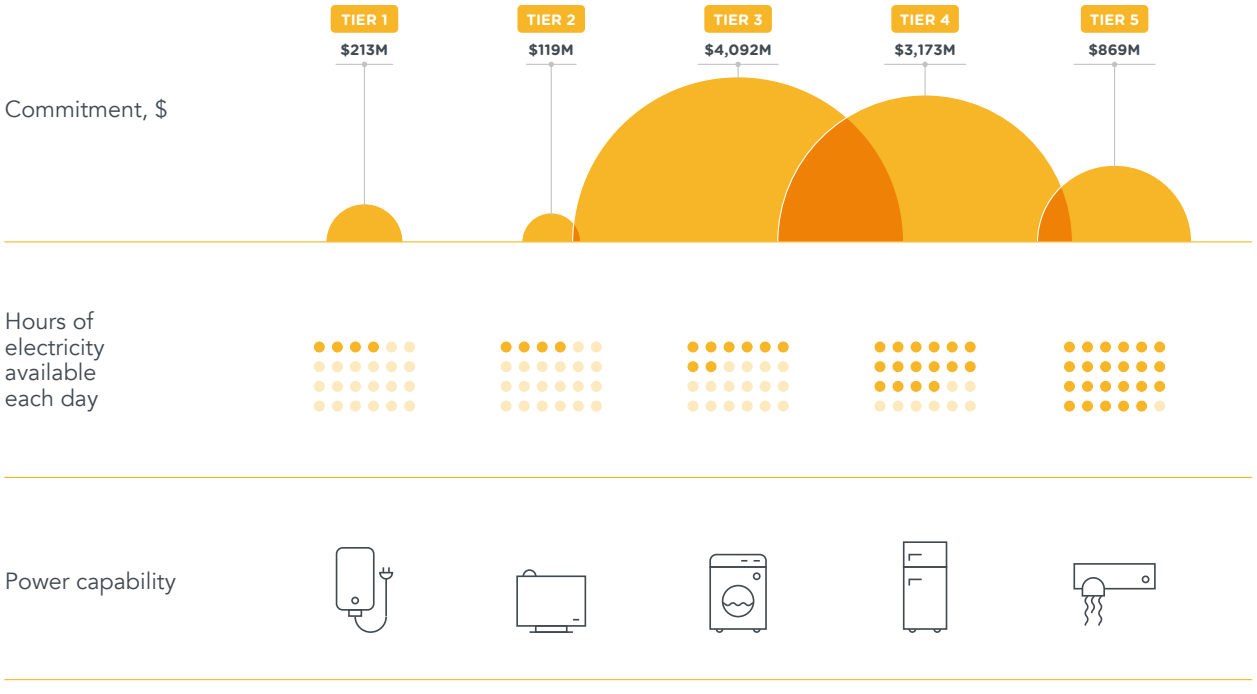


Figure 2.14

Finance commitments supporting residential electricity, by tiers of energy access (USD million)



Note: Energy efficiency flows for residential consumptions were not assigned to any specific tier and therefore have been excluded from the visual.
Source: Adapted from IIED (2016), based on IEA and WB 2015: http://pubs.iied.org/pdfs/16623IIED.pdf.

BOX 3

Finance for Electricity in Sub-Saharan Africa

Sub-Saharan Africa has the largest electricity access gap of any region in the world, accounting for nearly 600 million people currently lacking access to electricity. Experts do not expect this number to decrease by 2030. Africa's child population is projected to increase by 170 million between now and 2030 (UNICEF, 2017) and electrification progress struggles to keep pace with population growth in many countries (Tracking SDG7: The Energy Progress Report 2018).

To achieve electrification for all in Sub-Saharan Africa, approximately USD 50 billion needs to be invested every year by 2030 (IEA, 2017). However, this study finds that in 2015-16, just USD 5 billion per year was committed to the 13 Sub-Saharan African countries covered. Regrettably, this figure is also USD one billion lower than in 2013-14.

Further, the majority of finance commitments supported fossil fuels plants (USD 1.6 billion per year, on average, in 2015-16), doubling the figure for 2013-14 (Figure 2.10). This was driven by the 1,050MW Lamu Coal Power Station in Kenya, which represents the only coal project financed in Sub-Saharan Africa. With its USD 2 billion committed in 2016, the Lamu Station accounts for 62% of all fossil fuel financing tracked in the region. The Lamu Station was also the commitment that resulted in Kenya moving into the top four high-impact countries for finance received in 2015-16 (Kenya ranked seventh in 2013-14), and without the Lamu Station investment, Kenya and Uganda tie in fourth place for high-impact countries for finance received in 2015-16. Gas-powered generation plants in Kenya, Nigeria and Tanzania made up the remaining 38% of fossil fuel finance in Sub-Saharan African.

Investment in large scale, grid-connected renewable energy in Sub-Saharan Africa, on the other hand, decreased by almost USD 2 billion from 2013-14 to 2015-16. Ethiopia had USD 1 billion less investment, Nigeria USD 700 million less, and Tanzania USD 100 million less. Uganda is the only country where a significant increase in renewable energy financing was identified, increasing from USD 270 million per year in 2013-14 to USD 600 million in 2015-16.

Investment in transmission and distribution remained proportionally significant across the Sub-Saharan African high-impact countries, increasing by USD 300 million to USD 1.5 billion per year in 2015-16. Ethiopia, Tanzania and Uganda saw the largest increase.

Although still small within the total picture, finance for off-grid electricity generation in Sub-Saharan Africa increased fivefold to USD 200 million per year in 2015-16, driven by solar off-grid companies in maturing markets like Kenya, Nigeria, Tanzania and Uganda.

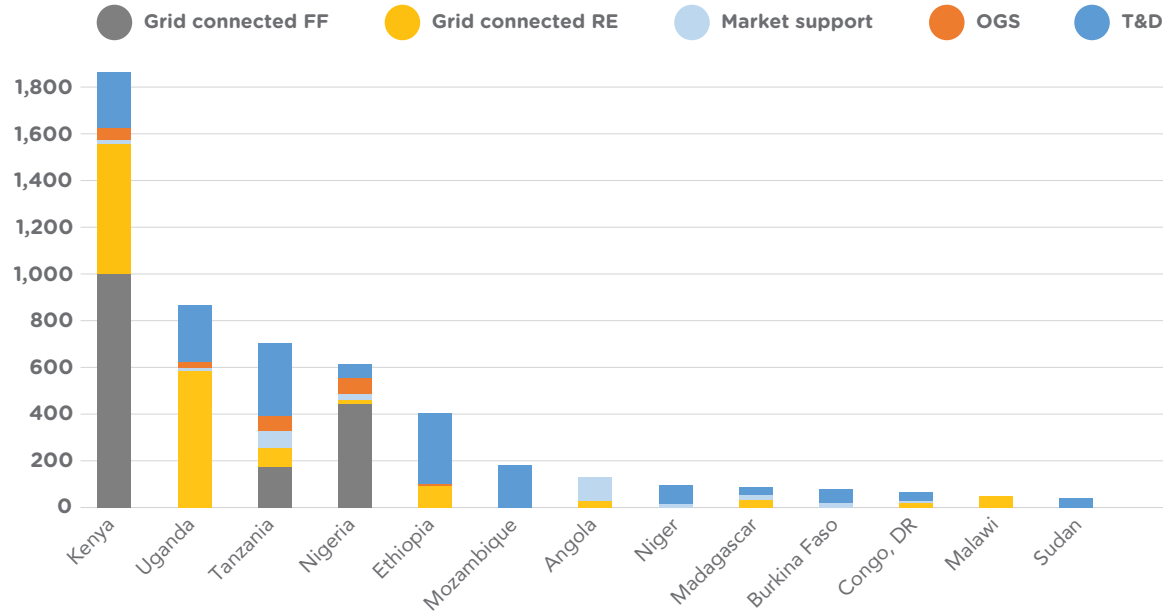
Of all the finance tracked in Sub-Saharan Africa, bilateral and multilateral development finance institutions provided slightly more than 50% (USD 2.6 billion annually), three quarters of this with concessional terms. Notably, total concessional development finance over 2015-16 increased by USD 300 million compared to 2013-14, mostly supporting transmission and distribution (55% or USD 1 billion per year) and renewable energy projects (21%, or USD 400 million).

Chinese public and private companies invested USD 1.1 billion per year in 2015-16 for energy projects in Ethiopia, Kenya and Uganda, mostly fossil fuel generation (60%).

Co-financing from domestic public and private organizations for renewable and fossil fuel generation projects was identified in six countries, a cumulative amount of USD 700 million per year.

Figure 2.15

Electricity sectors financed in Sub-Saharan Africa in 2015-16 (USD million)



Note: Average over 2015-16. The figure does not include energy efficiency, for which a negligible amount was tracked in just three countries (Kenya, Nigeria and Sudan)

2.2 FINANCE FOR CLEAN COOKING

FINANCE COMMITMENTS FOR CLEAN COOKING IN 2015-16 REMAINED MINISCULE COMPARED TO THE NEED.

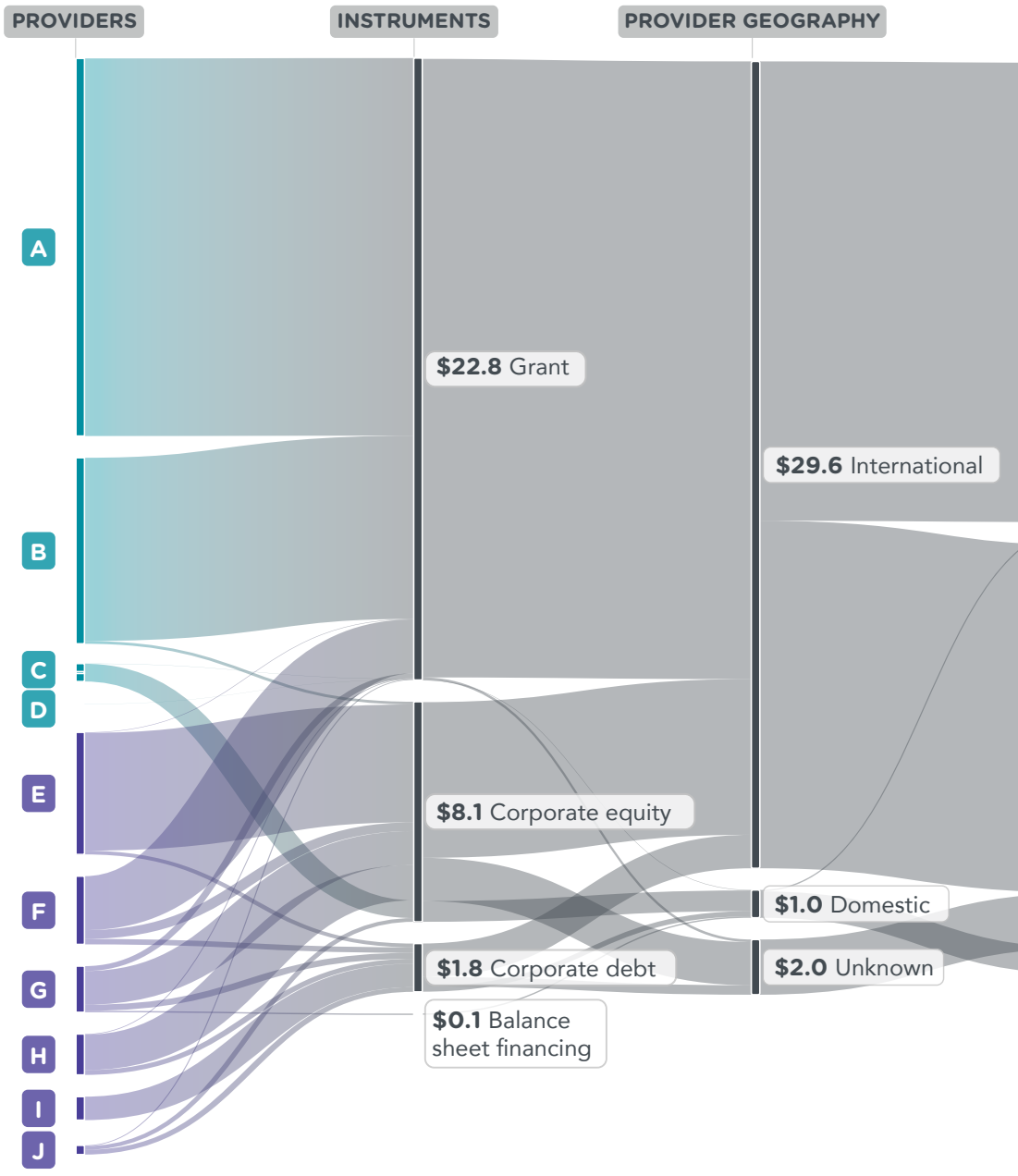
Unlike for electricity, the analysis provided for clean cooking focuses only on residential clean cooking financial flows. For simplicity, the text compares averages between the 2013-14 and 2015-16 periods, but the graphs show the 2013-2016 evolution.

Financial commitments to improve access to residential clean cooking fuels and technologies in the 20 high-impact countries averaged USD 30 million per year for 2015-16. (See Figure 2.16 for an illustrative depiction of providers, instruments, geographies, recipients, uses, sectors, and access.) This amount is a 5% drop from the USD 32 million per year committed in 2013-14, despite a larger amount of transactions tracked (177 in 2015-16 versus 119 in 2013-14). This amount is clearly grossly insufficient to address a problem faced by the 2.4 billion people living in the 20 high-impact countries without access to clean cooking, and is almost immaterial to the USD 4.4 billion annual investment needed to achieve universal access to clean cooking by 2030.

Despite an expanded methodology, which included using surveys to philanthropic foundations and impact investors (see Box 2), and additional data

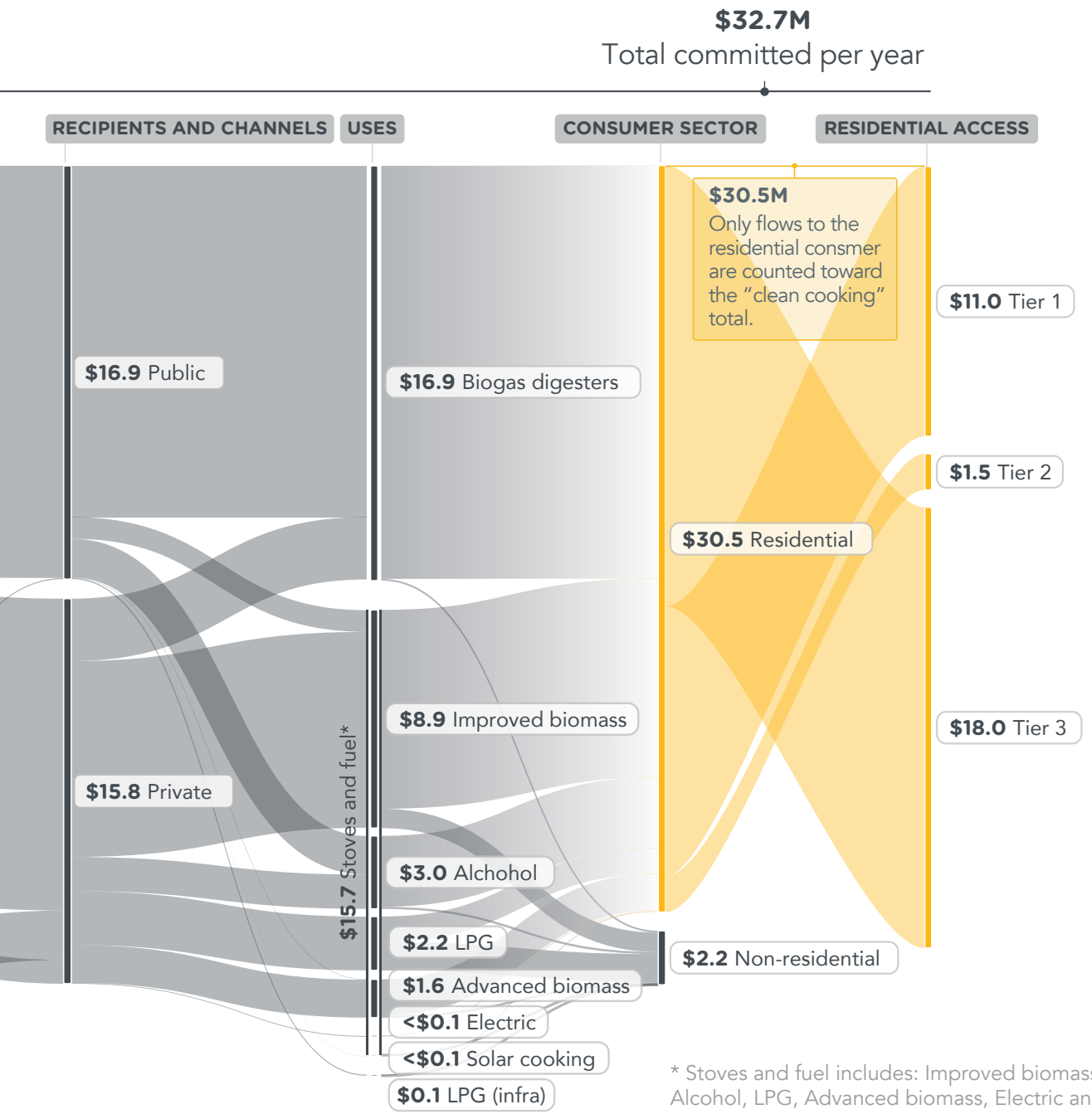
Figure 2.16

Finance for clean cooking in 2015-16
Average annual finance for clean cooking access, committed in 2015 and 2016 in high-impact countries ($, million).



- Public
- Private
- Residential access

A **$13.8** Multilateral DFIs; **B** **$6.8** International governments; **C** **$0.7** Bilateral DFIs; **D** **$<0.1** Domestic governments. **E** **$4.5** Commercial finance (PE, VC, II); **F** **$2.5** Philanthropic foundations; **G** **$1.7** Corporates and project developers; **H** **$1.5** Angel investors; **I** **$0.9** Commercial banks (incl. MFIs); **J** **$0.3** Entrepeneurs (own capital);



* Stoves and fuel includes: Improved biomass, Alcohol, LPG, Advanced biomass, Electric and Solar cooking.

