TRACKING SDG7

THE ENERGY PROGRESS REPORT 2021

A joint report of the custodian agencies

IEA International Energy Agency

IRENA International Renewable Energy Agency

United Nations Statistics Division

THE WORLD BANK IBRD • IDA | WORLD BANK GROUP

World Health Organization

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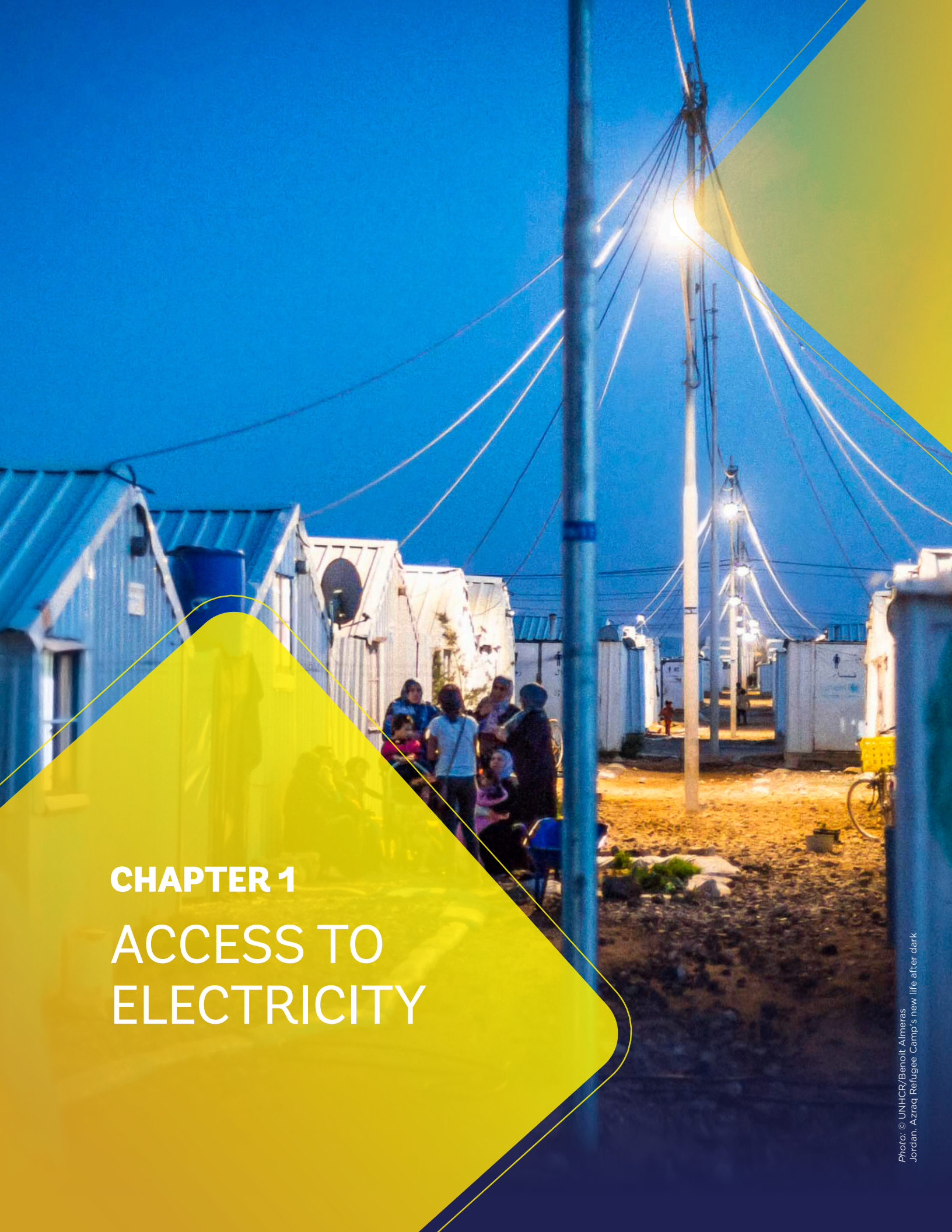

CHAPTER 1

ACCESS TO ELECTRICITY

Photo: © UNHCR/Benoit Almeras
Jordan. Azraq Refugee Camp's new life after dark

MAIN MESSAGES

- **Global trend:** The share of the world's population with access to electricity grew from 83 percent in 2010 to 90 percent in 2019.[1] Worldwide, 1.1 billion people gained access between 2010 and 2019.[2] With the spread of electrification, the number of people lacking access fell from about 1.2 billion in 2010 to 759 million in 2019 during this period. Continuous progress was made from 2017 to 2019, with 130 million people gaining access to electricity each year, slightly more than the average of 127 million people who gained access each year between 2010 and 2017.
- **Target for 2030:** Notwithstanding the remarkable growth in electrification recorded over the last decade, the present pace will not be sufficient to achieve indicator 7.1.1 of the Sustainable Development Goals (SDGs) by 2030. To meet the goal of 100 percent access to electricity, before considering disruptions from the COVID crisis, the pace of growth must accelerate to 0.9 percentage points each year through 2030, compared with the 0.74 percentage points achieved between 2017 and 2019. The necessary annual rate of growth required to reach universal access will be possible only through adoption and implementation of measures that challenge the status quo. Taking into account population growth and risks arising from the COVID-19 pandemic, a total of 940 million people will have to gain access the next nine years if universal access is to be achieved. Under current and planned policies, however, and given the effects of the pandemic, only 280 million people are projected to gain access to electricity over the period, which would leave 660 million people without access in 2030 (IEA 2020a).[3] Comprehensive electrification strategies, innovative business models and technologies, and a combination of supply- and demand side subsidies are some of the building blocks required to ramp up electrification efforts. In addition to progress in access, the quality, affordability, and reliability of electricity service will remain salient for many countries.
- **Regional highlights:** Most regions showed expansion of electrification over the past decade. However, progress toward the target of universal access to electricity has shown different trends across regions since 2010. In the regions of Latin America and the Caribbean, and Eastern and South-eastern Asia, more than 98 percent of the population had access to electricity by 2019.[4] In Western Asia and Northern Africa, and in Central Asia and Southern Asia, 94 and 95 percent of the population, respectively, enjoyed access in the same year. In Sub-Saharan Africa, by contrast, the 2019 rate of access was just 46 percent: 570 million people still lacked access to electricity. Sub-Saharan Africa accounts for three-quarters of the global population without access. However, between 2017 and 2019, electrification advanced faster than population growth, contributing to an annual average reduction of 2 million in the number of unserved people.
- **Fragile and conflict-affected countries:** The level of access to electricity in the 39 countries on the World Bank's list of fragile and conflict-affected countries (World Bank 2020a) grew faster than the global average annual growth of 0.8 percentage points, rising from 45 percent of the total population in 2010 to 54 percent in 2019. However, the annual increase in access did not outpace population growth between 2010 and 2019. About half of the global access deficit came from these countries in 2019. Overall, 364 million people in fragile and conflict-affected settings were without electricity in 2019 (compared with 359 million in 2010). Focusing on refugees and their surrounding host communities, data gathered by the United Nations High Commissioner for Refugees (UNHCR) in 18 countries between