NB: Values may not add up due to rounding

DATA GAPS ARE PARTICULARLY PROBLEMATIC FOR CLEAN COOKING FINANCE.

gathered from the Indonesian case study (Chapter 4), comprehensive analysis of finance flows for clean cooking remains limited due to data availability.

Compared to the electricity sector, commitments are generally fewer and smaller for clean cooking projects and companies. Larger transactions such as LPG storage and filling plants are typically made upstream, and limited information is available. In addition, financing of LPG and LNG infrastructures takes place in highly competitive environments, in which information-sharing of multi-million dollar transactions is uncommon. Public-sector financing can be similarly opaque and lack details that would allow for a precise identification of the clean cooking activities that are supported. Furthermore, carbon finance transactions, which may be more relevant for clean cooking solutions, are not specifically expressed in the data collected for the analysis and, therefore, are likely to be only partially covered or not covered at all. Due to the above mentioned challenges (summarized in Box 6), it is very likely that the commitments tracked for clean cooking are underreported.

When considering the data in this report, readers are encouraged to remain aware of these limitations, and the differences between clean cooking solutions reported and related financing models.

2.2.1 Providers

Public finance made up the largest share of all finance for residential clean cooking in 2015-16, accounting for 69% (or USD 21 million per year) of all commitments tracked (Figure 2.17). The public sector spends on average five times more per transaction than the private sector (USD 0.8 million against the USD 0.15 million of the private sector) and shows a wider variation in terms of technologies supported.[17] [18]

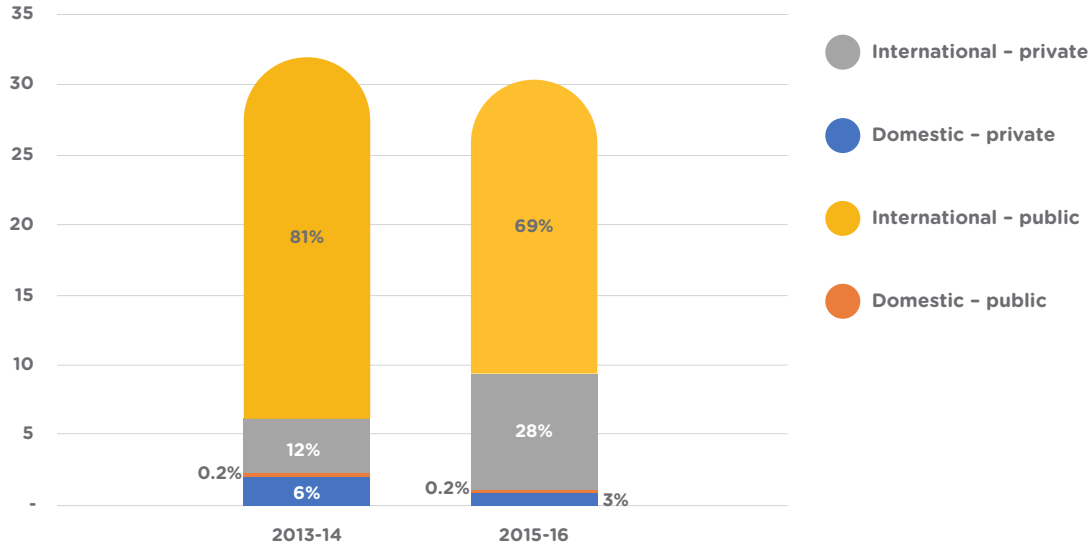
That noted, private sector commitments for clean cooking increased from USD 6 million per year in

[17] Public finance-supported transactions vary widely in terms of distribution, from as low as USD 3,000 to as high as USD 23.2 million.

[18] It should be noted that finance provided by philanthropic foundations, typically concessional in nature, has an average transaction size of less than USD 0.1 million. Excluding philanthropic contributions, public actors still spend 3.5 times more per transaction than the private sector.

Figure 2.17

Sources of finance for access to residential clean cooking solutions in high-impact countries (USD million)



2013-14 to USD 9.3 million in 2015-16, representing 31% of all finance tracked and an increase of 56%. Most private sector contributions came from international sources, which represented 76% or more of private financial commitments. The increase in private sector commitments was primarily driven by increased impact investment activities.

International transactions represented the vast majority (92%) of all finance for residential clean cooking in 2015-16, equivalent to an annual average of USD 28 million. The portion and amount do not differ much from the situation depicted in 2013-14, when international commitments averaged USD 30 million, or 94% of the total.

Only 13 financial commitments, for a cumulative value of less than one million dollars per year, were identified at the domestic level, most of these supporting the penetration of biomass stoves. For the reasons explained at the beginning of the chapter, it is likely that the domestic dimension of clean cooking financing is underrepresented in this analysis. (See also Box 6 on Tracking finance for the LPG supply chain.)[19]

[19] For example, data on domestic government spending on clean cooking in Indonesia (LPG-to-Kerosene program) and India (Ujjwala program launched in 2016) were not captured by the databases used for tracking finance for clean cooking.

Both public and private organizations directed most of their investment (74% and 67% respectively) towards Sub-Saharan African countries.

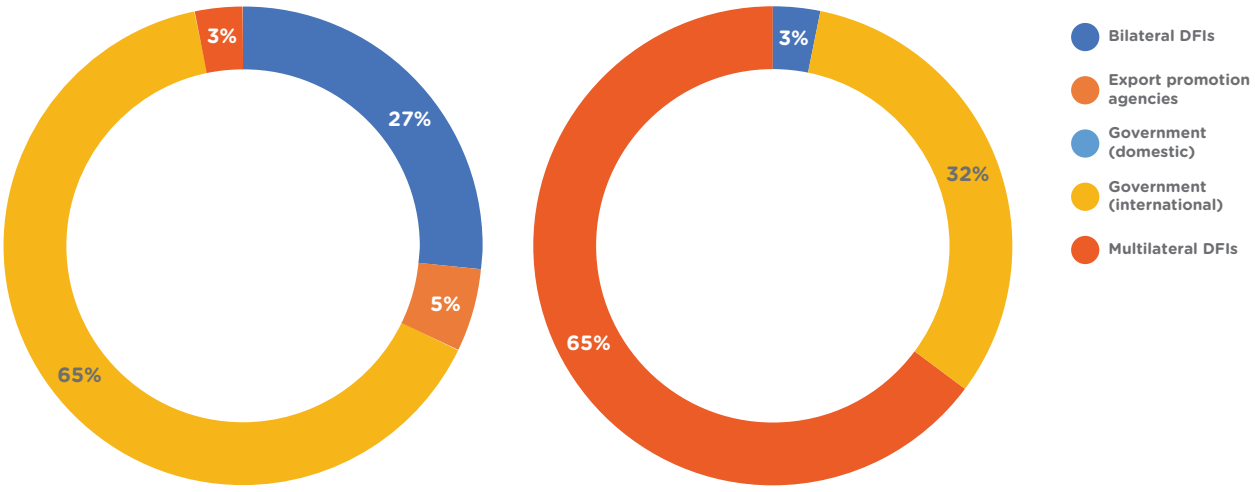
Nearly all public funding was committed in the form of grants, while equity investments were the predominant choice of private actors (62% contribution).

Multilateral development financial institutions provided the majority of clean cooking finance (45%), followed by bilateral governmental agencies and aid providers (22%). This is a significant shift compared to 2013-14 when bilateral governmental agencies provided 53% and multilateral development financial institutions only provided 2% of total committed finance (Figure 2.18). Bilateral governmental agencies decreased both their overall number of transactions (from 49 to 36 transactions) and the average financial commitment per transaction (from USD 0.7 million to USD 0.4 million per transaction) from 2013-14 to 2015-16. The significant increase in contributions from multilateral development financial institutions is due to a single financial commitment of USD 23 million made in 2015.

Non-bank financial institutions—such as private equity, venture capital, and impact investors—and phil-

Figure 2.18

Public finance providers for residential clean cooking (USD million)



anthropic foundations contributed 64% of private finance, providing 40% and 24% respectively (Figure 2.19). This year's survey results (see Box 2 for more details) showed that one impact investor was the leading investor among non-bank financial institutions from the private sector, contributing 29% of private sector commitments in 2015-16, or an average of USD 2.7 million per year. The philanthropic foundation with the largest annual financing to clean cooking averaged USD 0.9 million per year.

Much of the finance for clean cooking in 2015-16 was made through multilateral contributions, providing 54% of total committed finance, or an average of USD 16.7 million per year, predominantly as a result of the contribution from the European Development Fund to support the installation of 35,000 biogas digesters in Ethiopia in 2015.

In terms of individual country contributions, the United States provided 20% of total finance commitments (USD 6 million per year), followed by European public and private institutions which contributed 18% (USD 5.5 million per year) of total commitments. Of these, Germany and the United Kingdom each provided USD 1.3 million per year on average.

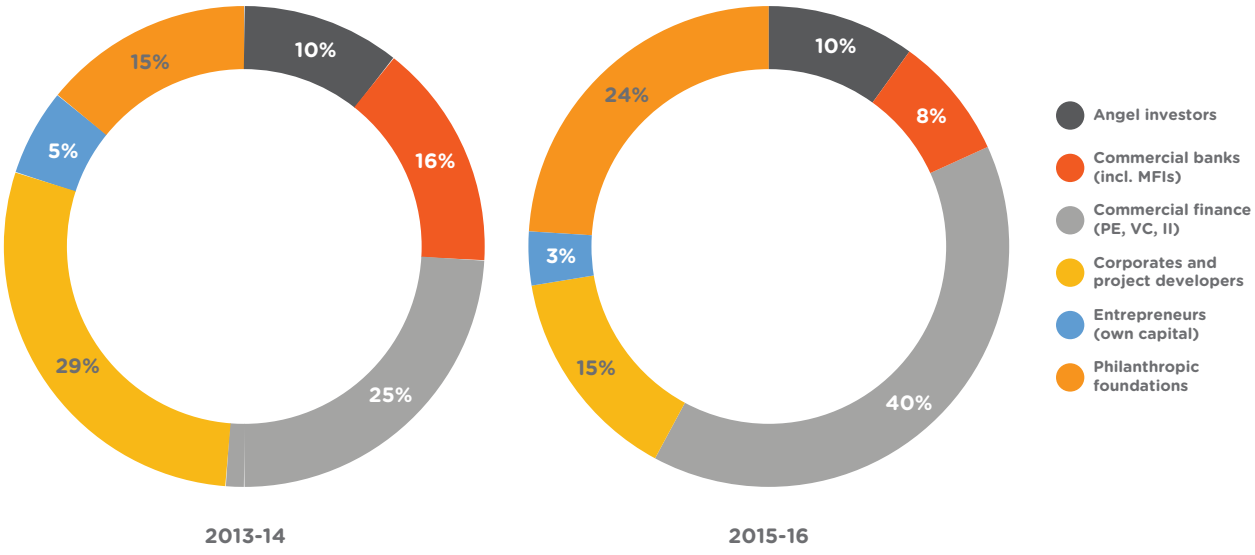
2.2.2 Instruments

Most of the finance commitments for residential clean cooking in 2015-16 were provided in the form of grants—about 74%, equivalent to an average annual commitment of USD 22.4 million—followed by equity investments at 21%, for a total annual flow of USD 6.4 million (Figure 2.20). Multilateral financial institutions and bilateral development assistance accounted for 91% of the grants for clean cooking solutions, primarily supporting biogas digesters and improved biomass stoves. One notable example is the European Development Fund's biogas digester program in Ethiopia, which was a main contributor of grants for residential clean cooking.

Compared to 2013-14, there was a significant increase in equity investment activities around residential clean cooking in 2015-16, albeit from a very low base. There were 40 transactions identified in 2015-16, compared to only 13 in 2013-14. All of the equity investments were small-scale, with an average of USD 0.3 million per transaction, primarily driven by commercial finance from non-bank financial institutions (representing 56% of all equity investments). Only three equity investments with a transaction value above USD 1 million were identified—two in India and one in Indonesia. The only equity investment that originated from a domestic source was in India.

Figure 2.19

Private finance providers for residential clean cooking



BOX 4

Data Coverage and Gaps

The report's analysis of the financial landscape for clean cooking relies on a number of data sources, including OECD's DAC CRS, GACC, IJ Global, and survey results from impact investment institutions. With the exception of the survey to philanthropic foundations and impact investors, the same data sources were used for the 2013-14 analysis.

However, significant data gaps exist that prevent the presentation of a completely comprehensive analysis on financial flows around clean cooking activities. The limitations and gaps include:

Market shares and market structure: country-level data showing residential and non-residential uses of clean cooking are limited. The analysis in this chapter focuses on finance flows for residential clean cooking access, to which the assumptions outlined in Annex 1 are applied.

Piped natural gas data: no transaction data is available to show finance flows for natural gas infrastructure, although these costs represent a significant amount.

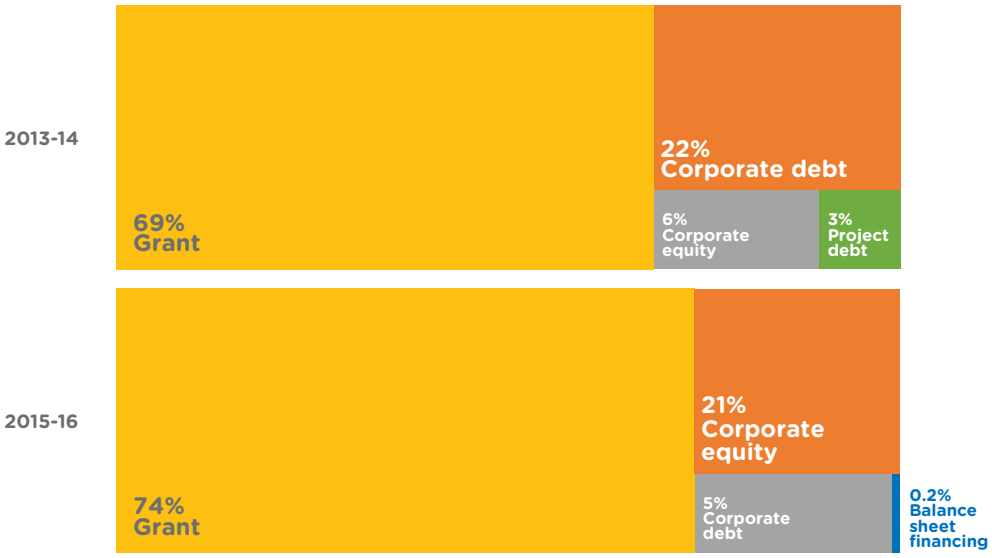
Country-level data: the depth and quality of country-level data in the global database vary significantly. No country-level financial flows data were found in the global database for Afghanistan, China, Congo (DR), Korea (DPR), Myanmar or Philippines.

OECD DAC CRS data: Project descriptions in the OECD DAC CRS database are limited. Conservative assumptions were used to determine the eligibility of the listed projects, along with the percentage of finance flows focusing on clean cooking.[20]

[20] The OECD-DAC is currently revising energy codes to allow a better tracking of development finance for SDG7, in particular for what concerns clean cooking and off-grid energy sources, pending approval from its members (personal communication with OECD staff, September 2018).

Figure 2.20

Finance instruments for residential clean cooking



Domestic subsidies for LPG consumption are not tracked in this chapter due to the complexity of obtaining the data. However, Chapter 4 describes the importance of such subsidies for the expansion of LPG solutions in Indonesia.

2.2.3 Recipients

Countries in Sub-Saharan Africa received the most funding for residential clean cooking access (72%, an average of USD 22 million per year) in 2015-16, followed by countries in the South Asia region (16%, an average of USD 5 million per year).

Overall, Ethiopia and Kenya were the biggest recipients of funding in 2015-16, receiving about 57% of total tracked financial commitments. In South Asia, India received the clear majority of finance—89%. In South East Asia, however, nearly all finance flows went to Indonesia (Figure 2.21).

Many countries with low access to clean cooking solutions, such as the Democratic Republic of Congo, Madagascar and Mozambique received little to no finance. When combined, Mozambique and Madagascar received less than 0.5% of tracked finance commitments, while the Democratic Republic of Congo did not receive any.

2.2.4 Sectors and Uses

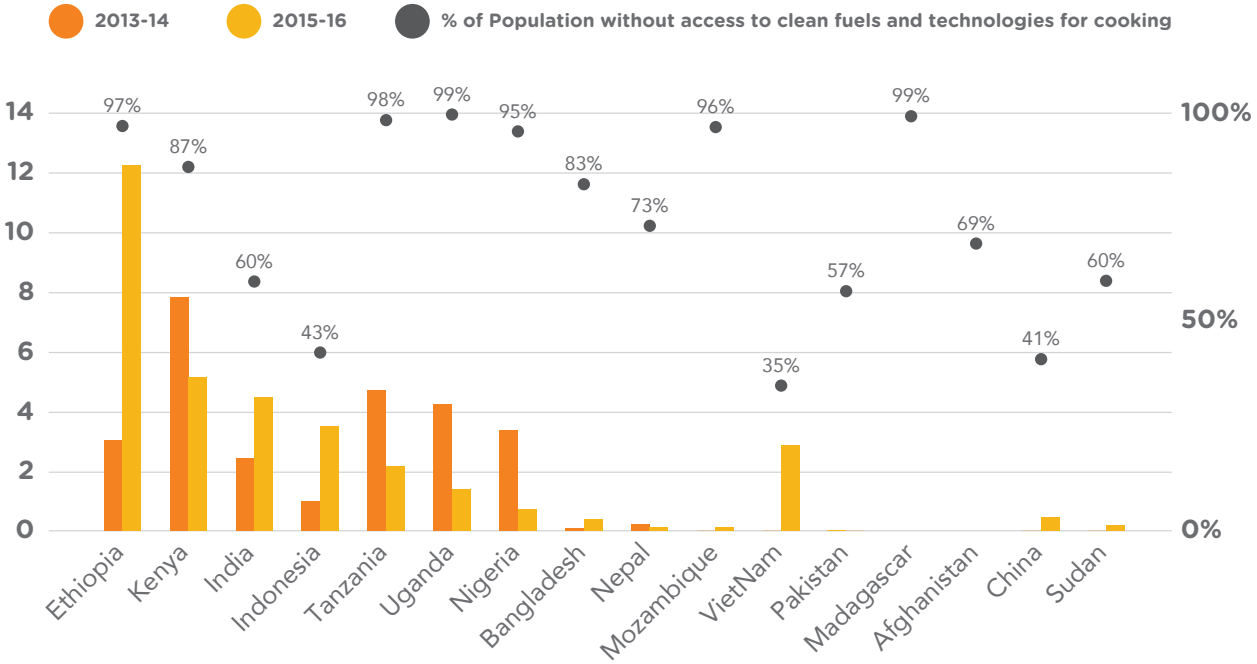
In terms of asset types, the analysis for 2015-16 shows a similar trend to 2013-14, where most finance commitments went to the distribution of biogas digesters (averaging USD 16.8 million per year) and improved biomass cookstoves (averaging USD 8.1 million per year). (See Figure 2.22). Finance flows to biogas digesters, which provide Tier 3 level access, and improved biomass cookstoves, which provide Tier 1 level access, represent 55% and 27% of all tracked financial commitments, respectively.