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1 Access to electricity (also referred to as "electrification" or "the electrification rate") refers in this report to the share of the population with access to electricity over a specified time period or geographic area. It is defined as the ability of the end user to consume electricity for desired services. Where surveys based on the Multi-Tier Framework, a method for measuring access to energy (ESMAP 2015, 2016), have been conducted (about 20 countries), access to electricity service from Tier 1 to Tier 5 is considered. Elsewhere, electricity access is calculated by a binary measure of "connected" or "not connected" derived from existing household surveys, such as the DHS and LSMS (World Bank and IEA 2015).

2 This chapter incorporates both short- and long-term trends to better understand the global effects of improved electricity access.

3 The Stated Policies Scenario (STEPS) in IEA's "World Energy Outlook 2020" (IEA 2020a) takes into account COVID's impact on GDP and its estimated impact on access progress in 2020 and 2021, as of September 2020.

4 United Nations classifications are used for the names and composition of the country groupings used in this report (https://unstats.un.org/unsd/methodology/m49/).

2018 and 2020 reveals that even though host communities had on average 34 percent access and refugees 19 percent only, the access rates for refugees and host communities remain very low. Owing to secondary displacement movements and the difficulty of conducting field surveys, data collection in fragile and conflict-affected settings is challenging, with attendant effects on data quality and reliability.

- **Urban-Rural distribution in electricity access:** Although progress in rural areas was faster than in urban settings over the 2017–19 period, rural areas still accounted for 84 percent of the global population living without access to electricity (640 million people) in 2019. The rural access rate rose globally from 70 percent in 2010 to 81 percent in 2019, outpacing population growth. Particularly, Central Asia and Southern Asia, and Oceania made the greatest progress, with annual growth in access of around 3 percentage points between 2010 and 2019. On the other hand, urban areas are approaching universal access, with the average access rate standing at 97 percent since 2016 (leaving 116 million people with no access in 2019). The progress in urban areas made between 2010 and 2019 also outpaced population growth across regions. Covering the last mile in both urban and rural areas will require addressing complexities in affordability, reliability, and the cost of deploying solutions to reach populations living in isolated or informal settlements and consuming small quantities of electricity.
- **The Top 20 access-deficit countries:** In 2019, the 20 countries with the largest populations lacking access to electricity made up 76 percent (580 million people) of the global access deficit.[5] Therefore, efforts to narrow the gap in electricity access for these countries are particularly important for progress on indicator 7.1.1. The three countries with the largest deficits are in Sub-Saharan Africa. Nigeria and the Democratic Republic of Congo (DRC) topped the list in 2019, with 90 million and 70 million people, respectively, lacking access. Ethiopia became the third largest access-deficit country in 2019 (displacing India), with about 58 million unserved people. Over the past decade, the rate of progress in the DRC and Nigeria trailed population growth, resulting in net increases in the access deficit of 14 million and 7 million people. In 9 of the 20 countries, access kept pace with population growth (Bangladesh, Democratic People's Republic of Korea, Ethiopia, India, Kenya, Myanmar, Sudan, Tanzania, and Uganda). Bangladesh, Kenya, and Uganda made the most progress in electrification, achieving annual growth in access of more than 3 percentage points after 2010.[6]
- **Decentralized renewable energy:** Electrification through decentralized renewables-based solutions has advanced rapidly since 2010. The number of people connected to mini-grids powered by various technologies more than doubled between 2010 and 2019, growing from 5 to 11 million people (IRENA 2020). Of those connected to solar mini-grids, 33 percent are connected at Tier 1 of the Multi-Tier Framework (the lowest level of energy access) while the remainder are connected to Tier 2 or higher. In 2019, 105 million people had access to off-grid solar solutions,[7] up from 85 million in 2016 (GOGLA 2020). Forty-nine percent lived in Sub-Saharan Africa, and 29 percent in South Asia. Since 2010, policy frameworks to support mini-grid and off-grid systems have developed more quickly than those for on-grid electrification (ESMAP 2020a).
- **Affordability gap:** More than 25 million people in developing Asia and Africa could lose the ability to afford an essential bundle of electricity services by the end of 2020 (see box 1.1). Two-thirds of the total live in Sub-Saharan Africa, representing about 3 percent of the region's currently connected population. Because the COVID-19 pandemic could slow progress in access, widen the affordability gap, and cause delays in payments, it is important for the international community to support the ability of governments to preserve affordability, economic growth, health, and gender equality.
- **The effects of COVID-19:** Disruptions related to the pandemic are expected to slow or even reverse progress in electrification as utilities and off-grid service providers face financial difficulties. The lack of reliable energy access has already caused health problems. More than 70 percent of the health facilities in Sub-Saharan Africa have no access to reliable electricity, and one in four has no access at all. Electrification of health facilities (and other public institutions) is essential for vaccine deployment and storage, as well as broader efforts to mitigate and recover from the pandemic.