Alcohol, which is used for stoves and fuel and considered Tier 1 access, made a significant jump, receiving, on average, USD 2.9 million per year compared to the previous two years, in which it averaged less than USD 0.2 million per year.

About 59% of the finance commitments that were tracked are expected to deliver Tier 3 level of clean

Figure 2.21

Recipients of finance for residential clean cooking (USD million)



Note: average over 2015-16. No data was found for Afghanistan, China, Congo DR, Korea DPR, Myanmar, Philippines or Sudan.

BOX 5

Focus on GACC Tracking Efforts

Since 2010, the GACC has worked with its member organizations to collect data about their annual sales, distribution numbers, and financing raised. This self-reported data is compiled to help track and measure progress toward increasing access to and adoption of cleaner and more efficient cookstoves and fuels. For the development of this report and the previous one, GACC kindly contributed its data on financing raised from cookstove and fuel companies, which represent a fundamental part of the global clean cooking financing landscape. At the time of writing, GACC was finalizing an update to the existing database of transactions and its newest findings were not included in this report.

However, preliminary findings from GACC's update show that finance raised by the clean cooking companies it tracked reached USD 59 million in 2015-16 (24 months), an average of USD 29.5 per annum, updating its previous figure of USD 46 million (USD 23 per annum) for the same period.

cooking access (an average of USD 18 million per year), driven primarily by the European Development Fund's biogas digester program in Ethiopia (Figure 2.23). Approximately 36% of finance commitments are expected to deliver Tier 1 level of clean cooking access (an average of USD 11.3 million per year), mostly from the distribution of improved biomass stoves.

The report notes that 69% of non-concessional private finance commitments, or an average of USD 5 million per year, went to support improved biomass stoves distribution. In the same period, 74% of concessional finance, an average of USD 16.6 million per year, from both public and private actors, went to support biogas digesters. This shows early signs of a maturing market for improved cookstoves and a base to scale up commercial finance to extend the use of lower-tier technologies. Concessional finance is still crucial to support dissemination of higher-tier solutions, and is required in amounts in an order of magnitude above current levels.

Figure 2.22

Finance for residential clean cooking according to asset type

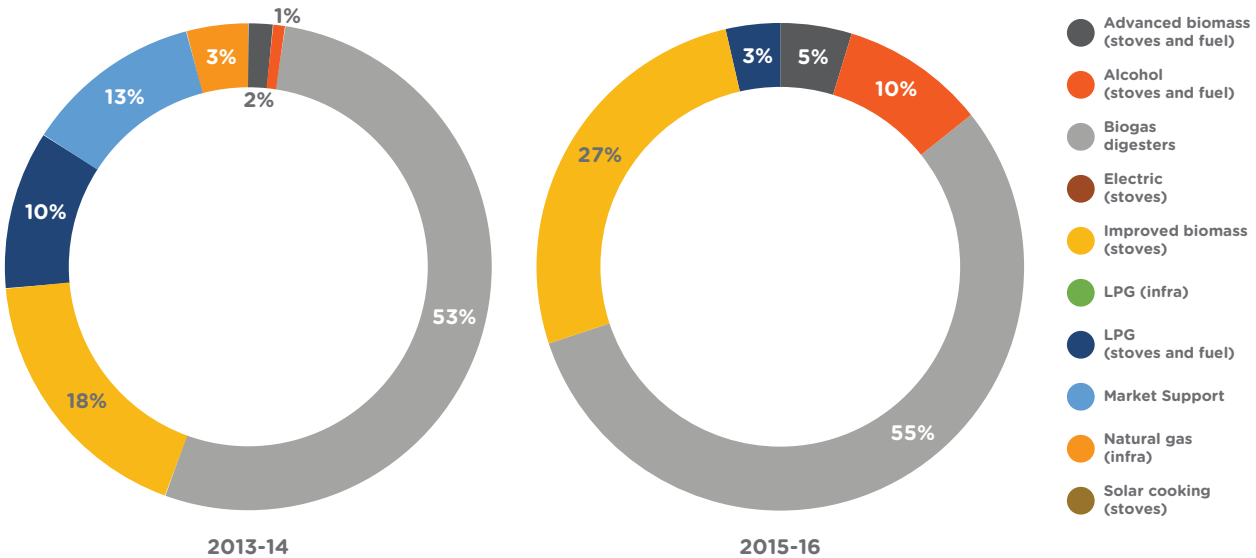
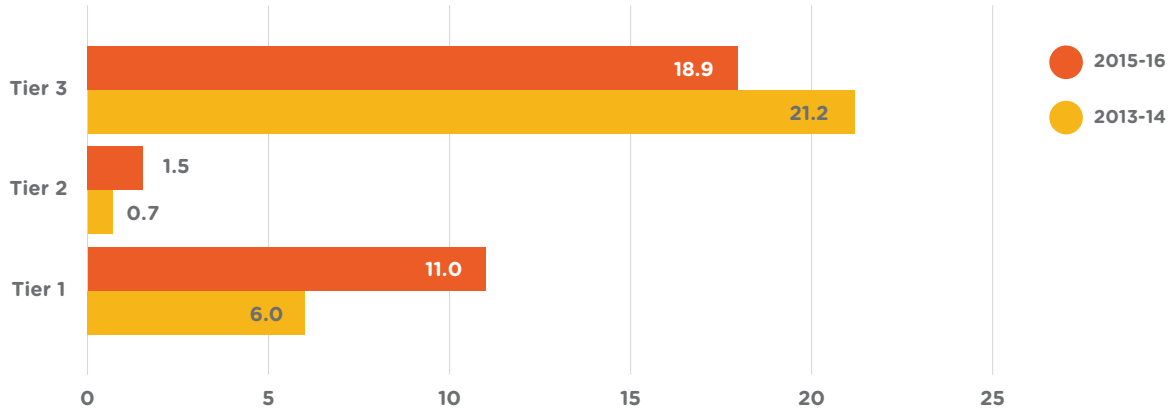


Figure 2.23

Finance for residential clean cooking according to Tiers of access (USD million)



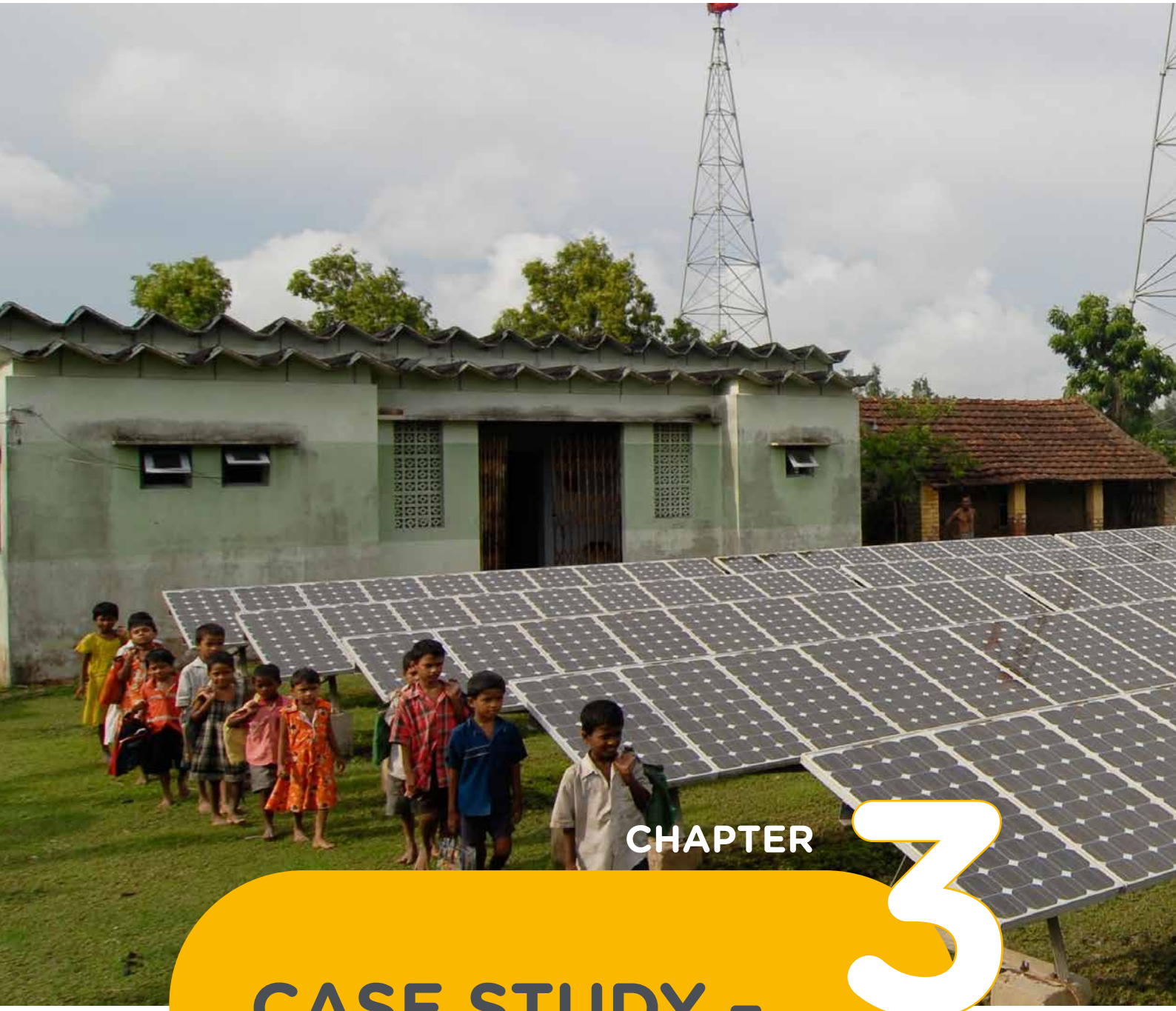
BOX 6

Tracking Finance for LPG Supply Chains

A predominant issue in tracking finance to the clean cooking sector is the variety of technologies offering clean solutions, and the capital required to fund them. Most of the activities tracked in this chapter have a smaller-scale, community impact, but other solutions, such as LPG, biogas and ethanol, require developers and financiers to adopt long-term, "industry building" perspectives, as well as multi-million dollar investment. The financial and professional service providers and organizations, as well as the regulatory aspects driving these industries are substantively different to the rest of the sector, as is the contribution to countries' clean cooking access. According to IEA projections, the LPG and biogas sectors have the potential to provide clean cooking access to 1 billion people by 2030, mostly in urban areas (IEA, 2017). Implementing these opportunities requires a combination of refining, bulk fuel storage, bulk fuel transport and distribution, refilling, and consumer appliance development. It will also require substantial investment from local government, as well as general market development support.

This analysis is currently unable to capture domestic budget investment, and therefore lacks an important piece of the clean cooking finance puzzle. However, the report's methodology was expanded to include investment for LPG storage facilities and cylinder bottling plants, which will be reflected in future iterations of this research.

SEforALL will continue to work with the Global LPG Partnership (GLPGP) and the World LPG Association (WLPGA) to further improve the tracking methodology for LPG solutions for clean cooking access and provide a more comprehensive overview of the market for future iterations of the research.



CHAPTER 3

CASE STUDY – ELECTRICITY ACCESS IN INDIA

In this section, the report takes a deep look at financing for electricity access in India. Context is provided for electricity access goals and status, in addition to an overview of current financing for electricity access, extracted from the analysis presented in Chapter 2. Key financial barriers to electricity access are also discussed, as well as the most relevant technologies and recommendations to increase financing flows in the sector and ultimately achieve universal electrification and reliable power supply in India.

3.1 ACCESS TO ELECTRICITY IN INDIA

WHILE INDIA HAS MADE SOLID PROGRESS ON ELECTRIFICATION IN RECENT YEARS, 22 MILLION HOUSEHOLDS IN THE COUNTRY STILL LACK ANY ELECTRICITY ACCESS, AND MILLIONS MORE FACE UNRELIABLE POWER SUPPLY.

Electrification of every household and a reliable, 24x7 power supply are the critical milestones for electricity access. In April 2018, the Government of India officially announced that 100% of its villages had been electrified under the Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY[21]), Centre's rural electrification program. This is a noteworthy annoucement, but does not necessarily translate to 100% household electrification, as a village in India is deemed electrified as long as only 10% of the total households and some public places like schools, government offices, and health centers in the village have access to electricity. As a result, the report estimates that more than 22 million households[22] in India (roughly 130 million people) have yet to achieve access to grid or off-grid electricity. The state of Uttar Pradesh, alone, accounts for almost 50% of the total unelectrified households, and five other states have more than one million households unelectrified.

India aims to achieve universal household electrification by 2019, and 24x7 'Power to All' by 2022 (Ministry of Power, 2017):

- To achieve the first target of electrification of all rural and urban households, the government launched Pradhan Mantri Sahaj Bijli Har Ghar Yojana (Saubhagya) in 2017. This initiative aims to provide electricity connections (grid connected and solar standalone systems) to all unelectrified households in rural and urban areas by March 2019.

- The second target is to ensure uninterrupted and reliable electric supply to all of the already electrified households, especially in the rural hinterlands. As shown by a 2018 analysis (see Appendix 2.1),[23] grid unreliability is a national issue in India, with 100 out of 1,100 towns witnessing more than 14 power cuts per week, which corresponds to the lowest level tiers of energy access. The situation worsens when data is analyzed at the village-level. For example, in six Indian states, while almost 100% of villages were reached by the grid, in rural areas, only 69% of households were connected to it. Of this number, 63% of households were receiving less than four hours of electricity per day (Tier 0 of the MTF) (CEEW and Niti Aayog, 2017).

[21] http://www.ddugjy.gov.in/portal/index.jsp
[22] As of July 2018 available on Saubhagya website; http://saubhagya.gov.in/
[23] These number are averages of last six months starting July 2018 mainly to account for seasonal variations in any month.

3.2 CURRENT LANDSCAPE OF FINANCE FLOWS FOR ELECTRICITY ACCESS IN INDIA

INDIA IS INCREASING ELECTRICITY FINANCE, WITH STRONG FINANCIAL SUPPORT FROM DOMESTIC PRIVATE INSTITUTIONS BUT IS NOT ON TRACK TO MEET FUTURE NEEDS.

After 2014, a significant increase in finance for electricity access occurred in India. In fact, India alone accounted for more than 57% of the total increase in electricity finance recorded across all 20 high-impact countries from 2013-14 to 2015-16. Finance increased by USD 9.4 billion over this period, reaching USD 17.2 billion a year in 2015-16.

While this progress is encouraging, it is important to note that while electricity access has improved, India is not keeping pace with its present and future needs. Traditionally, India has viewed solutions to rural electricity access as originating from centralized generation and grid-based distribution approaches, although these investments have been slow to materialize and meet rural electrification needs. The centralized, grid-sector has managed to attract large amounts of private capital, as evident from increased investments in utility scale renewable projects. However, investments in off-grid solutions, which are critical for rural energy access, remain lackluster.

Figure 3.1

Sources of electricity finance in India in 2015-16 (USD billion)

Note: Averages over 2015-16

3.2.1 Sources

The majority of the tracked financing flows for electricity (85%) come from domestic sources of finance, mainly from private corporations and project developers. Domestic corporations and project developers invested USD 10 billion a year in 2015-16, compared to USD 1.6 billion a year in 2013-14 (Figure 3.1). Of this, about 87% was allocated to grid connected solar and wind projects, in particular utility scale projects.

This remarkable increase was mainly driven by India's aggressive policy target of 175GW of renewable energy generation by 2022, growing certainty around renewable technologies with more predictable cash flows and strategic potential of renewable investments (CPI, 2018). These renewable targets were backed by supporting policies such as generation-based incentives (GBIs), capital and interest subsidies, viability gap funding, concessional finance, fiscal incentives etc. in the last few year (MNRE, 2017). The initial support from public finances and supportive government polices has ensured an effective transition to private sector led renewable energy deployment. However, it is important to note that rooftop solar projects, which are more essential for increasing energy access, are still struggling to receive financing as evident from its currently installed capacity of mere 2.5 GW (compared to 40GW target by 2022).

About 15%, or USD 2.6 billion, of all financing for electricity in India originated from outside of India. International public finance channeled to the country reached USD 2 billion in 2015-16, of which multilateral institutions and bilateral donors provided an annual average of USD 1.4 billion and USD 0.6 billion respectively, in line with the volumes tracked in 2013-14. These investments were generally channeled to grid connected renewables (47%), transmission and distribution projects (27%), and market support activities (10%). Commitments from multilateral and bilateral institutions to the transmission and distribution of electricity, in particular, decreased by 36% to USD 700 million in 2015-16.

Germany was the largest contributor among bilateral donors and agencies in 2015-16, providing USD 428 million, followed by Japan with USD 230 million. This is in line with the India-German consultations in 2015, wherein Germany committed a credit line for concessional loans of up to EUR 1 billion (MNRE, 2017) towards India's green energy corridors and solar projects through KfW, the German development bank.

While domestic public finance also contributed to electricity access, data gaps mean that the overall numbers do not capture this contribution (see Annex 2.2). There is reasonable evidence that public support set the conditions necessary for increasing electricity access and may have actually played a major role in India's recent progress. Historically, as well as more recently, the central and state governments, through various policy schemes, have focused on providing

electricity connections and improving sub-transmission and distribution infrastructure. The DDUGJY[24] scheme (until 2021-22) has an outlay of USD 6.8 billion[25], which includes budgetary support of USD 5.1 billion. Similarly, the Saubhagya scheme (until 2019) has a total cost of USD 2.5 billion, including USD 1.89 billion of budgetary support from the central government.

The figures presented in this chapter do not account for the cost of these domestic policies and subsidies. As highlighted in the previous chapter, domestic energy budgets are not generally available and have to be collected through in-country efforts. Revenue supporting measures or tax incentives could also constitute double counting with the other investment forms that are tracked, like hard infrastructure financing.

Public and private India banking institutions provided an increasing amount of finance for electricity projects. Commitments for grid-connected renewables from national public banks increased fourfold. Overall commitments by national public banks increased from USD 950 million a year in 2013-14 to USD 2.4 billion in 2015-16. While their lending to coal fueled grid connected projects remained almost the same at USD 550 million between 2013-14 and 2015-16, national banks' commitments to grid connected renewables projects increased to USD 1.7 billion from USD 400 million.

Similarly, commercial banks' lending to renewable projects accounted for 71% of their total lending, doubling in size in 2015-16 compared to 2013-14 to reach almost USD 1 billion. This momentum is primarily due to a conducive policy environment, driven by a highly ambitious renewable energy target of 175 GW, complemented by the Reserve Bank of India allowing priority sector lending status to the renewable energy sector in early 2015.

3.2.2 Instruments

Balance sheet financing, mainly from corporates and project developers, accounted for almost 50% of total domestic financing, or USD 7.1 billion in 2015-16.[26] Project equity from domestic financing almost doubled from USD 1.5 billion in 2013-14 to USD 2.9 billion in 2015-16. Approximately 40% of international finance for electricity was concessional in nature, mainly in the form of project debt from bilateral and multilateral institutions, down from 52% in 2013-14.

As visualized in Figure 3.2, off-grid solar in India is still dependent upon public or concessional support. Unlike in other parts of the world, like East Africa, this market has not yet been able to attract a significant volume of private investment, and realistically will struggle to expand in the coming years.

3.2.3 Uses

GRID-CONNECTED SOLAR AND WIND PROJECTS ARE RECEIVING MORE FINANCE THAN EVER BEFORE IN INDIA, WHILE FOSSIL FUEL POWER COMPANIES HAVE STARTED TO FACE DETERIORATING FINANCIAL PERFORMANCE.

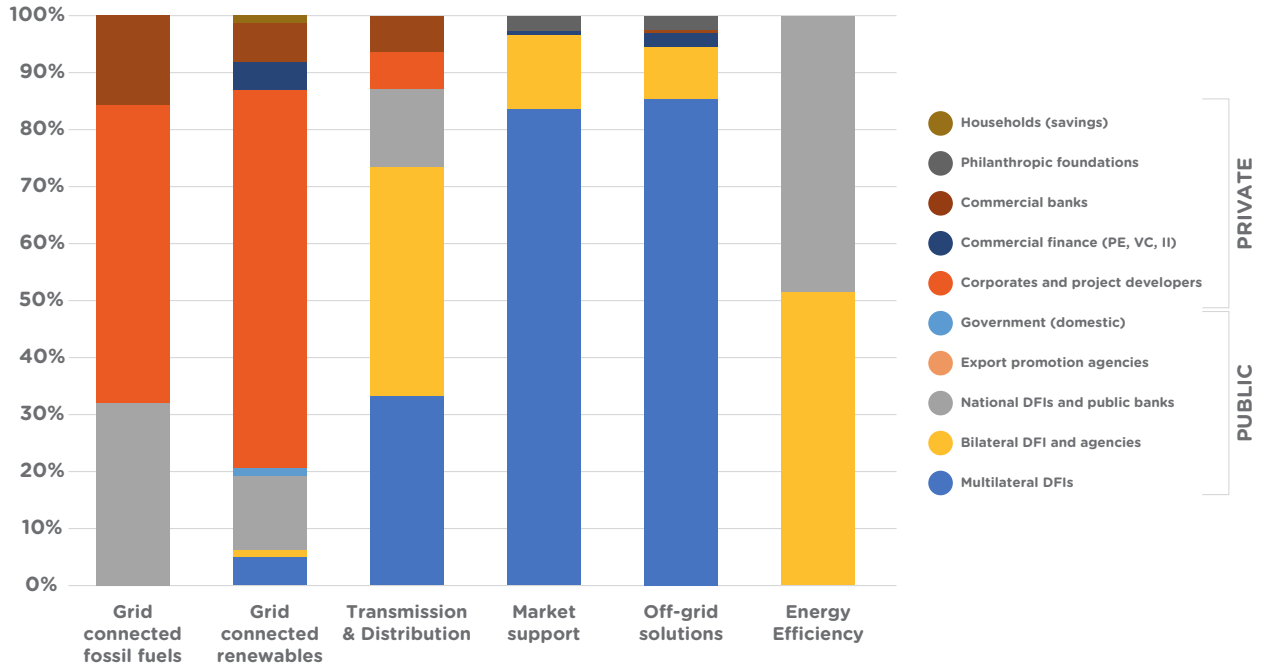
The share of grid connected renewables in all electricity flows in India increased to approximately 80% in 2015-16, up from 65% in 2013-14 (Figure 3.3). The tracked data shows that investment in grid connected renewable projects increased almost three times, to reach USD 13.6 billion a year in 2015-16. The share of utility solar PV projects doubled to 40%, reaching USD 6.9 billion a year in 2015-16, compared to USD 1.5 billion in 2013-14. Wind projects ranked second with 35%, and saw an increase of 2.3 times in the absolute amount (USD 6.2 billion in 2015-16).

[24] Under the scheme, the central government provides 60% of the project cost as grant, the state DISCOMs raise 10% of the funds, and 30% is borrowed from financial institutions and banks.
[25] All figures are converted from local currency (INR).

[26] Assumptions of realistic debt to equity ratios were applied to balance sheet financing, which is a default classification used by data providers when information on financing details is missing. Structures of 70:30 are common for financing large scale wind and solar PV projects in India.

Figure 3.2

Sources of financing by technology (%)



In absolute terms, financing for transmission and distribution projects remained at more than USD 1 billion, although its share on the total finance tracked declined from 15% in 2013-14 to 6% in 2015-16. It is important to note that central and state governments have made considerable investments in inter-and-intra-state grids recently due to their focus on expanding last mile connections, aggressive support to the electrification of railway tracks, and further upgrades to the capacity of transmission lines. The government has put in place an investment plan of USD 35 billon in the transmission sector for the period 2017-22, with plans to allocate nearly USD 18 billion to inter-state transmission capacity (EPR, 2018). To capture these commitments in future research, the methodology will need to expand with improved tracking for domestic public data sources.

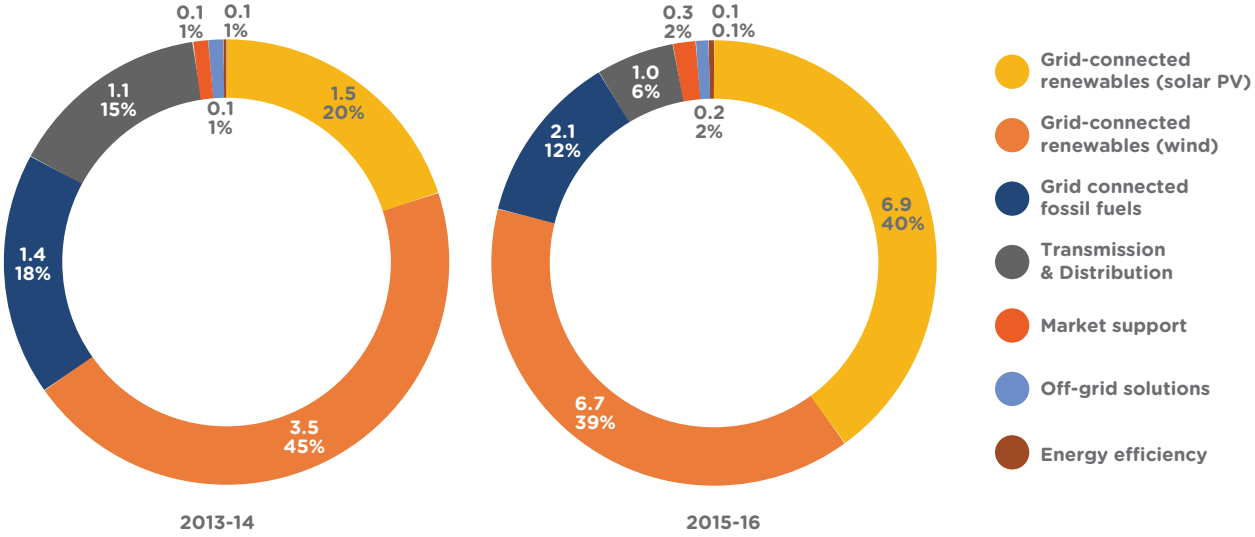
The report estimates that 24% of electricity finance tracked in 2015-16 contributed to increasing or improving access to electricity for residential consumers, with the rest mostly benefiting the industrial and commercial sectors. Nationwide, the report estimates that residential consumers have access to mostly Tier 3 and 4 levels of electricity,[27] suggesting that a significant flow of finance has been used for improving the reliability of the grid for already connected residential households. The situation worsens in rural contexts where households, despite having an electricity connection, experience lower Tiers of access due to unreliable grid services, often receiving less than four hours of electricity a day (CEEW and Niti Aayog, 2017).

Grid-connected solar and wind projects are receiving more finance than ever before in India, and concurrently, fossil fuel power companies in India have started to face deteriorating financial performance, due to a decreasing return on capital and the increasing cost of capital. This is due to low capacity utilization, increasing fuel cost, and increased competition from the renewable energy sector decreasing their return on capital (CPI, 2018 and IEEFA, 2018). In India, during 2015-16, only one grid connected coal plant investment of USD 2.2 billion was made by a private developer, Talwandi Sabo Coal Plant (1980 MW). The other tracked commitments to coal projects were

[27] See Annex 1 for more information about the Multi-Tier Framework.

Figure 3.3

India: Flows by technology (USD billion and %)



made by national and commercial banks to finance plants already under construction. All funding to these projects was made on commercial terms.

According to a Central Electricity Authority 2016 report, India requires no further coal-based capacity additions to meet its energy demand until 2022, besides those that are already under construction.[28] Instead, India would focus on renewable-based capacity additions (Business Standard, 2018).

Funding for market support activities quadrupled to USD 280 million in 2015-16, yet still account for less than 2% of the total financing. More than 97% was received from international sources, e.g., multilateral and bilateral DFIs, and international government agencies.

Only 1%[29] of all funding, or about USD 168 million per year, was allocated to off-grid solutions (OGS), including mini-grids, mainly from multilateral DFIs. It is important to note that financial information for OGS remains underreported given limited information from national budgets and private sources.[30] India's Ministry of New and Renewable Energy (MNRE) allocated USD 21 million a year in 2013-14, and USD 70 million a year in 2015-16 to finance programs and schemes in off-grid/distributed and decentralized renewable power, including the Remote Village Electrification Programme. These are not captured in the dataset, however, given limited or no public disclosure of the detailed project level information.

While on-grid connections are expected to be the dominant type of electricity connection by 2025, mini grids and other off-grid technologies are equally important, at least in the short-to-medium-term for the 100% rural electrification goal, and to improve the overall reliability of power (IEA, 2015). The government has already embarked upon taking the central grid to each household in India. While this is commendable, experiences from some Indian states and other countries that have achieved universal rural electrification in recent years show that OGS are critically important to achieve reli-

[28] CEA reports that over 50 GW of coal-based power projects are currently under various stages of construction and are likely to be finalized by 2022.
[29] A conservative approach has been taken with the GOGLA dataset, which tracks investments in off-grid solar home systems and lanterns, wherein financing in companies with global focus are excluded, as limited information about their country level presence may lead to possible double counting. Also, commitments from several foundations which are active in the electricity access space remain largely unaccounted for, due to limited publicly available information.

[30] According to Dalberg's (2016) report, capital deployment so far in mini-grid technology is less than USD 100 million with 30 mini-grid companies operational in India. Most of the capital deployed is from development finance institutions, impact investors, and philanthropies (90%), with negligible participation from commercial lenders.

able, stable, less time-consuming and cost-effective access to electricity. Given this experience, the Government of India's target is to install 500 MW of mini-grids by 2021, with USD 350-400 million of capital investment required. However, there is neither a dedicated policy nor a clear implementation plan from the government to achieve these mini-grid installation targets.

A MULTI-PRONGED APPROACH IS NEEDED TO SOLVE INDIA'S ENERGY ACCESS PROBLEM, WHICH INCLUDES CENTRALIZED AND OFF-GRID SOLUTIONS (OGS). WHILE THERE ARE GROWING INVESTMENTS IN UTILITY SCALE ELECTRICITY PROJECTS, OGS HAVE SECURED ONLY 1% OF THE TOTAL CAPITAL COMMITMENTS FOR ELECTRICITY FINANCING.

The required magnitude of investments in OGS has yet to fully materialize. This gap between current investment levels and required capital investment in OGS is likely to hamper India's energy access targets. In the next section, the report discusses the key financing barriers to OGS that are impeding the existing financial instruments to mobilize capital, especially private commercial capital. More general barriers to electricity access are discussed in Annex 2.3.

3.3 BARRIERS IN FINANCING OFF-GRID SOLUTIONS IN INDIA

India needs a well-calibrated, multi-pronged approach that uses all available centralized and off-grid solutions (OGS) in the most efficient manner. Some general guidelines that are often proposed to provide electricity access to a region include the following:

- Mini-grids are most suitable for villages and hamlets with commercial activities, a significant number of households, and relatively flat and easily accessible geographies.
- Off-grid solutions, like solar home systems, are the most economically efficient solution for remote rural areas and hamlets with difficult terrain and a limited number of households.
- The central grid is typically the most economical option for urban areas with industries and large populations.

Considering these guidelines, OGS are crucial to help fill in the electricity access gap to the millions of rural households in India without access to electricity. However, the current financing landscape for the OGS segment is primarily a patchwork of international grants, government subsidy, debt from DFIs, and promoter equity for both solar home systems and mini-grids. Private commercial capital is still insufficient, and although off-grid solar markets are active with more than 40 established companies, few of them have achieved profitability and most need to scale two-to-four times the amount of capital to break even, let alone become commercially viable. The major issue is the lack of appropriate investor class, which can support the sector by propelling the growth phase of the existing OGS players. In addition, there is also a lack of early-stage equity investors, which could support the emerging OGS players (Dalberg, 2016). Table 3 shows the various barriers impeding financing to off-grid solutions.

Table 3

Key barriers faced by OGS providers in accessing capital

Investment Barriers	Description	Financial Instrument and/ Investor Class Impacted
HIGH OFF-TAKER CREDIT RISK	• High cost of debt financing due to: o Rural households as off-takers with low income levels. o Lack of financial performance data for new OGS developers for credit evaluation. o OGS assets not accepted as collateral due to absence of secondary market and their remote location.	Private Commercial Debt investors and in many cases, concessional debtors
LACK OF PROJECT FINANCE IN INDIA	OGS sector, especially the mini-grid segment, is difficult to finance. Small and medium enterprises are without collateral and entail credit risk.	Commercial Project Finance Debt
LACK OF CAPACITY	• Lack of capacity amongst project developers to access grant and concessional financing. • Lack of capacity and resources at the local level amongst investors limit their ability to identify a suitable pipeline of projects. All investors, especially donors and commercial debtors.	All investors, especially donors and commercial debtors.
SCALE OF INVESTMENT	• Low investment ticket size of OGS projects and demand aggregation lead to high transaction costs.	All investors
EXIT OPTIONS[31]/ LIQUIDITY	• Lack of lucrative and standard exit options for equity investors. • Uncertainty of the long-term commercial viability of projects and subsequent phasing out of public capital.	Commercial equity and debt investors
POLICY/ REGULATORY RISKS	• Concerns over the long-term sustainability of OGS projects especially mini-grid projects; central grid extension plans by policymakers often lack clarity on long-term integration of mini-grids to the main grid.	All investors
OTHER COMMERCIAL/ MARKET BARRIERS	• Low attractiveness and uncertainty on realized output price; excessive market volatility, especially due to longer investment horizons for OGS projects. • Lack of matured mobile money market for advancements of innovative end-user financing models.	All investors

[31] Uncertainties on the realized value when monetizing the investment before end of asset's lifecycle (for equity sponsors), or maturity of loans (for lenders).

3.4 PATHWAYS TO INCREASE ACCESS TO MATCH THE INDONESIA STUDY

CONTINUOUS AND ENHANCED SUPPORT FROM THE PUBLIC SECTOR IS REQUIRED TO MOBILIZE PRIVATE COMMERCIAL CAPITAL IN THE OGS SECTOR.

Despite a few successful cases, OGS developers face several barriers in accessing the right forms of required capital, and additional efforts are required from all stakeholders to ensure that India achieves its 'Power for All' goal. This section briefly discusses some solutions to overcome the existing barriers to financing access to electricity, as well as ways to adopt, adapt, and scale up successful examples of increasing financing in OGS.

a) **The role of public capital in the future:** Public capital has played a key role in providing early start-up financing to several OGS projects but private commercial capital has not yet materialized at scale. Opportunities to use public capital more effectively are:

i. Risk mitigation: to mitigate credit risk and payment delay risks – both major risks for a private financier – a credit guarantee mechanism could catalyze private capital into the sector, by covering off-taker payment delays to developers though liquidity and default compensation.

Example: The Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE)[32] is a prime example of a third-party credit guarantee scheme set up by the government to enable private debt capital to lower credit-rated small and medium enterprises (SMEs). The CGTMSE supports SMEs in multiple productive sectors and can be adapted to the OGS sector.

ii. Grant capital for project preparation: As mentioned previously, OGS players, especially mini-grid developers, are struggling to scale up their businesses after crossing the initial start-up phase due to unavailability of long-term capital at affordable rates. A project preparation facility could provide grants to support the early-stage preparation of OGS projects and improve them into viable investment opportunities for long-term debt providers.

Example: The US-India Clean Energy Finance Facility (USICEF[33]) is a partnership between the Indian Ministry of New and Renewable Energy, the Overseas Private Investment Corporation (OPIC), and a consortium of foundations. The facility provides early stage preparation and development support to distributed solar power projects, in order to attract long-term debt financing from OPIC and other international financial institutions.

b) **Utilizing blended financing structures specific to OGS projects:** There are several innovative product-based financial structures that can be used for the OGS. One can be "blended finance",[34] which bridges the early/growth stage funding gap by combining grant capital with long tenor debt, or patient equity.