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5 The top-20 access-deficit countries in 2019 were: Nigeria, Democratic Republic of the Congo, Ethiopia, Pakistan, Tanzania, India, Uganda, Mozambique, Sudan, Madagascar, Niger, Angola, Myanmar, Burkina Faso, Malawi, Kenya, Chad, Democratic People's Republic of Korea, Bangladesh, and South Sudan.

6 The access rates of Kenya for 2016 and 2019 depend on two types of surveys: Multi-Tier Framework (MTF) and national census (Kenya National Bureau of Statistics 2019). The two capture the service level in different ways. During the internal consultation process with the World Bank country team, it was agreed, for data accuracy, that data for years 2016 and 2019 would be sourced from the MTF (53.1 percent) and Census (69.7 percent), respectively.

7 GOGLA defines eligible off-grid solar lighting products as systems that include a solar panel, a battery and at least one light point.

ARE WE ON TRACK?

Ninety percent of the world's population had access to electricity in 2019 (figure 1.1). Taking into account current and planned policies as well as COVID-19's impacts, it is projected that 92 percent of the global population will have access by 2030, leaving close to 660 million people without it (IEA 2020a).

Between 2010 and 2019, the global population without access dropped from 1.2 billion to 759 million. In each of the three last years of the period (2017–19), an annual average of 130 million people gained access, easily outstripping the average annual population growth of 82 million and marginally exceeding the progress recorded over the 2010–17 period, during which an average of 127 million people gained access each year. The global access rate over the entire period was driven chiefly by a group of countries that made startling progress. Kenya and Mali, for instance, each scored annual growth of more than 6 percentage points, with electrification outpacing population growth from 2017 to 2019. However, the global progress masks disparities across regions and sets of countries. The 46 least-developed countries still had an access rate of just 53 percent in 2019, trailing the global average,[8] while 51 percent of the world's population without access to electricity lived in low-income countries and 48 percent in fragile and conflict-affected areas.[9]

FIGURE 1.1 • Percentage of population with access to electricity

Source: World Bank 2021; IEA 2020.

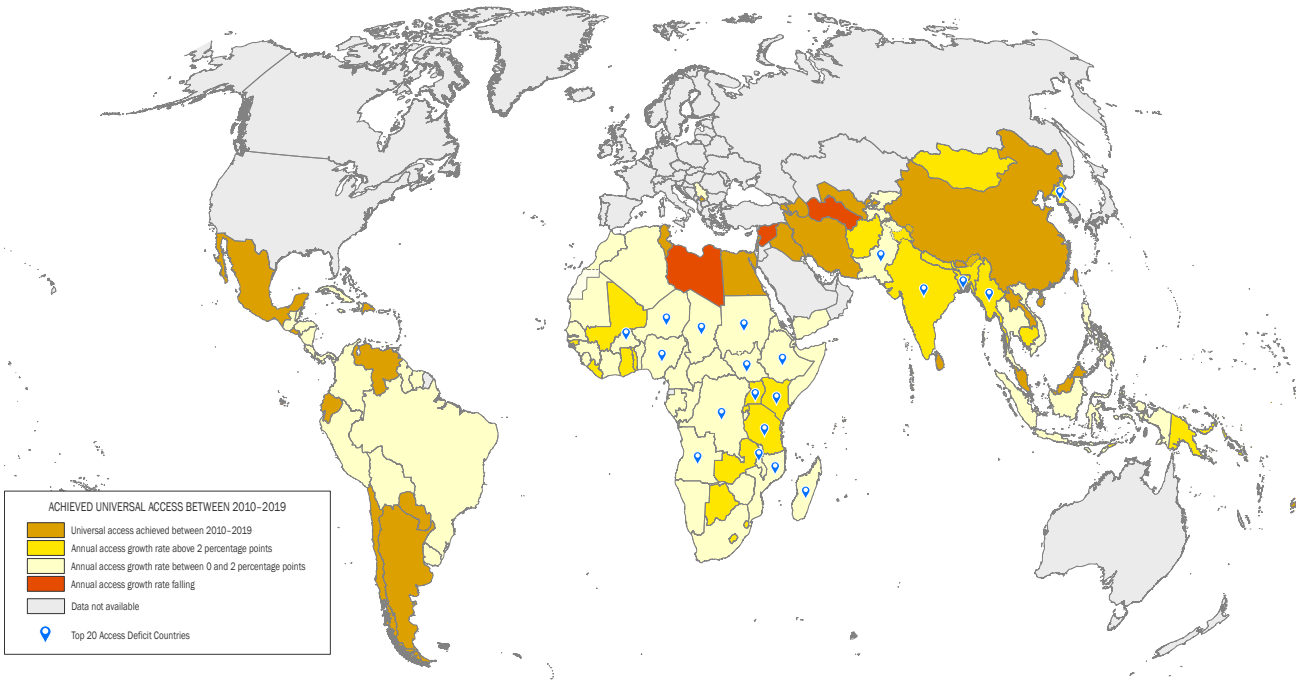
Thirty-nine countries attained universal access after 2010—15 of them in Latin America and the Caribbean.[10] Another 95, densely clustered in Sub-Saharan Africa, were still below the level of target 7.1 in 2019. About a quarter of the 95 access-deficit countries improved their annual electrification rates by more than 2 percentage points between 2010 and 2019. Seven of the 25 fastest-improving countries are also among the top 20 access-deficit countries: Bangladesh, Democratic People's Republic of Korea, India, Kenya, Myanmar, Uganda, and Tanzania (figure 1.2). Half of the access-deficit countries were located in Sub-Saharan Africa, where an annual average of more than 24 million people gained access each year after 2010, advancing the regional access rate from 33 percent in 2010 to 46 percent in 2019. Among the countries in Sub-Saharan Africa, some, such as Kenya and Eswatini, achieved annual growth of more than 2 percentage points over the 2010–19 period, but they are still short of the rate required to achieve universal access by 2030.

8 The electricity access rate in the least-developed countries (United Nations 2020) rose from 33 percent in 2010 to 53 percent in 2019.

9 Countries with a per capita gross national income of less than USD 1,035 are classified as low-income (World Bank 2020b). Countries affected by violent conflict are identified based on a threshold number of conflict-related deaths relative to the population (World Bank 2020a). The two categories are not mutually exclusive.

10 The 39 countries that achieved universal access are Anguilla, Antigua and Barbuda, Argentina, Armenia, Aruba, Azerbaijan, Bhutan, British Virgin Islands, Chile, China, Cook Islands, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Fiji, Iran, Iraq, Kiribati, Kosovo, Lao PDR, Lebanon, Malaysia, Maldives, Mauritius, Mexico, Nauru, Palau, Paraguay, Saint Kitts and Nevis, Saint Vincent and the Grenadines, Seychelles, Sri Lanka, State of Palestine, Tunisia, Tuvalu, Uzbekistan, and Venezuela.

FIGURE 1.2 • Annual increase in access to electricity in access-deficit countries, 2010–19



Source: World Bank 2021.

Note/disclaimer: This map was produced by the Geospatial Operations Support Team of the World Bank based on the Cartography Unit of the World Bank. *The boundaries, colors, denominations, and other information shown on any map in this work do not imply any judgment on the part of the custodian agencies concerning the legal status of or sovereignty over any territory or the endorsement or acceptance of such boundaries.*

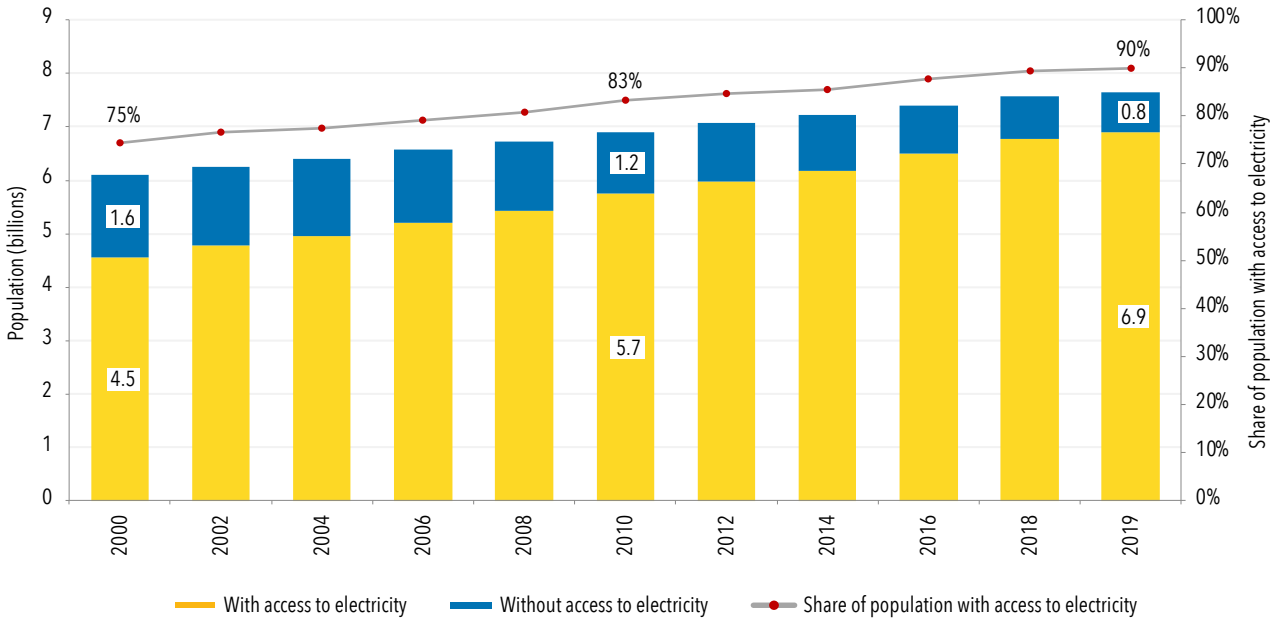
LOOKING BEYOND THE MAIN INDICATORS

This chapter reviews progress in access to electricity by considering various socioeconomic electrification patterns across regions and countries using data for the 2000–19 period. The purpose of the analysis is to examine global efforts to reach the target of universal access by 2030 and to ensure continuous gains in electrification worldwide. The methodology used in compiling the database is presented at the end of the chapter. In addition to the analytical findings, the chapter provides policy insights into electrification efforts and their contribution to a sustainable recovery from the COVID-19 pandemic through a literature review and country case studies.