Example: Again, the USICEF is an example of blended finance. Public grants for project preparatory services are expected to mobilize USD 200 million of capital investment, leading to an estimated capacity installation of nearly 300 MW of grid-connected rooftop solar projects in India.

c) **De-risking the integration of mini-grids into the main grid:** Policymakers in key Indian states would need to communicate a clear policy framework for integrating mini-grids into the expanding main grid (REEEP, 2017). This framework should clearly lay out how to continue operating and safeguarding existing mini-grid project (and related investments) when central grids expand to remote areas. For instance, mini-grids should be allowed to sell excess power to the main grid at pre-defined tariffs, fixed by the Central Electricity Regulatory Commission (CERC). The mini-grid policy by Uttar Pradesh offers a good starting point: it explicitly states that distributed energy service companies (DESCOs) can continue to supply power to their consumers in parallel to the main grid, if the consumer agrees.

d) **Creating institutionalized secured lending:** An effective lending market requires primarily two things: acceptable credit information by an authenticated entity and a conversion of this information into institutionalized secured lending. Both aspects are interlinked and currently missing in India's OGS sector. There is a need to develop new credit rating models, or to improve existing ones to best assess the OGS sector. Investments are needed to create technology platforms to fill the gap of credit information systems. Collateral registries are also

[32] https://www.cgtmse.in/default.aspx
[33] https://www.usicef.org/

[34] Blended finance is defined in this report as "the use of public/philanthropic funds to mobilize multiples of additional private capital."

needed to identify rooftop solar as an asset class, which at the moment is not happening in India.

e) **Consolidation of business models:** It is important for project developers, especially in the mini-grid space, to align their business models to already successful ones, in order to avoid lengthy evaluation processes from funders. The DESCO model and the Pay-as-You-Go (PAYG) model, which have already been tested successfully in some African countries, are a few of the successful emerging business models.

Example:

- "Smart Power India," established by the Rockefeller Foundation, is a USD 75 million program to increase electricity access in rural areas of India by enabling the commercially viable business models of Electricity Service Companies (ESCOs) in the OGS space.

- PAYG faces the barrier of low mobile penetration and a robust mobile money market in India. Companies like SIMPA Networks and Greenlight Planet India, which have traditionally relied upon micro-financing, are already working to adopt the PAYG model in the country by implementing complementary solutions, such as deferred payment mechanisms. More companies need to adopt similar models to accelerate progress.

India has recently achieved remarkable progress in electrifying its population, but 22 million households still lack access. As with most countries, the traditional approach of providing centralized, grid-based connections has not fully reached remote areas and needs to be revisited as the primary solution for electrification for those areas. OGS, especially mini-grids, are heralded as the most cost-effective solution globally, and India should consider these as another viable mainstream solution to achieve energy access in the rural hinterlands.


DALMIA

CHAPTER 4

CASE STUDY – ACCESS TO CLEAN COOKING IN INDONESIA

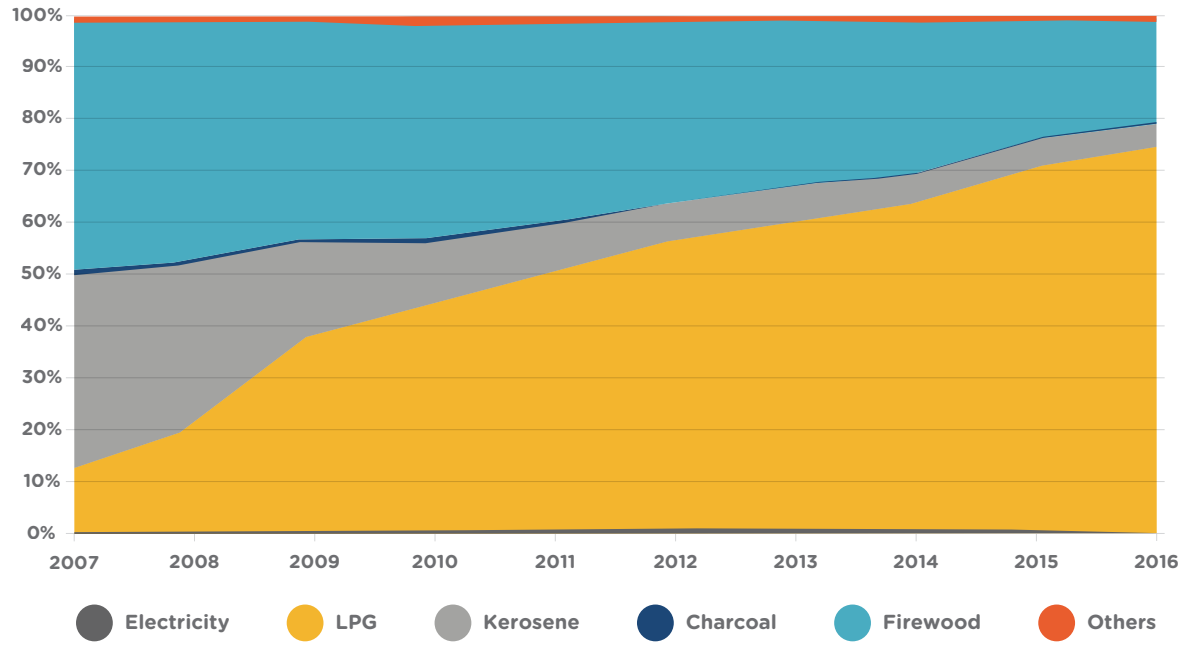
In this section, an in-depth assessment of financing for clean cooking access in Indonesia is presented. First the report looks at the policy context and current financing status of this sector, before assessing the emerging business models and relevant technologies, and providing recommendations to improve access to clean fuels and technologies for cooking in Indonesia.

4.1 CLEAN COOKING IN INDONESIA

AS OF 2016, 27% OF INDONESIAN HOUSEHOLDS – APPROXIMATELY 70 MILLION PEOPLE – STILL USE WOOD, KEROSENE, OR CHARCOAL COOKING METHODS. HOWEVER, THIS IS A VAST IMPROVEMENT FROM 2007, DRIVEN BY CONCERTED GOVERNMENT EFFORTS.

Figure 4.1

Share of household cooking in Indonesia (2007–2016)



Source: National Statistics Agency, 2007-2016

The Indonesian government launched a large-scale cooking fuel conversion program in 2007 to phase out kerosene and other traditional cooking methods, and shift to Liquefied Petroleum Gas (LPG). The target was to convert 6 million households in 2007, and approximately 42 million households and micro-business, nationally, by 2012 (MEMR, 2007). The program was successful in reaching more than 50 million households by 2012, reducing kerosene use from 37% in 2007 to only 6% in 2012, and increasing LPG use from 11% in 2007 to 55% in 2012 (Figure 4.1).

LPG has effectively replaced kerosene as the main source of cooking fuel in many regions in Indonesia; in 2016, 72% of Indonesian households used LPG for cooking. It is a cleaner and more efficient alternative to traditional cooking practices, and it appeals to mid-to-low income groups in both urban and rural regions. However, as of 2016, nearly 18 million households (27% of all Indonesian households), still rely on traditional cooking fuels, including firewood (22%) and kerosene (4%). Most of these households are located in Indonesia's rural and remote areas, especially in the Eastern provinces.[35] Figure 4.2 shows the difference between the national average and that of the Eastern rural provinces.

Aside from LPG, other technology solutions, such as biogas digesters and improved/advanced biomass cookstoves, are being tested through various clean cooking programs, primarily at the local level, but have yet to make a significant impact at the national level. Modern clean cooking solutions, such as natural gas, have generally not been used for residential use, and electric stoves are used only by a very small percentage of households, primarily in developed urban areas. Subsidies for LPG, and a lack of infrastructures for alternative solutions, have led to a general preference for LPG.

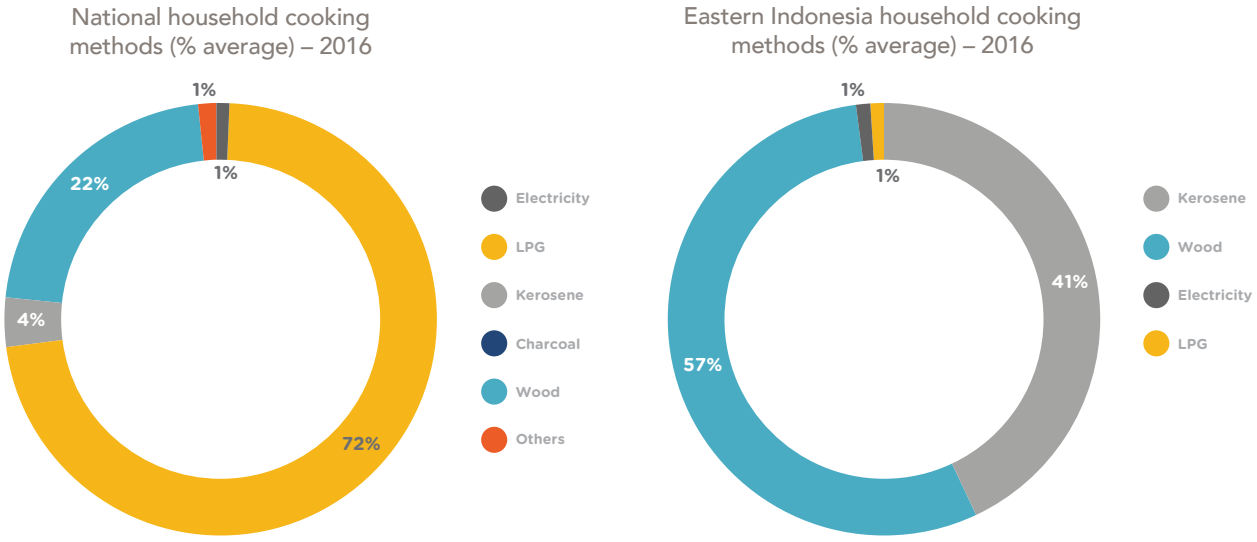
4.2 CURRENT LANDSCAPE OF INDONESIA FINANCE FLOWS FOR CLEAN COOKING

This section explores the country results for Indonesia by using the global methodology for tracking finance flows for residential clean cooking presented in Chapter 2.

[35] Maluku, North Maluku, East Nusa Tenggara, Papua, and West Papua regions.

Figure 4.2

Household cooking methods: comparison between the national average and Eastern Indonesia



Source: National Statistics Agency, 2007-2016

THE INDONESIAN GOVERNMENT'S SUPPORT FOR LPG REPRESENTS THE BULK OF FINANCE FLOWS FOR RESIDENTIAL CLEAN COOKING IN THE COUNTRY, WHILE OTHER ACTORS ARE LOOKING AT MORE DIVERSIFIED SOLUTIONS.

The methodology does not account for the cost of domestic policies and subsidies, but focuses instead on finance commitments made by international actors and the private sector, totaling USD 3.5 million per year in 2015-16.

To provide a more comprehensive overview of finance for residential clean cooking in Indonesia, the global methodology scope was expanded, and additional finance data on government subsidies for LPG were gathered. These are significantly larger than the other dimensions presented—USD 1.8 billion per year in 2015-16—and are presented separately in the next section.

4.2.1 Sources

The financial commitments tracked for Indonesia in 2015-16 averaged USD 3.5 million per year, almost entirely provided by multilateral DFIs (75%) and European bilateral donors (24%).

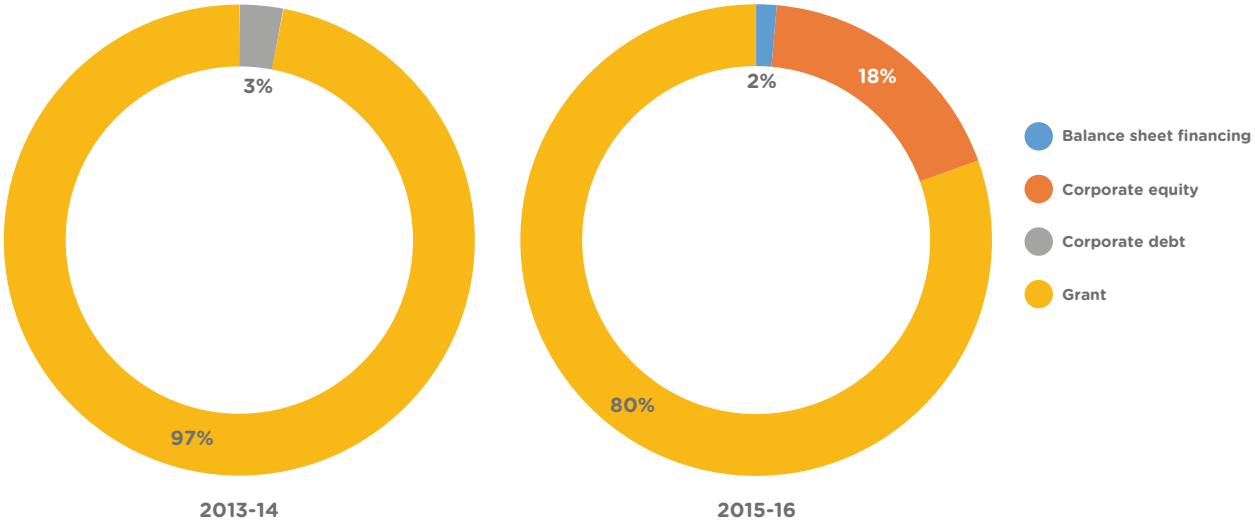
Various barriers, primarily associated with affordability and accessibility, have prevented the private sector from making a bigger impact in this sector. As a result, only a small portion of private investment was identified in 2015-16.

4.2.2 Instruments

Clean cooking activities in Indonesia were mostly supported through grants, accounting for 97% in 2013-14 and 80% in 2015-16 (Figure 4.3). Only one equity investment of USD 1.3 million was tracked in 2015 to support the production and distribution of advanced biomass stoves and fuels.

Figure 4.3

Financial instruments for clean cooking in Indonesia

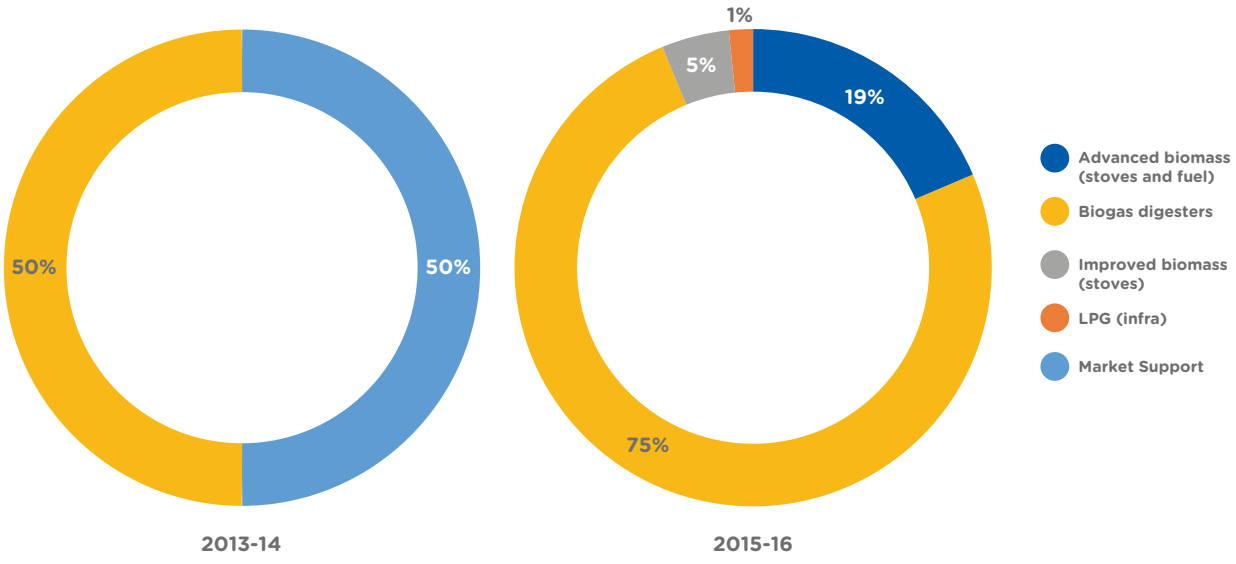


4.2.3 Uses

Most finance flows tracked from 2013 to 2016 supported the distribution of biogas digesters (75% or USD 2.6 million per year in 2015-16), followed by advanced biomass stoves and fuel (19%), and improved biomass stoves (5%) (See Figure 4.4). This suggests that international actors have not expanded to include LPG as a clean cooking solution in Indonesia.

Figure 4.4

Finance flows in Indonesia by technology



BOX 7

LPG Subsidies in Indonesia

Additional information on the Indonesian government's support to its domestic LPG sector was collected to provide a more comprehensive picture of the overall financial flows for residential clean cooking in Indonesia.

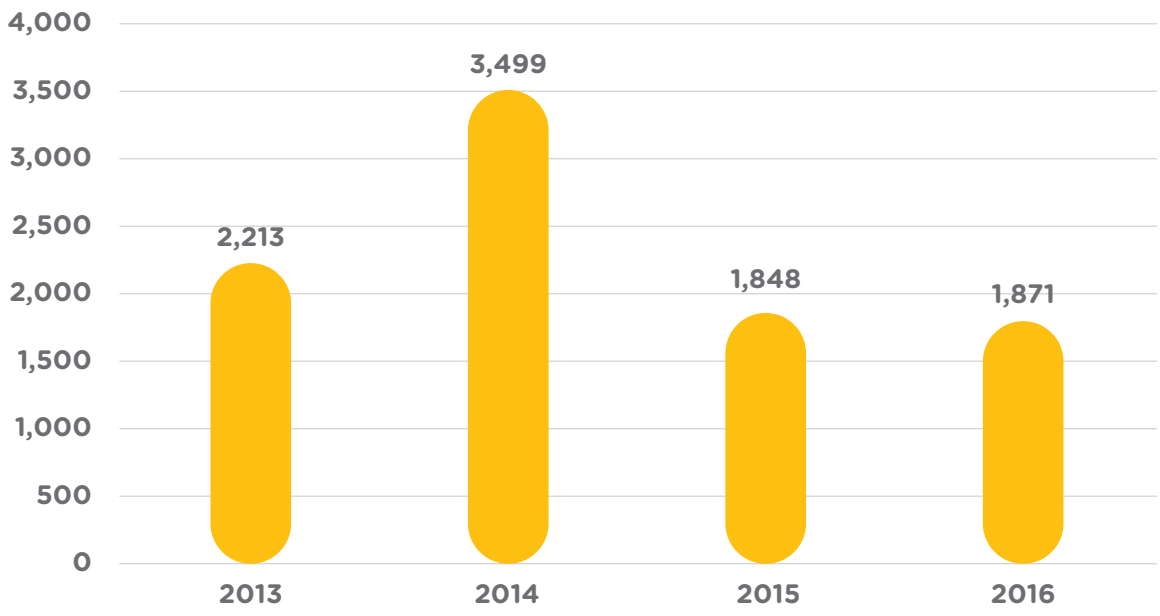
Between 2013 and 2016, the government provided an average of USD 2.3 billion per year of subsidies for residential LPG use (Figure 4.5).