ACCESS AND POPULATION

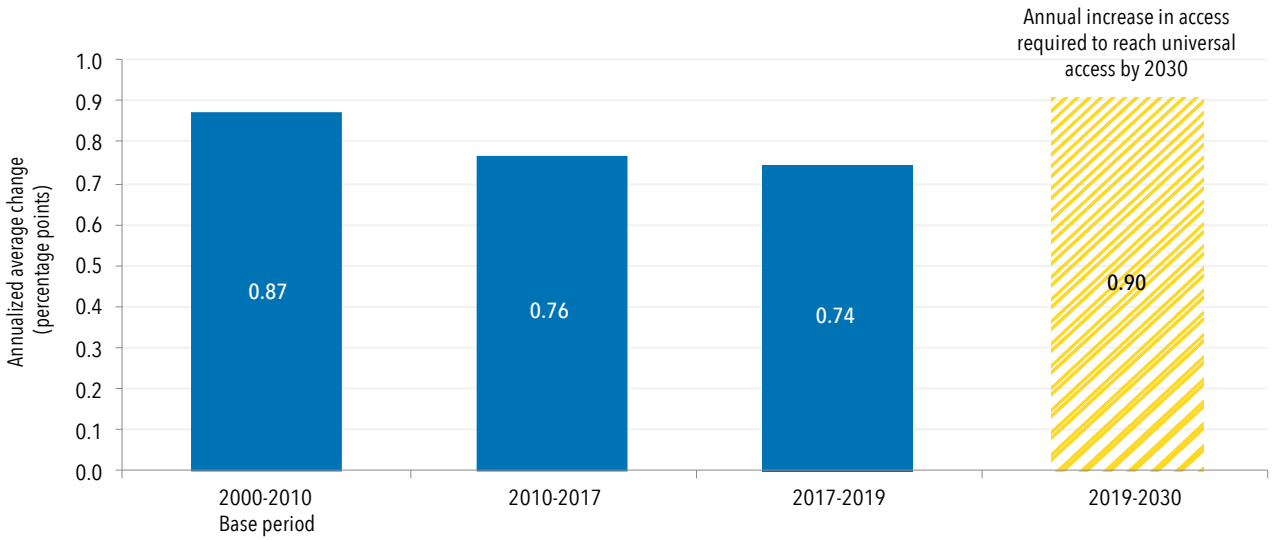
In comparison with past decades, progress in electrification since 2010 has been remarkable. However, its pace still needs to accelerate if the 2030 target is to be met. Globally, electrification expanded from 83 percent of the world's population in 2010 to 90 percent in 2019 (figure 1.3), while the population without access dropped from 1.2 billion to 759 million. Between 2017 and 2019, access grew by 0.74 percentage points per year, and progress was slower than the average annual increase of 0.90 percentage points required to achieve universal access by 2030 (figure 1.4). In view of the modest progress over the last three years of the period, and of the current pandemic and the difficulty of electrifying the populations that remain unserved, the final stretch to the road to universal access is bound to be challenging. At the same time, quality of supply, affordability, and reliability are still serious issues for many countries. Affordability is examined in box 1.1.

FIGURE 1.3 • Gains in electricity access, 2000–19



Source: World Bank 2021.

FIGURE 1.4 • Average annual increase in access to electricity



Source: World Bank 2021.

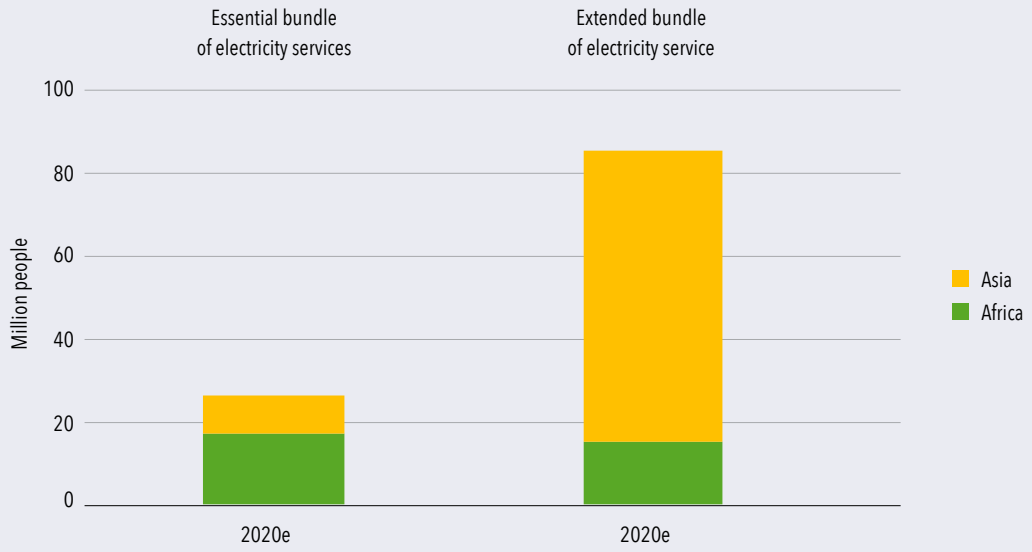
BOX 1.1 • ENERGY POVERTY AND COVID-19

The economic fallout from the COVID-19 crisis has lowered the incomes of many vulnerable people in emerging markets and developing economies. Recent analysis shows that up to 100 million people, mainly in Sub-Saharan Africa and developing Asia, were likely pushed into extreme poverty in 2020, and a further 200 million people are at risk of falling into poverty (Lakner and others 2020). The decline in welfare has major consequences for the most vulnerable households, who may be forced to make trade-offs between their energy needs and other demands, and therefore return to inefficient traditional fuels.

Estimates from the International Energy Agency, using data from Lakner and others (2020), show that more than 25 million people in developing Asia and Africa may have lost the ability to afford an essential bundle of electricity services by the end of 2020 (IEA 2020a).[a] Two-thirds of those affected were in Sub-Saharan Africa, accounting for around 3 percent of the connected population in the region. Between 5 and 10 percent of the connected population in Ethiopia, Nigeria, Democratic Republic of the Congo, and Niger may have been affected. A further 85 million connected people, mainly in developing Asia, may have lost the ability to pay for an extended bundle of electricity services. The difference in emphasis between losing access to the essential bundle of electricity services in Sub-Saharan Africa and losing access to the extended bundle in Asia reflects different circumstances: Sub-Saharan Africa has relatively more people at risk of being pushed into extreme poverty (less than USD 1.90/day) owing to COVID-19, while in Asia (and in particular India) the crisis is likely to affect more people at higher poverty lines (USD 3.20/day or USD 5.50/day) but with a greater likelihood of recovering after the crisis.

A similar pattern is observed for poor households' access to clean cooking fuels and technologies, which is sensitive to changes in incomes and fuel prices. Many households in rural or peri-urban areas could therefore revert to charcoal, kerosene or fuelwood. A survey conducted by the University of Liverpool before and during a community-wide lockdown in an informal settlement of Nairobi found that confinement measures caused a major loss of income for around 95 percent of surveyed households (Shupler and others 2020). As a result, nearly 15 percent of households that had been using LPG as a primary cooking fuel before the COVID-19 crisis reverted to kerosene, and a further 13 percent switched to gathering free firewood to meet their cooking needs. In the settlement, kerosene has a per-meal fuel cost almost 60 percent higher than bulk LPG, but a full cylinder of LPG has a high upfront cost. If a similar trend were found across all of Sub-Saharan Africa, nearly 25 million people would be at risk of reverting to traditional fuels (IEA 2020a).

FIGURE B1.1.1 • People with access to electricity in Asia and Africa at risk of losing the ability to pay for basic electricity services in 2020



Source: IEA 2020a; using Lakner and others (2020).

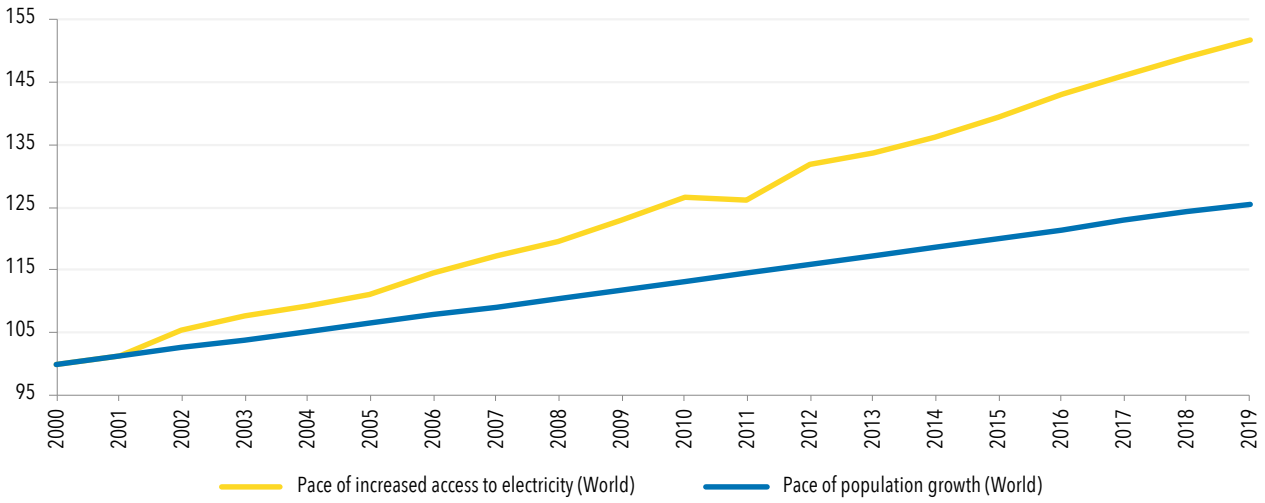
Solutions are available to support continued access to energy services. Some countries introduced measures to protect vulnerable customers (and, in so doing, sometimes aggravated the financial distress of utilities already affected by decreased demand). Côte d'Ivoire, Ghana, Mali, Nigeria, Senegal, and Togo provided free electricity to poor households for several months in 2020. Uganda removed value-added tax on liquefied petroleum gas (LPG) in June 2020. India's government guaranteed free LPG refills for some of the poorest members of society between April and September 2020. The Energy Access Relief Fund, an initiative of several development finance institutions, has provided liquidity support to energy access companies (off-grid, mini-grid, and clean cooking) to allow them to continue serving their customers and maintain jobs.

Other indirect policies could also help countries avoid a reversal of progress on access to energy. For example, some consumer finance mechanisms (such as pay-as-you-go) could allow households to purchase modern fuels in smaller amounts, commensurate with their income structure. Support provided to markets and supply chains for different clean cooking fuels could also lead to lower prices, making it possible for vulnerable households to maintain their use. In addition, some communities with access to distributed renewables showed greater livelihood resilience in the onset of COVID-19. For instance, in India, solar-powered digital service centers have helped maintain access to services that supported business transactions while communities were under lockdown (SEKCO Foundation 2020).

a. A household is at risk of losing its ability to pay for a specific bundle when electricity spending exceeds 5 percent of household spending. The essential bundle of electricity services includes a mobile phone charger, four lightbulbs operating four hours per day, a fan used for three hours per day, and a television for two hours per day, equating to 500 kilowatt-hours (kWh) per household per year. The extended bundle includes the essential bundle plus one refrigerator and twice the hours for the fan and the television, equating to 1 250 kWh per household per year with standard appliances. "Basic electricity services" are defined as services provided under either the essential or extended bundle.

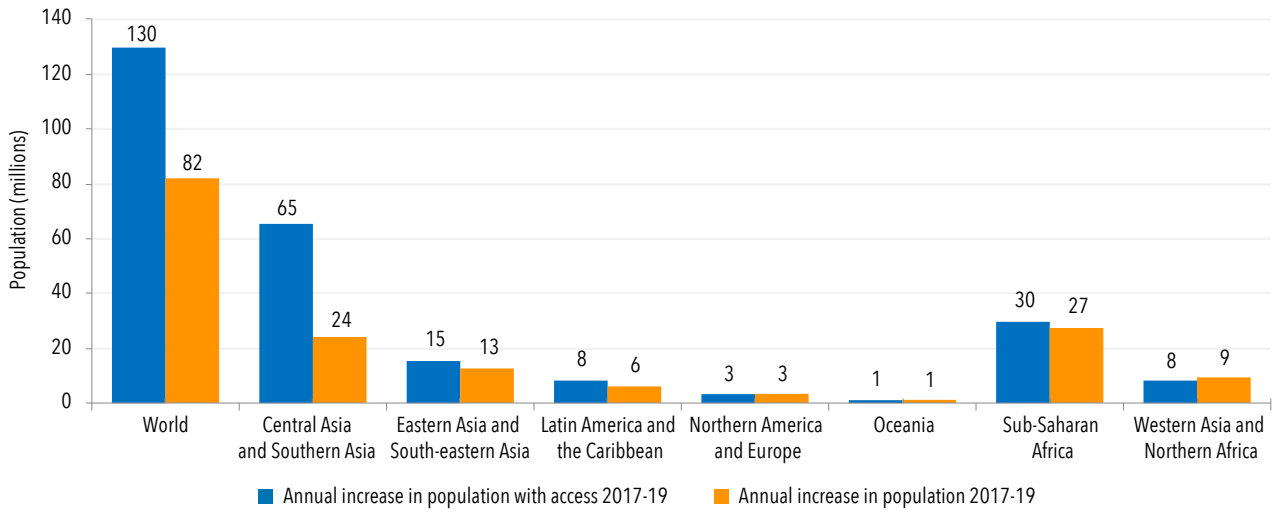
Global electrification outpaced world population growth between 2010 and 2019 (figure 1.5). The trend persisted in 2017–19, as 130 million new people were electrified each year against world population growth of 82 million (figure 1.6). Correspondingly, the world's unserved population fell by 95 million in 2017–19. The progress in access resulted primarily from advances in Central Asia and Southern Asia, where an annual average of 65 million people gained access in 2017–19, surpassing population growth of 24 million.[11] The rapid pace of annual growth in electrification was mainly driven by advances in India and Bangladesh. Meanwhile, though it has the largest remaining access deficit, the pace of electrification in Sub-Saharan Africa (30 million people each year) outstripped population growth of 27 million over the same period. Therefore, the number of people without access to electricity in the region fell by about 2 million people each year between 2017 and 2019.[12]