The LPG subsidy comprises a growing share of the total government subsidy, increasing from 7% in 2011 to 14% in 2016. This situation raises concerns about whether the government can sustain this level of subsidy, particularly as budget deficits continued to increase from 1.1% of GDP in 2011 to 2.5% of GDP in 2016.

Subsidies are supporting the purchase of LPG stoves, which usually require a one-off purchase from households, and more importantly the purchase of fuel, which is a recurrent expense. Although disaggregated data is not available to help in understanding the respective support provided, the overall continued support highlights the large funding needs and the expensive nature of improving clean cooking access in Indonesia through increased LPG use. Concerns also arise about whether households will revert to traditional cooking methods if the government reduces the amount of LPG subsidy, something which has been seen before in low-income segments.

Figure 4.5

National government subsidy on LPG (in USD million)



Source: Central Government Audited Financial Statements, 2013 – 2016

LPG subsidies have been instrumental in improving clean cooking access in Indonesia, and in encouraging households to shift to a more environmentally friendly cooking method. While recognizing that LPG is derived from fossil fuels, it is a cleaner and more efficient fuel than kerosene and traditional biomass fuels and will be a key transition fuel, particularly in urban settings. However, as stated in Sustainable Development Goal 12, fossil fuel subsidies need to be rationalized and reduced in the long-term, as they create market distortions and encourage wasteful consumption, problems which are being addressed in the case of Indonesia.

LPG subsidies in this chapter should not be compared with the estimated USD 4.4 billion of annual investment needed to reach universal clean cooking access by 2030. These estimated investment needs only include the cost of cookstoves and not the cost of cooking fuels and supporting infrastructure, such as storage and distribution facilities. If fuel costs and related infrastructure investments are considered, the investment needed globally would be significantly larger.

4.3 BARRIERS TO CLEAN COOKING ACCESS IN INDONESIA

WITHOUT IMPROVEMENTS TO BASIC INFRASTRUCTURE, DELIVERING CLEAN COOKING SOLUTIONS TO THE UNTAPPED REGIONS OF INDONESIA WILL REMAIN EXPENSIVE AND WILL HINDER INVESTMENTS TO IMPROVE ACCESS.

The recent growth in clean cooking access has not been as fast as it was during the early years of the kerosene-to-LPG conversion program, with nearly 27% of the population still using traditional cooking methods in 2015-16.

This section focuses on the existing challenges that prevent further investments, particularly in non-LPG sectors, to increase clean cooking access in Indonesia.

Improving accessibility requires large investment in basic infrastructure: Indonesia's vast archipelago presents a significant natural challenge to increasing access to clean cooking solutions in the country, particularly in areas with limited infrastructure and networks, such as small islands and remote uplands in Eastern Indonesia. Building a functioning and efficient supply chain in these regions depends in large part on the development of basic, but expensive, infrastructures, such as roads, ports, and fuel stations.

Infrastructure needs may differ across the target regions and depend on the technology solutions required. LPG, for example, has higher infrastructure needs than other cooking technologies. In addition to issues related to physically delivering the stoves, the fuels (in the form of LPG cylinders) typically must be transported from other regions, often at great distances, due to the unavailability of production and storage facilities locally or near the target regions, because of the highly distributed nature of the island geography. For other clean cooking options, such as improved biomass cookstoves and biogas digesters, fuels are generally more available locally and do not require significant transportation costs. However, basic infrastructure is still needed to deliver the cookstoves (or install biogas digesters) without incurring significant costs, and to develop an efficient local supply chain.

Commercial finance is non-existent due to affordability issues: The remaining population in Indonesia without access to clean cooking is largely living in areas with limited infrastructure and/or in rural areas with limited economic activities in the region. This means that the income of many households in these regions is far below the country average and people are often simply unable to afford clean cooking stoves and fuels. Delivering clean cooking solutions to this segment of the population, therefore, requires non-commercial funding to cover the upfront costs, partly or in full, of purchasing cookstoves.

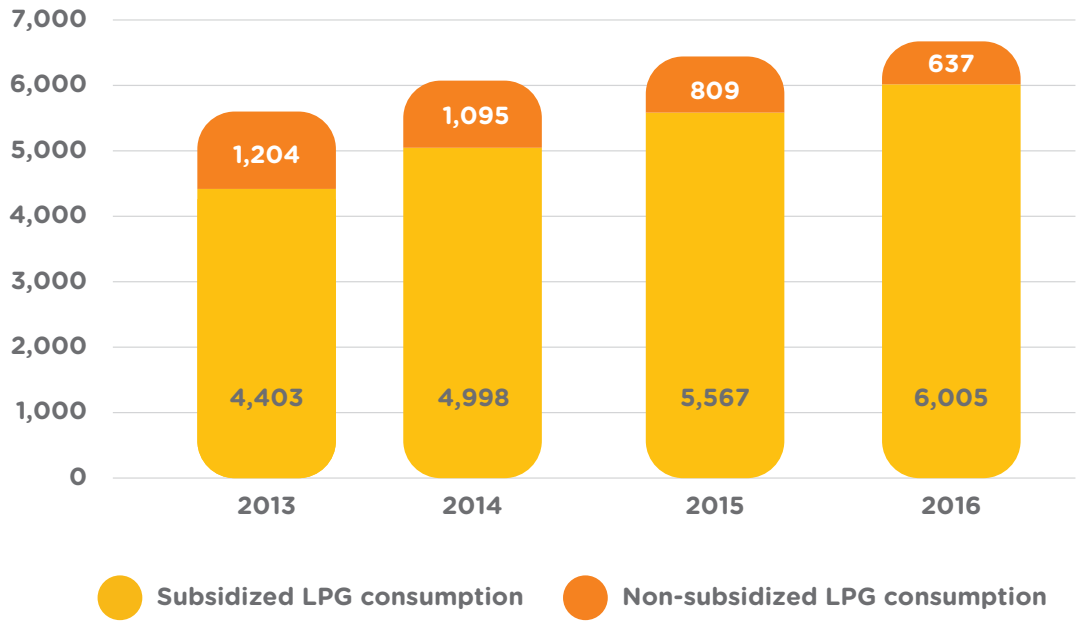
For certain clean cooking solutions like LPG, fuel costs are not always affordable for households and require non-commercial finance to cover them. Many households still find subsidized fuel prices too expensive, prompting them to revert to traditional cooking methods. Findings from the World Bank Clean Stove Initiative Study showed that the average monthly income of those using LPG was significantly higher than the households not using it, indicating affordability as a major barrier.

Delivering clean cooking solutions to the priority regions in Indonesia, therefore, may require deploying a significant amount of non-commercial finance. However, availability of this type of funding is very limited with many competing demands. (See Box 7 for details regarding the level of subsidies provided by the government.)

Public finance use is not always effective: Another challenge to increasing access to clean cooking is ineffective use of public finance. An example is the subsidy of LPG fuel prices, which is not always directed to those most in need. Subsidized LPG cylinders are generally available in large cities, and accessible to anyone regardless of their income levels. Figure 4.6 shows that consumption of subsidized LPG continued to dominate overall LPG consumption with an increasing upward trend, while the proportion of non-subsidized LPG use continued to decrease. These inefficiencies may potentially cost the government billions of dollars, which might otherwise be utilized to support efforts to increase clean cooking access.

Figure 4.6

LPG consumption in Indonesia between 2013 and 2016 (in '000 Ton)



Source: Directorate General Oil & Gas Statistics, MEMR

4.4 PATHWAYS TO INCREASE ACCESS

Historically, public finance has been instrumental in driving clean cooking access in Indonesia. But with 18 million Indonesian households still without access to clean cooking solutions, significant investments are needed. As public funding is limited and unsustainable in the long-term, effectiveness and ability to mobilize private capital are key to reach clean cooking targets.

Ensure that subsidies meet their targeted impacts: The LPG subsidy is an important component in the government's effort to extend the use of LPG for clean cooking. Given the limited availability of government funds, and the increasing trend of LPG use, it is important that subsidies are directed to those most in need. Policies need to be put in place to ensure that those who are financially stable do not have access to subsidized LPG fuels.

ALTHOUGH LPG SUBSIDIES HAVE BEEN CRUCIAL TO HELPING IMPROVE CLEAN COOKING ACCESS IN INDONESIA, THEY ARE NOT SUSTAINABLE IN THE LONG-TERM AND ENCOURAGE INEFFICIENT CONSUMPTION.

There are two initiatives being considered by the government to distribute subsidized LPG stoves and fuels more effectively. The first approach is through the use of barcodes connected to a database of low-income households. The second approach uses social security cards to ensure that sales of subsidized LPG stoves and fuels only go to those who are eligible. These systems may help the government monitor the effectiveness of LPG subsidies.

Savings from LPG subsidies could save millions of government spending, which can be redirected to improve LPG distribution infrastructure in priority regions.

Adapt clean cooking solutions to local conditions and challenges: According to IEA's universal access to clean cooking scenario, LPG, natural gas, and electricity will be the primary clean cooking solutions for those living in urban areas. On the other hand, the path to increasing access to those living in rural areas will rely on improved and advanced biomass stoves, LPG, and biogas digesters.

In Indonesia, the use of traditional cooking methods has increasingly become a rural and geographical issue. With a combination of inadequate basic infrastructure and low-income levels in households in priority regions, increasing clean cooking access using technologies other than LPG may be more effective in the short-term. This means that approaches to clean cooking solutions must be tailored to the local region. A thorough assessment of local needs and social characteristics can provide useful information to design clean cooking interventions, including determining the most appropriate type of stove and fuel type.

Given the limited availability of basic infrastructure in the eastern part of Indonesia where access to clean cooking is still low, relying on improved and advanced biomass cookstoves is a good stepping stone for short-term solutions, as fuels are generally available in the region. In addition, improved and advanced biomass cookstoves may also be preferable to the local population—typically low-income people who consider affordability as a critical issue to selecting cooking methods —as their investment costs are generally lower than they would be for other cooking methods(IEA, 2017).

Furthermore, biogas digesters are also viable clean cooking solutions for rural areas in so far as there is a sufficient level of economic activities at the local region to support their dissemination—a daily supply of 25 kg of dung is needed to implement biogas digesters. (See Box 8.)

Effective use of public finance: Historically, public finance has played an influential role in expanding clean cooking access in Indonesia. Many clean cooking programs, both successful and unsuccessful, have been driven primarily by public funding. As there are 18 million Indonesian households which still lack access to modern cooking methods, it is difficult to see how public finance can be scaled up to reach these households and sustained in the long-term, as demands for energy in Indonesia are projected to continue to increase along with the country's growing economic trajectory.

Given the many barriers associated with improving clean cooking access in Indonesia, the need for public finance is still significant to help overcome them. It is important, therefore, to use public finance efficiently and effectively so that finance reaches the necessary scale to meet clean cooking targets. This means, when designing clean cooking interventions, public actors should look to incorporate market-based solutions involving private actors. Private capital providers, such as technology developers, commercial banks, impact investment institutions, microfinance institutions, and philanthropic foundations are potential partners to mobilize finance in the clean cooking market.

One approach to a more effective use of public finance for clean cooking is results-based financing (RBF). RBF differs from the conventional use of grants in that payments made to users are contingent upon the successful delivery of results, including successful verification by an independent party, according

BOX 8

Success Story: Indonesia's domestic biogas programme provides clean cooking solutions by adapting to local economic conditions

Biogas digesters are one option to improve clean cooking access in rural areas located in islands with more developed economies that utilize livestock farming—an important input for biogas digester technologies. The Indonesia Domestic Biogas Programme (IDBP) has been proactive in implementing these technologies, supporting more than 20,000 biogas digester installations in rural areas in Indonesia through 2016.

The IDBP first conducted a feasibility study to assess target areas with the most potential to implement biogas digesters. It then incorporated market-based solutions, specifically access to private credit, to improve clean cooking access in rural areas in Indonesia. The program combined development finance assistance from international government with local financial institutions to provide local farmers with access to credit. As most farmers are unable to afford the high upfront costs to install biogas digesters, public finance is used to partially cover these costs through subsidy (around 30%), while local financial institutions cover the larger part of the costs (World Bank, 2013).

As of 2016, the program had partnered with a total of 46 credit providers, successfully improving access to credit to 8,500 farmers. In addition to the benefit of switching to a cleaner cooking method, farmers are also trained in creating additional value from investing in biogas digesters by developing bioslurry-based products (fertilizer), a byproduct of biogas production, which they can sell locally and which then becomes a source of additional income.

to pre-agreed criteria. This means public finance is deployed only after eligible projects or programs have met the desired clean cooking objectives. This approach has been successfully tested by EnDev in other high-impact countries.

In Indonesia, the Indonesia Clean Stove Initiative, a collaborative effort between the World Bank and the Government of Indonesia, was launched in 2014 to pilot the RBF approach in increasing clean cooking access. The initiative aims to incentivize market-based solutions for clean cooking, and targets and rewards market aggregators that demonstrate successful delivery of clean cooking solutions. Between 2014 and 2016, the initiative managed to attract 10 private businesses to participate in the pilot, and was successful in stimulating innovation in technology and business models for delivering clean cooking solutions at the local level.

Another approach to utilize public finance more effectively is by complementing clean cooking programs with access to credit (and/or banking services in general). Access to credit is particularly useful when introducing more expensive clean cooking technology such as biogas digesters, which cost about USD 575 in Indonesia (IEA, 2017). As an illustration, the report's analysis indicates that, for an average rural household in Indonesia, the cost of a biogas digester is equivalent to 21% of annual household expenditure, or 52% of annual non-food household expenditure, which shows the importance of affordability and/or willingness to pay for switching to cleaner technology. The numbers could be even higher for rural households living in untapped regions. Financial institutions with access to rural areas, such as microfinance institutions, credit unions, and fintech, offer interesting opportunities to provide financial access to this market.

ANNEXES

A.1 ANNEX 1: METHODOLOGY

This methodology explains the approach taken to map commitments intended to increase access to electricity and to clean cooking solutions across the 20 high-impact countries. The methodology clarifies how the report tracked finance commitments for energy access using a two-step approach (summarized in Figure A1.1), followed by clarifications and caveats. The methodology is structured as follows:

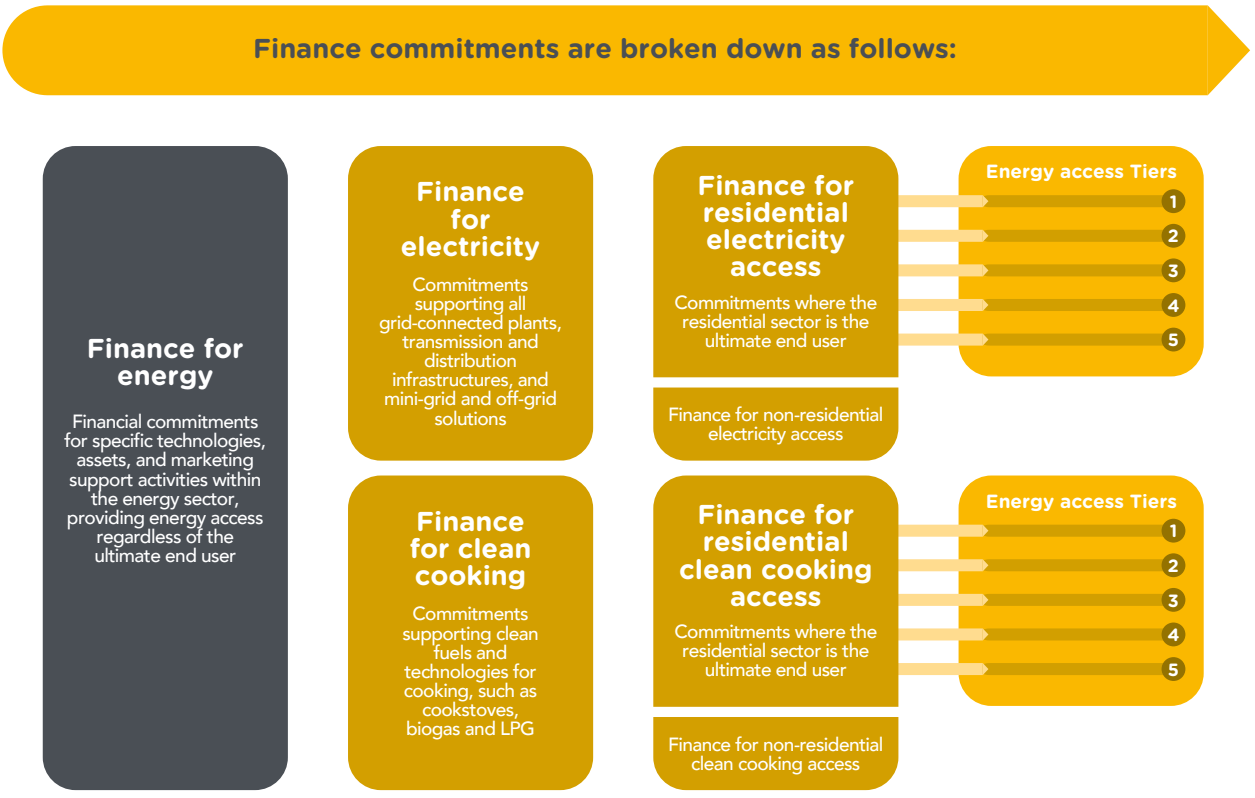
1) Tracking finance for energy access, with a focus on commitments.

2) Estimating the portion of finance for residential energy access and applying the MTF to identify the type of energy access provided.