FIGURE 1.5 • Growth in electricity access vs. growth in global population, 2000–19 (indexed, 2000 = 100)



Source: World Bank 2021.

FIGURE 1.6 • Annual increase in electrification and population, 2017–19, by region



Source: World Bank 2021.

11 Between 2017 and 2019, electrification outpaced population growth in the following countries of the region: Bangladesh, Bhutan, India, Iran, Maldives, Pakistan, Sri Lanka, and Tajikistan.

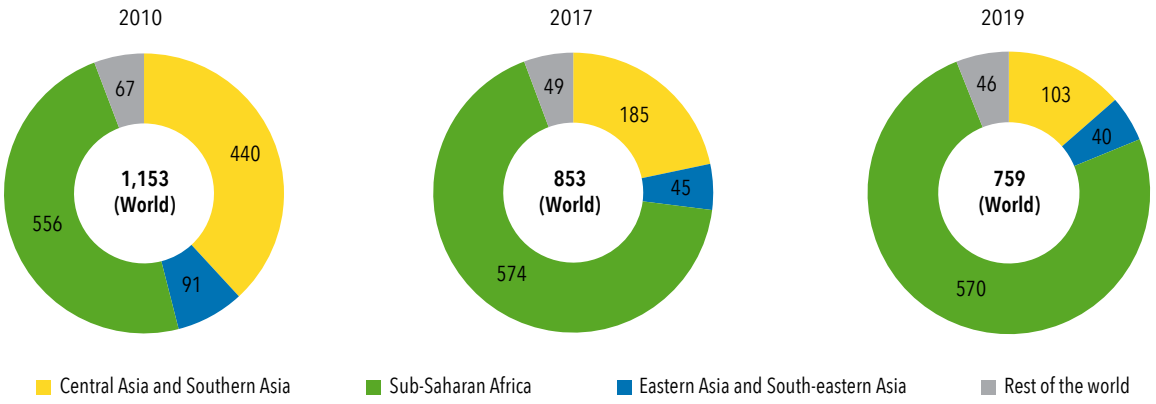
12 Between 2017 and 2019, electrification outpaced population growth in the following countries of Sub-Saharan Africa: Benin, Botswana, Cabo Verde, Cameroon, Comoros, Côte d'Ivoire, Eswatini, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Mali, Mauritius, Mozambique, Namibia, Rwanda, Senegal, South Africa, South Sudan, Tanzania, Togo, and Uganda.

THE ACCESS DEFICIT

Although the number of people without access to electricity dropped steadily from 1.2 billion in 2010 to 759 million in 2019, progress varied from region to region. For Sub-Saharan Africa, the share of the population with access to electricity grew from 33 percent in 2010 to almost 46 percent in 2019. However, the global access deficit is increasingly centered on Sub-Saharan Africa, home to 75 percent of the world's population without access in 2019. In fact, with population growth, the absolute deficit in Sub-Saharan Africa has grown since 2010, with 570 million people lacking access in 2019 (figure 1.7). Electrification lagged notably behind population growth in DRC, Nigeria, Niger, Chad, Malawi, and Burkina Faso. Thanks to Kenya and Mali, however, where the annual growth rate in access was more than 6 percentage points in 2017–19, electrification outpaced population over the last two tracking years for the region as a whole, resulting in a drop of about 2 million unserved people in each of the three years.

During the period between 2010 and 2019, the most significant drop in the deficit was found in Central Asia and Southern Asia, where it shrank fourfold from 440 million in 2010 to 103 million in 2019 (figure 1.7). The countries driving the decline were Afghanistan, Bangladesh, India, and Nepal. Eastern Asia and South-eastern Asia also showed improvement, reaching more than 98 percent access in 2019 (from 96 percent in 2010). Meanwhile, Latin America and the Caribbean is approaching universal access. Compared to 96 percent of people connected in 2010, the level of access to electricity of the region in 2019 was 98 percent, leaving 10 million people without access, most of them living in Haiti, Nicaragua, Guatemala, Honduras, and Peru.

FIGURE 1.7 • Regional access deficits (in millions of people without access) for 2010, 2017, and 2019



Source: World Bank 2021.