3) List of the high-impact countries considered in the report, accompanied by relevant population figures and data.

Figure A1.1

Methodology Summary



Note: Diagram is not to scale

TRACKING FINANCE FOR ENERGY

Building on the methodology developed by SE-forALL, CPI and the World Bank in the first edition of the report, and CPI's Global Landscape of Climate Finance methodology (Buchner et al., 2017), this mapping exercise tracks public and private finance commitments to any project that enhances energy access, including investments in 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.

Chapter 2 of the report tracked more than 3,600 primary financial transactions plus public framework expenditures,[36] such as the development of national energy strategies or capacity-building initiatives committed in 2015 and 2016.[37] This means that the report only collected information that was available at the project level, disregarding aggregate (regional or global), unverifiable figures and top-down estimates.

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 Chapters 3 and 4). Feed-in tariffs, for example, pay back investment costs, so including them would constitute double counting. 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.

The report tracks commitments according to the following dimensions:

[36] Precisely 3,406 finance commitments for electricity and 178 for clean cooking.
[37] 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. 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 flows, given that committed amounts are often disbursed over a number of years. Disbursement information would provide a more accurate picture of the actual volume of financial resources devoted to addressing climate change in a given year (which can include commitments from earlier years, as well as those due to commitments for the current year), but consistent data for disbursements are lacking.

TECHNOLOGIES

Electricity technologies tracked in the report include electricity generation technologies and the transmission and distribution network.[38]

Specifically, the following technologies are included, as either electricity generating or facilitating the ultimate 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 (including grid extensions and connections) networks.
- 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.

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

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

PROVIDERS

Public sector institutions including:

- Multilateral DFIs – includes climate funds and EU institutions.

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

- Bilateral DFIs – providers of bilateral climate-related development investors
- Export promotion agencies.
- National DFIs – includes public banks and local public sector providers of debt instruments.
- Government domestic – government entities or departments/ministries that do not directly sell energy.
- Utilities and State-Owned Enterprises – ministries and state-owned institutions that produce and sell energy.

Private sector institutions, including:

- Corporate actors and project developers designing, commissioning, operating and maintaining energy projects, such as private sector utilities and energy companies, independent power producers.
- Commercial financial institutions providing private debt capital, like 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, such as family-level economic entities, high-net-worth individuals and their intermediaries (for example, family offices investing on their behalf).
- Entrepreneurs.

FINANCIAL INSTRUMENTS

The report tracks all investment-like commitments—including debt, equity and grants—whether with concessional or non-concessional terms. The report tracks guarantees and other risk mitigation instruments but does not include them in total commitments to avoid double counting between, for example, the face value of full loan guarantees and loans.

DOUBLE COUNTING

Aggregating data from different sources presents some challenges. To avoid double counting, 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 (2018). Nonetheless, challenges remain, including the issue that multilateral DFIs and development agencies are often reported through different channels. The tracking exercise is focused on international finance commitments. However, several data sources provided information on domestic commitments.

TABLE A1.2

List of data sources used to track financial commitments

Source name	Description	Treatment	Sector relevance
Organisation for Economic Co-Operation and Development (OECD, 2018)	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 – all Cooking – all International only	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, 2018)	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 High-impact Countries
Climate Policy Initiative (CPI, 2017)	Project-level data from DFIs (MDBs and IDFC members) collected during the Global Landscape of Climate Finance	Electricity – all Cooking – all International only	Additional data for bilateral and multilateral DFIs that includes guarantees, risk mitigation instruments and non-concessional finance not reported in OECD DAC CRS
Climate Funds Update (2018)	Additional data on national and multilateral Climate Funds' commitments	Electricity – grid connected and off-grid renewable generation International only	Complements data on international and domestic public finance for electricity projects
World Bank (2018)	Private Participation in Infrastructure Database, contains data on investment commitments in infrastructure with private participation in Emerging Markets and Developing Economies	Electricity – grid connected renewable and fossil fuel generation International and domestic	Complements data for electricity projects
GACC (2018)	Venture investment database	Cooking – all International and domestic	GACC contributed data on financing raised by clean cooking companies
GOGLA (2018)	Database on financing raised from GOGLA's member organizations	Electricity – off grid solar International only	Financing raised by solar off grid companies located or operating in HICs
IJGlobal (2018)	Energy and infrastructure finance database	Electricity – grid connected generation (fossil fuel, nuclear and large hydro) and transmission and distribution Cooking – LNG distribu-tion International and domestic	Main reference for grid-connected fossil fuel and LNG distribution projects

Source name	Description	Treatment	Sector relevance
Boston University GEGI (2018)	The Boston University's China Global Energy Finance database 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 only	Complements coal finance data.
SEforALL surveys	Surveys sent to 20 philanthropic foundations and impact investors.	Electricity – Off-grid solutions Cooking – all International only	Data was collected at the project level and complemented with websites and annual reports

FINANCE COMMITMENTS FOR RESIDENTIAL ENERGY ACCESS AND ALLOCATING TIERS

Once finance commitments for energy access are identified, the portion specifically referring to residential energy access is determined and then allocated to the relevant Tier. Unless project-specific information is available, assumptions are made at country/technology level, following two steps:

Firstly, adjustments to estimates and commitment values are made so that only the proportion of value relating to residential energy access is recognized. 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.

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.

Secondly, for a given residential asset or flow attribute, the report then identifies which Tiers of energy access the associated technology will provide, proposing an initial, simplified categorization of commitments by applying the Multi-Tier Framework approach (World Bank, ESMAP, SREP, SEforALL, 2018; IEA and the World Bank, 2015; Bhatia and Angelou, 2015) to available information at country/technology level on selected attributes within the framework.[39]

The report first uses technology-specific ranges of attribution as an initial starting point for allocating technologies to energy access Tiers. Figure A1.3 illustrates those used for electricity (Bhatia and Angelou, 2015) and Figure A1.4 illustrates those used for cooking. Where a technology covers more than one Tier, specific attributes based on the Multi-Tier Framework are used to determine specific allocation. For example, in the case of central-grid connected plants—ranging between Tiers 3 and 5, based on Figure A1.3—country-specific data was applied on the reliability of the grid in that country to determine the final Tier of allocation.

Figure A1.5 summarizes technology-specific assumptions used for the estimates of consumption shares across sectors and allocation to Tiers.

[39] As the Multi-Tier Framework relies on extensive use of surveys to determine allocation, unavailable at the global level, the framework itself suggests the use of simpler versions to facilitate its implementation on a global scale, capturing varying amounts of information. Three different levels of the framework are envisaged: (i) a comprehensive framework, (ii) a simplified framework, and (iii) a minimalistic framework (Bhatia and Angelou, 2015).

This year, the World Bank and ESMAP teams have provided the results of the MTF surveys about the current status of electricity access in five countries: Bangladesh, Cambodia, Ethiopia, Myanmar and Rwanda. Replacing the simplified methodology (summarized in Figure A.15) 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). However, due to unexpected complexities, only Ethiopia was effectively incorporated into the report's methodology. More work and collaboration with the World Bank are needed in the future to properly integrate the MTF country results into the finance tracking methodology.[40]

[40] Rwanda and Cambodia are not high-impact countries for electricity. Ethiopia MTF results are presented in Padam et al. 2018.

Figure A1.3

The Multi-Tier Framework for measuring access to household electricity supply

ATTRIBUTES		TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
Capacity	Power capacity ratings (in 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[a]	Daily Availability	Less than 4 hours	At least 4 hours		At least 8 hours	At least 16 hours	At least 23 hours
	Evening Availability	Less than 1 hour	At least 1 hours	At least 2 hours	At least 3 hours	At least 4 hours	
Reliability		More tahn 14 disruptions per week			At most 14 disruptions per week or at most 3 disruption per week with total duration of more than 2 hours	(>3 to 14 disruptions / week) or 3 disruptions / week with > 2 hours of outage	At most 3 disruptions per week with a total duration of less than 2 hours
Quality		Householding experiences voltage problems that demage appliances				Voltage problems do not affect the use of desired appliances	
Affordability		Cost of a standard consumption package of 365 kWh per year is more than 5% of household income			Cost of a standard consumption package of 365 kWh per year is less than 5% of household income		
Formality		No bill payments made for the use of electricity				Bill is paid to the utility, pre-paid card seller, or authorized representative	
Health & Safety		Serious or fatal accidents due to electricity connection				Absence of past accidents	

[a] Previously referred to as "Duration" in the 2015 Beyound Connections report, this MTF attribute is now referred to as "Availability", examining access to electricity through levels of "Duration" (day and evening). Aggregate tier is based on lowest tier value across all attributes
**Color signifies tier categorization.*

Source: World Bank, ESMAP, SREP, SEforALL, 2018 updating Bhatia and Angelou, 2015

Figure A1.4

The Multi-Tier Framework for measuring access to cooking solutions

ATTRIBUTES		TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
Cooking Exposure[a]	Emission: Fuel	Firewood, dung, twigs, leaves, rice husks, processed biomass pellets or briquettes, charcoal, kerosene				Biogas, ethanol, high quality processed biomass pellets or briquettes	At least 2 kW
	Emission: Stove Design	Three-stone fire, tripod, flat mud ring, traditional charcoal stove	Conventional or old generation ICS	ICS + chimney, rocket stove or ICS + insulation	Rocket stove with high insulation or with chimney, advanced insulation charcoal stoves	Rocket stove with chimney (well sealed), Rocket Stove gasifier, Advanced secondary air charcoal stove, forced air	Electricity, solar LPG
	Ventilation: Volume of Kitchen[b]	Less than 5 m^2	More than 5 m^2	More than 10 m^2	More than 20 m^2	More than 40 m2	Open air
	Ventilation: Structure	Not opening except for the door	1 window	More than 1 window	Significant openings (large openings below or above height of the door)	Veranda or a hood is used to extract the smoke	Open air
	Ventilation: Level	Bad			Average	Good	
	Contact Time[c]	More than 7.5 hours	Less than 7.5 hours	Less than 6 hours	Less than 4.5 hours	Less than 3 hours	Less than 1.5 hours
		Bad			Average	Good	
Cookstove Efficiency	ISO's Voluntary Performance Targets (TBC)	Less than 50%	More than 10%	More than 20%	More than 30%	More than 40%	More than 50%
Convenience	Fuel acquisition (through collection or purchase) and preparation time (hours per week)	More than 7 hours		Less than 7 hours	Less than 3 hours	Less than 1.5 hours	Less than 0.5 hours
	Stove preparation time (minutes per meal)	More than 15 minutes		Less than 15 minutes	Less than 10 minutes	Less than 5 minutes	Less than 2 minutes
Safety of Primary Cookstove		Serious accidents over the past 12 months				No serious accidents over the past year	
Affordability[d]		Levelized cost of cooking sollution (fuel) more than 5% of household income				Levelized cost of cooking sollution (fuel) less than 5% of household income	
Fuel Availability		*Primary fuel available less than 80% of the year*				Primary fuel is readily available 80% of the year	Primary fuel is readily available throughout the year

[a] Determined by combination of fuel and stove design, ventilation of cooking space, and contact time. [b] Not used in the analysis of Cooking Exposure in Cambodia. [c] Not used to calculate an individual stove's tier for Cooking Exposure but used to weight each stove's tier for Cooking Exposure in the calculation of a household's tier for Cooking Exposure. [d] In this report, cookstove cost was not considered when calculating the Affordability tier due to data limitations which hindered making this calculation.

Source: World Bank, ESMAP, SREP, SEforALL, 2018 updating Bhatia and Angelou, 2015

TABLE A1.5

Approaches used to estimate consumption shares and Tier allocation[41]

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.	**Export and 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 2013-2014 using IEA (2017) for the majority of high-impact countries, looking at 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 percentage of domestic generation.	**Tier allocation** Grid-connected capacity typically ranges between Tiers 3 and 5 according to IEA and WB (2015) and World Bank (2017). 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 & Distribution (extensions and unspecified)	**Exception: Export and sector-specific breakdown for the distribution network** As investments in the distribution network do not benefit exports or large industry (taking place at higher voltages), to identify residential investments, distribution values are presented net of the share going to the commercial sector.	
Mini-grids, fossil fuels and renewable/hybrid	**Export and 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 that.[42] 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 national level.	**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 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.

[41] This part of the methodology has remained unchanged from the previous report due to lack of time and resources, but we are aware the figures should have been updated for 2015-16.
[42] For example, in Nigeria, the overwhelming majority of the identified capacity additions for 2013-15 consists 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)
Other off-grid	**Export and 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 instead 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 A2.3). Tier allocation is defined by technology types, following the approach suggested for mini-grid. 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.	**Export and 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 the assessment of the social, environmental impact of off-grid lanterns. The suggested approach focuses 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
Cooking		
Advanced biomass (Stoves and fuel & 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: 2

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)
Alcohol (stoves and fuel & infrastructures)	**Determination of % units (# individual assets) applied to residential vs. non-residential sector:** Financial commitments to alcohol 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: 1
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: 3
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: 3
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: 1
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 details of each project. When available, IEA consumption shares for LPG were used (IEA, 2017b).	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: 3
Natural gas (stoves and fuel)	**Determination of % units (# individual assets) applied to residential vs. non-residential sector:** Financial commitments were both 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: 3

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)
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: 3
Solar cooking (stoves)	**Determination of % units (# individual assets) applied to residential vs. non-residential sector:** Financial commitments to solar cookers 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: 3
Market support	Not applicable	Not applicable

DATA ON HIGH-IMPACT COUNTRIES

This section describes the high-impact countries that were considered for the report. The list of high-impact countries, both for access to electricity and access to clean cooking, is taken from the 2015 Global Tracking Framework (IEA and the World Bank, 2015) that was the most up to date list at the time the 2017 Energizing Finance report was commissioned and maintained in 2018 to ensure comparison across years.

The recently published Tracking SDG7: The Energy Progress Report 2018 (IEA, World Bank, IRENA, 2018) has a slightly updated list reflecting countries' progress in energy access. The list includes Chad, Mali and Zambia, and no longer includes Afghanistan, Philippines, and Yemen for electricity access. For clean cooking, Ghana was added and Nepal removed.

Figure A1.6

High-impact countries analyzed in the report

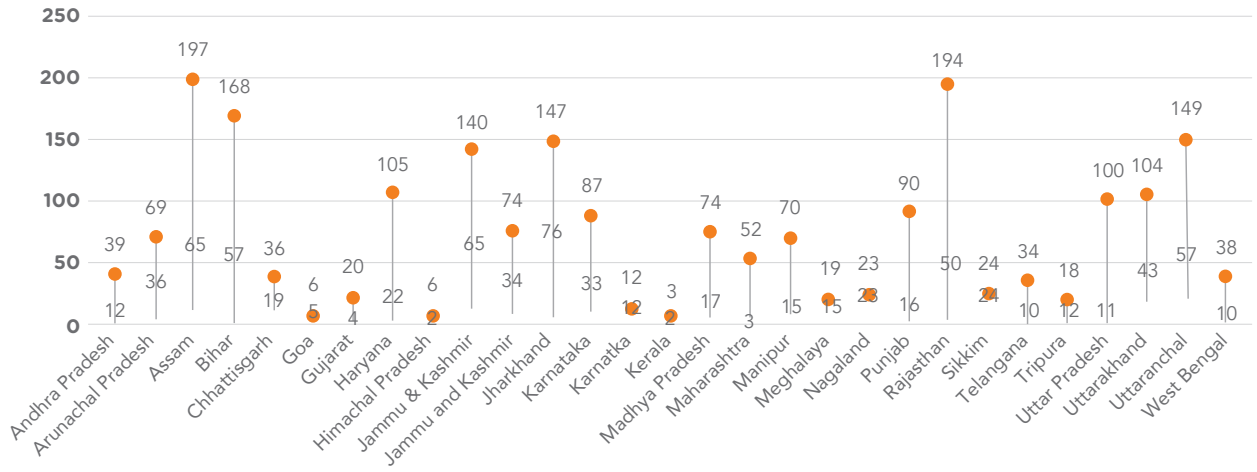
Country	Electricity	Cooking	Region	Income level	Population (in million)	Percent of population without access to electricity	Percent of population without access to clean cooking solutions
Afghanistan	X	X	South Asia	Low	34.2	22%	69%
Angola	X		Sub-Saharan Africa	Lower-middle	28.3	59%	52%
Bangladesh	X	X	South Asia	Lower-middle	162.1	28%	83%
Burkina Faso	X		Sub-Saharan Africa	Low	18.4	81%	91%
China	X		East Asia and Pacific	Upper-middle	1375	0%	41%
Congo, DR	X	X	Sub-Saharan Africa	Low	77.5	83%	96%
Ethiopia	X	X	Sub-Saharan Africa	Low	101.1	62%	97%
India	X	X	South Asia	Lower-middle	1316.6	14%	60%
Indonesia		X	East Asia and Pacific	Lower-middle	259.6	3%	43%
Kenya X	X		Sub-Saharan Africa	Lower-middle	47.8	51%	87%
Korea, DPR	X	X	East Asia and Pacific	Low	25.3	62%	90%
Madagascar	X	X	Sub-Saharan Africa	Low	24.6	79%	99%
Malawi	X		Sub-Saharan Africa	Low	17.8	89%	98%
Mozambique	X	X	Sub-Saharan Africa	Low	28.4	76%	96%
Myanmar	X	X	East Asia and Pacific	Lower-middle	52.6	41%	82%
Nepal	X		South Asia	Low	28.8	11%	73%
Niger	X		Sub-Saharan Africa	Low	20.3	84%	98%
Nigeria	X	X	Sub-Saharan Africa	Lower-middle	183.6	44%	95%
Pakistan		X	South Asia	Lower-middle	191.3	4%	57%
Philippines	X	X	East Asia and Pacific	Lower-middle	102.5	10%	57%
Sudan X	X		Sub-Saharan Africa	Lower-middle	39.1	62%	60%
Tanzania	X	X	Sub-Saharan Africa	Low	54.7	74%	98%
Uganda	X	X	Sub-Saharan Africa	Low	40.8	77%	99%
Vietnam		X	East Asia and Pacific	Lower-middle	94.0	0%	35%
Yemen	X		Middle East and North Africa	Low	27.3	29%	35%

Note: Region and income level are based on World Bank's country and lending groups. Population and access levels are an average for 2015-16, based on World Bank Indicators. Figures for India's unelectrified population presented in Chapter 3 are more updated.

ANNEX 2: OTHER FACTORS IMPACTING ELECTRICITY ACCESS IN INDIA

Annex 2.1

Number of power cuts in a month witnessed by towns in Indian States



Note: These number are averages of six months, between December 2017 and July 2018, for which data is available. These averages allow us to capture the seasonal variations in any particular month.

Interpretation: The line shows the average spread of power cuts witnessed by towns in a given state. For instance, a town in Rajasthan reports power cuts averaging 50 in a month and a maximum 194 power cuts in month.

Annex 2.2:

One of the inherent limitations in the global tracking of electricity access is the underreporting of public finance through domestic national budgets. Budgetary allocations to renewable energy in India remain largely uncaptured, except for a few data entries from various data sources. For instance, MNRE makes allocations for grid-interactive renewable power projects based on wind power, biomass, small hydro, and solar. These are implemented through several State Nodal Agencies (SNAs), public sector units, impaneled government agencies, and institutes like the Indian Renewable Energy Development Agency Limited (IREDA) and Solar Energy Corporation of India (SECI). For instance, MNRE reported actual disbursements in grid connected renewables amounting to USD 230 million and USD 428 million in 2013-14 and 2015-16, respectively. After accounting for IREDA and SECI entries already in the landscape, there is likely underreporting of approximately USD 128 million in 2013-14 and USD 343 million in 2015-16. However, the report followed a conservative approach to not include this in the global landscape, as more detailed project level data with exact sources of finances and implementing agencies is not readily available.

Rural Electrification Corporation (REC) is a nodal agency for various government schemes, such as the aforementioned DDUGJY and SAUBHAGYA programs, that finances and promotes electrification projects in India. It has reported a 38% increase in disbursements, an indication of overall commitments, from USD 6.5 billion a year in 2013-14 to USD 9 billion in 2015-16, sponsoring on average more than 800 projects per year. It is important to note that it is difficult to identify the exact magnitude from different sources of financing given limited project level data. For instance, it finances projects from market borrowings, DFIs through credit lines with KfW and JICA, and government finances. To develop a comprehensive picture of domestic finance, it is imperative to consider all these avenues of financing and even develop an India-specific financing landscape with greater stakeholder engagements.

Annex 2.3:
Discussed below are some key barriers to electricity access in India:

Poor financial conditions of the State distribution companies (DISCOMs) in India: The primary responsibility of providing reliable and affordable electricity to the households lies with the State DISCOMs. However, the majority of the State DISCOMs are hampered with the formidable challenge of poor revenue generation due to high aggregate technical and commercial (AT&C) losses which include transmission losses, power theft, lack of bill collections irregularity and politically determined low tariff structures. The accumulated debt of all State DISCOMs stood at INR 4.06 lakh crores (USD 62 billion) in 2014-2015.

To address this issue, the Central Government launched the UDAY (Ujwal Discom Assurance Yojana) scheme in 2015 wherein the state government takes over the debt of DISCOMs (up to 75%) provided efficiency on pre-determined technical and operational indicators is exhibited. At an aggregated level, targeted debt of USD 32 billion (INR 2.09 lakh crores or 78% of the total liability) has already been taken over by states of respective DISCOMs thus benefiting them in the form of savings on interest and increase in cash flows. However, the impact of UDAY on the states has been asymmetric; for instance, only 7 states (out of 30) reported achieving the targeted AT&C of 15%.

DISCOMs are further disincentivized from investing in rural electrification infrastructure and supplying required quality and quantity of electricity because of the high cost of supply. An analysis of four DISCOMs in Uttar Pradesh revealed that DISCOMS incur huge losses in supplying electricity to rural residential consumers (Table 4). Similarly, the average through rate for lifeline consumers was reported at INR 3.47/kWh as against a cost of supply of INR 7.22/kWh, leading to huge uncovered revenue for the DISCOMS, not compensated by the subsidies from the state governments. The losses incurred due to inability of DISCOMS to charge the cost reflective tariffs to the rural segment can be cross-subsidized by higher tariffs in other consumer segments such as the industrial and commercial segments. However, DISCOMs often engage in gratuitous load-shedding to further check operational losses, leading to an unreliable electricity supply.

Table 4

Losses incurred by the State DISCOMs when supplying to rural customers

UP – State DISCOMs	Sales (MU)	Cost of Service (INR/KwH)	Average Billing Rate (INR/KwH)
Dakshinanchal Vidyut Vitran Nigam Ltd., Agra	2157.1	7.40	2.63
Madhyanchal Vidyut Vitran Nigam Ltd., Lucknow.	1816.6	6.84	1.91
Pashchimanchal Vidyut Vitran Nigam Ltd., Meerut	3329.5	6.45	1.55
Purvanchal Vidyut Vitran Nigam Ltd., Varanasi	3788.8	6.96	1.64

Note: These estimates are for consumer segments receiving supply as per "Rural Schedule" for 2014-15. These include residential consumers both metered and unmetered. Source: Uttar Pradesh Electricity Regulatory Commission, Ministry of Statistics and Programme Implementation (MOSPI and UDAY website).

Low paying ability of rural customer base: On the demand side, rural consumers face low paying ability and poor power reliability, creating a vicious circle on the demand and supply side, slowing the pace of rural electrification. The rural households targeted under the universal electricity access generally have limited ability to spend along with low per capita power consumption. For instance, below poverty line rural consumers account for a mere 4% of the total units sold and 3% of their total revenue for five DISCOMs in Uttar Pradesh, the Indian state with the highest percentage of unelectrified households. In addition, the unreliability of the power supply from the grid increases the coping cost, for example an additional spending on kerosene cost/ candles (Teri, 2017), for these rural households. This disincentivizes the households to demand grid connection unless reliable power supply is assured to avoid bearing both metered payments and alternative fuel costs.

Other issues with providing connection through centralized technologies: In India, 75% of new electricity access since 2000 has been through coal led power generation (IEA, 2015). This is in contrast with achieving its Intended Nationally Determined Contribution (NDC) at the Paris Climate Agreement. Clean energy access through utility scale renewable projects and off-grid solutions is a step in the right direction.

REFERENCES

Bhatia, M. and Angelou, N. (2015). Beyond Connections: Energy Access Redefined. ESMAP Technical Report. Washington, DC: World Bank. Available at: https://openknowledge.worldbank.org/handle/10986/24368

Biogas Rumah (BIRU). (2016). Annual Report: Indonesia Domestic Biogas Programme (2015). Indonesia. Available at: http://www.biru.or.id/files/IDBP_Annual_Report_2015.pdf

Biogas Rumah (BIRU). (2017). Annual Report: Indonesia Domestic Biogas Programme (2016). Indonesia. Available at: http://www.biru.or.id/files/BIRUAnnualReport2016.pdf

Bloomberg New Energy Finance (BNEF). (2018a). Internal Database on Renewable Energy Companies and Database on VC/PE Deals. Available at: https://about.bnef.com/

Boston University, Frederick S. Parade School of Global Studies. (2018). China's Global Energy Finance Database. Available at: https://www.bu.edu/pardee-school/chinas-global-energy-finance-database/

Business Standard. 2018. India does not need more coal-based capacity addition till 2022: Central Electricity Authority. Available at: https://www.business-standard.com/article/economy-policy/india-does-not-need-more-coal-based-capacity-addition-till-2022-central-electricity-authority-116121300042_1.html

CEEW and Niti Aayog. 2017. Realities and Challenges of Energy Access in India. Available at: http://niti.gov.in/writereaddata/files/Abhishek%20Jain.pdf

China Africa Research Initiative (CARI). 2018. The Path Ahead: The 7th Forum on China-Africa Cooperation. Written by Janet Eom, Deborah Brautigam, and Lina Benabdallah. Available at: https://static1.squarespace.com/static/5652847de4b033f56d2bdc29/t/5b84311caa4a998051e685e3/1535389980283/Briefing+Paper+1+-+August+2018+-+Final.pdf

Climate Funds Update (2018). Data dashboard. Available at: http://www.climatefundsupdate.org/data

Climate Policy Initiative (CPI). 2017. Global Landscape of Climate Finance 2017. Buchner B., Oliver P., Wang X., Carswell C., Meattle C. Mazza F. Available at: https://climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-2017/

Climate Policy Initiative (CPI). 2018. Getting to India's Renewable Energy Targets: A Business Case for Institutional Investment. https://climatepolicyinitiative.org/wpcontent/uploads/2018/03/Getting-to-Indias-Renewable-Energy-Targets-A-Business-Case-for-Institutional-Investment.pdf

Center for Financial Accountability, 2017. Government-owned Banks in India Financed More Coal than RE in 2017. http://www.cenfa.org/coal/government-owned-banks-in-india-financed-more-coal-than-re-in-2017/

Central Electricity Authority. 2016. Draft National Electricity Plan. http://www.cea.nic.in/reports/committee/nep/nep_dec.pdf

Dalberg. 2016. Solar rooftop and off-grid mini grid landscape. For CSFFI.

Electrical and Power Review. 2018. Power Up: Is India's T&D sector set for big leap? Available at: http://www.eprmagazine.com/cover-story/power-up-is-indias-td-sector-set-for-big-leap/

Energy Sector Management Assistance Program (ESMAP). (2015). The State of the Global Clean and Improved Cooking Sector. Washington, DC: The International Bank for Reconstruction and Development. Available at: https://openknowledge.worldbank.org/bitstream/handle/10986/21878/96499.pdf?sequence=1

Global Alliance for Clean Cookstoves (GACC). 2018. Personal communication with team. October 2018.

Global Alliance for Clean Cookstoves, (GACC). (2018a). Internal Database on Clean Cooking Investments.

Global Off-Grid Lighting Association (GOGLA). (2016c). Standardized Impact Metrics for the Off-grid Energy Sector. Utrecht, The Netherlands. Available at: https://www.gogla.org/sites/default/files/afbeelding-en/gogla-standardised-impact-metrics-for-the-off-grid-energy-sector1.pdf

GOGLA, 2018. Internal database on solar investment raised and solar off-grid companies.

Institute for Energy Economics and Financial Analysis (IEEFA) and Sightline Institute. 2018. The Financial Case for Fossil Fuel Divestment. http://ieefa.org/wp-content/uploads/2018/07/Divestment-from-Fossil-Fuels_The-Financial-Case_July-2018.pdf

International Energy Agency (IEA) and the World Bank. (2015). Global Tracking Framework—Progress Toward Sustainable Energy. Washington, DC: World Bank. Available at: http://seforall.org/sites/default/files/GTF-2105-Full-Report.pdf

International Energy Agency (IEA) and the World Bank. (2017). Global Tracking Framework—Progress Toward Sustainable Energy. Washington, DC: World Bank. Available at: http://gtf.esmap.org/data/files/download-documents/eegp17-01_gtf_full_report_for_web_0516.pdf

International Energy Agency. 2015. India Energy Outlook. Available at: https://www.iea.org/publications/freepublications/publication/IndiaEnergyOutlook_WEO2015.pdf

International Energy Agency, 2017. Energy Access Outlook 2017. World Energy Outlook Special Report. Available at: https://www.iea.org/publications/freepublications/publication/WEO2017SpecialReport_EnergyAccessOutlook.pdf

International Energy Agency (IEA). (2017b). Statistics. Available at: https://www.iea.org/statistics/statisticssearch/

International Hydropower Association. 2016. Hydropower Status Report. https://www.hydropower.org/sites/default/files/publications-docs/2016%20Hydropower%20Status%20Report_1.pdf

International Renewable Energy Agency (IRENA). (2017). Renewable Energy Prospects: Indonesia. Abu Dhabi. Available at: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2017/Mar/IRENA_REmap_Indonesia_report_2017.pdf

IJ Global. (2018). Energy and infrastructure finance database. Available at: https://ijglobal.com/data
Ministry of Finance, Republic of Indonesia. Laporan Keuangan Pemerintah Pusat tahun 2011-2016. Available at: https://www.kemenkeu.go.id/publikasi/laporan/laporan-keuangan-pemerintah-pusat/

Ministry of New and Renewable Energy. 2017. MNRE & GIZ Signs Agreement to Improve Framework Conditions for Grid Integration of Renewable Energies. Available at: http://pib.nic.in/newsite/PrintRelease.aspx?relid=170280

Ministry of Power, India. 2017. Vision of the Government is '24x7 Power for All' – All the States on board to achieve Target by March 2019. http://pib.nic.in/newsite/PrintRelease.aspx?Relid=174171

Ministry of Power, India. 2018. Clarification regarding electrification status of certain villages. http://pib.nic.in/newsite/PrintRelease.aspx?relid=179031

Organisation for Economic Co-Operation and Development (OECD). (2018). Creditor Reporting System (CRS). Available at: https://stats.oecd.org/Index.aspx?DataSetCode=CRS1

Padam, Gouthami; Rysankova, Dana; Portale, Elisa; Koo, Bonsuk; Keller, Sandra Ofelia; Fleurantin, Gina. 2018. Ethiopia – Beyond connections : energy access diagnostic report based on the multi-tier framework (English). Washington, D.C. : World Bank Group. http://documents.worldbank.org/curated/en/372371533064359909/Ethiopia-Beyond-connections-energy-access-diagnostic-report-based-on-the-multi-tier-framework

Pertamina and the World LP Gas Association. (2011). Kerosene to LP Gas Conversion Programme in Indonesia: A Case Study of Domestic Energy. France. Available at: https://www.wlpga.org/wp-content/uploads/2015/09/kerosene-to-lp-gas-conversion-programme-in-indonesia.pdf

Pertamina. (2016). Financial Statements (2015). Jakarta. Available at: https://www.pertamina.com/media/b82f973d-eb1b-4906-9eb8-34a085f99c82/LKFS_Pertamina_2015.pdf

Quinn, A. et al. (2018). An Analysis of Efforts to Scale Up Clean Household Energy for Cooking Around The World. Available at: https://reader.elsevier.com/reader/sd/pii/S0973082618302679?token=D9095ABAC33B866328C0E5078184A70AD994B29C0585C688508D02F02903E5FD67A784E3B237DEFF6D8BC3EB6647DB60

Rain Forest Action. 2018. Banking on Climate Change. https://www.ran.org/wp-content/uploads/2018/06/Banking_on_Climate_Change_2018_vWEB.pdf

REEEP. 2017. Scale and Sustainability – Toward A Public-Private Paradigm in Powering India. https://www.reeep.org/sites/default/files/Scale_and_Sustainability_PowerInIndia_ForScreens.pdf

Saubhagya website. http://saubhagya.gov.in/

SEforALL, Climate Policy Initiative (CPI) and the World Bank.(2017). Understanding the Landscape – Tracking finance for electricity and clean cooking access in high-impact countries. SEforALL, Washington, DC. License: NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0). At: https://www.seforall.org/sites/default/files/2017_SEforALL_FR2.pdf

Sustainable Energy for All (SEforALL) and the African Development Bank. 2017. Missing the Mark – Gaps and lags in disbursement of development finance for energy access. SEforALL, Washington, DC. License: NonCommercial-No-Derivatives 4.0 International (CC BY-NC-ND 4.0). At: https://www.seforall.org/sites/default/files/2017_SEforALL_FR1.pdf

Statistics Indonesia. Percentage of Household Population by Province and Type of Cooking Fuel, 2001, 2007-2016. (2017). Available at: https://www.bps.go.id/statictable/2014/09/10/1364/persentase-rumah-tangga-menurut-provinsi-dan-bahan-bakar-utama-untuk-memasak-tahun-2001-2007-2016.html

Statistics Indonesia. Number of Households by Province, 2000-2015. Available at: https://www.bps.go.id/dynamictable/2015/09/07/851/banyaknya-rumah-tangga-menurut-provinsi-2000-2015.html

Statistics Indonesia. Average Monthly Expenditure per Capita in Rural Areas by Province and Commodity Groups (rupiahs), 2007-2017. Available at: https://www.bps.go.id/statictable/2014/09/08/941/rata-rata-pengeluaran-per-kapita-sebulan-di-daerah-perdesaan-menurut-provinsi-dan-kelompok-barang-rupiah-2007-2017.html

Stoveplus. (2018). Indonesia Pilot Attracts Entrepreneurs' Appetite to Bring Clean Cooking Technologies to Households. Available at: http://www.stoveplus.org/en/news-project/project/indonesia-pilot-attracts-entrepreneurs-appetite-to-bring-clean-cooking-technologies-to-households

Tharakan, P. (2015). Summary of Indonesia's Energy Sector Assessment. Manila: Asian Development Bank (ADB). Available at: https://www.adb.org/sites/default/files/publication/178039/ino-paper-09-2015.pdf

Thoday, K., Benjamin, P., Gan, M., and Puzzolo, E. (2018). The Mega Conversion Program from Kerosene to LPG in Indonesia: Lessons Learned and Recommendations for Future Clean Cooking Energy Expansion. Available at: https://reader.elsevier.com/reader/sd/pii/S0973082618302412?token=18E1F969DBA477A800EDE1347E89FC5E4CC25418EE6D5369915F415396E0396045D5F07C4AFA0D024946D1DAF2E92EA9

Vorley, B., Porras, I., and Amrein, A. (2015). The Indonesia Domestic Biogas Programme. London: International Institute for Environment and Development. Available at: http://pubs.iied.org/pdfs/16597IIED.pdf

World Bank, ESMAP, SREP, SEforALL. 2018. Rwanda. Beyond Connections Energy Access Diagnostic Report Based on the Multi-Tier Framework Written by: Bryan Bonsuk Koo, Dana Rysankova, Elisa Portale, Niki Angelou, Sandra Keller, Gouthami Padam.

IEA, World, IRENA 2018. Tracking SDG7: The Energy Progress Report 2018. International Energy Agency; International Renewable Energy Agency; United Nations; World Bank Group; World Health Organization. World Bank, Washington, DC. © World Bank. https://openknowledge.worldbank.org/handle/10986/29812

World Bank. (2018a). World Bank Country and Lending Groups. Available at: https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-andlending-groups

World Bank. (2018b). Private Participation in Infrastructure Database. Available at: https://ppi.worldbank.org/

World Bank. (2018c). Indicators. Available at: http://data.worldbank.org/indicator

World Energy Council. 2016. World Energy Resources – Hydropower 2016. https://www.worldenergy.org/wp-content/uploads/2017/03/WEResources_Hydropower_2016.pdf

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