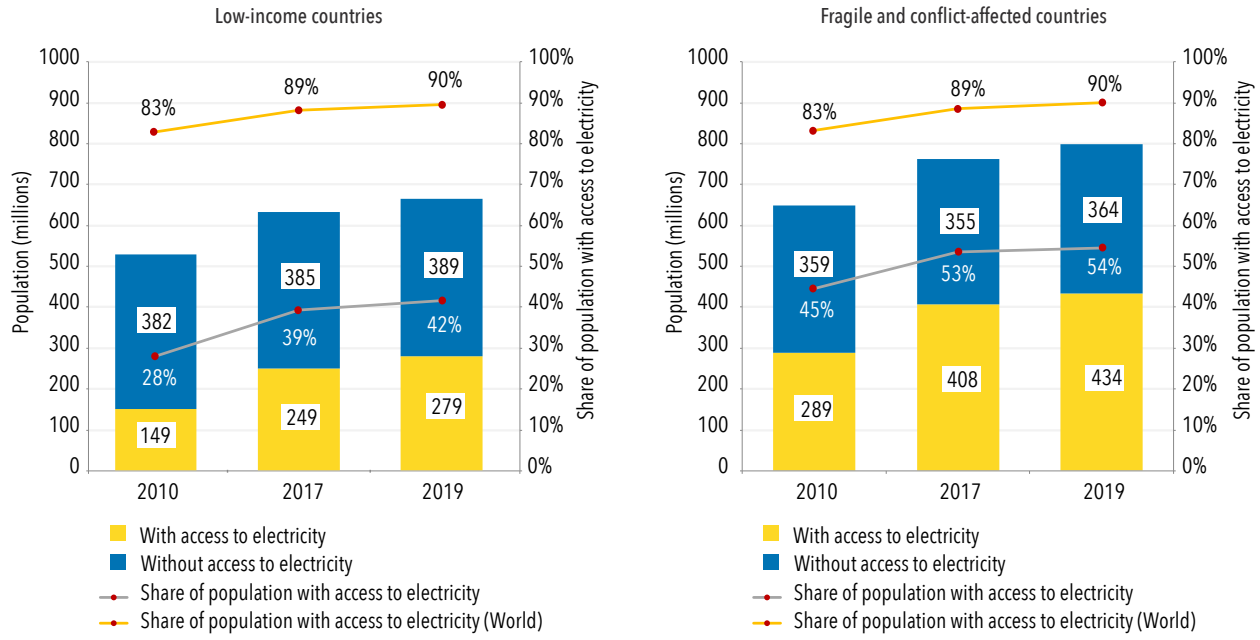
Low-income countries and those affected by fragility and conflict have shown progress in access over the past two decades, but they still lag in efforts to expand electrification. More than half of the globe's unserved population lives in the world's 29 low-income countries (those with a gross national income below USD 1,035), where the share of the population enjoying access to electricity grew rapidly from 28 percent in 2010 to 42 percent in 2019 (figure 1.8). Several countries in the group stand out for their annual rate of growth in access from 2010 to 2019. For example, Afghanistan (6 percentage points), Uganda (3 points), and Rwanda (3 points) achieved substantial advances. Between 2017 and 2019, access grew only slightly—from 39 percent to 42 percent—in the low-income group, with 279 million people electrified in 2019. During the same period, however, annual growth in access for these countries trailed population growth. An annual average of 15 million people gained access to electricity, while the population grew by more than 17 million per year. In Chad, Malawi, Syria, and Yemen, growth in access was outstripped by growth in population between 2017 and 2019.

In fragile and conflict-affected countries, the access rate rose from 45 percent in 2010 to 54 percent in 2019, still much lower than the global average.[13] The population lacking access to electricity and living in situations of fragility and conflict grew from 359 million in 2010 to more than 364 million in 2019. The countries in

13 The ongoing conflict in the Central African Republic has interrupted electrification efforts. As a result, the access rate in 2019 was almost the same as in 2010 (around 10 percent).

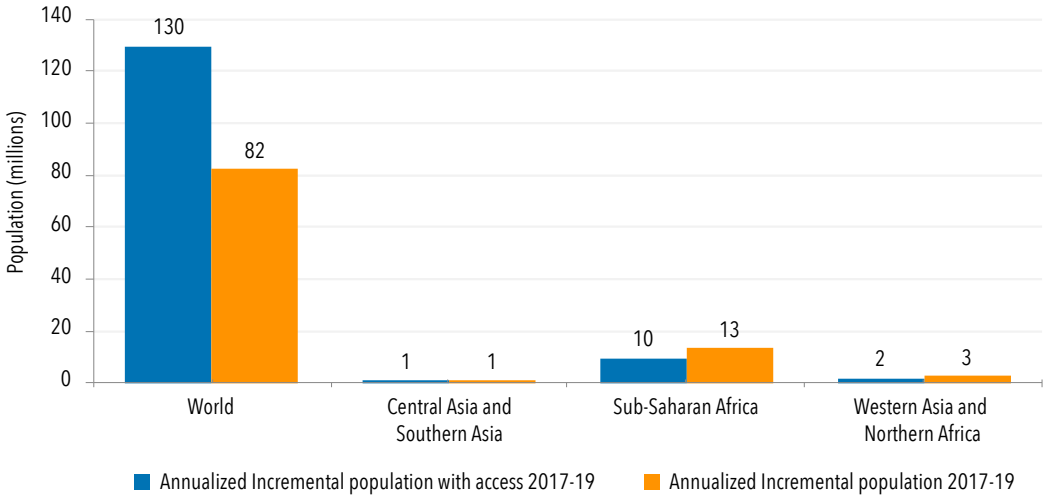
the group with the greatest annual increases in access from 2010 to 2019 were Timor-Leste (6 percentage points), Afghanistan (6 points), Papua New Guinea (5 points), Kiribati (4 points), and Solomon Islands (4 points). Still, almost half of the world's unserved people in 2019 (48 percent) were found in fragile and conflict-affected contexts. Although the annual advance in access for such countries in Sub-Saharan Africa, and Western Asia and Northern Africa did not keep pace with population growth, the opposite was true in Central Asia and Southern Asia (figure 1.9). Some fragile countries, such as Sudan and Niger, refined off-grid and mini-grid solutions for their electrification planning, while grid-based electrification efforts stalled (ESMAP 2020a). More up-to-date, reliable and granular data are needed to improve policy in the fragile and low-income environments that present the most complex challenges. Household surveys capturing the various dimensions of electricity access (quality of service, affordability, legality), supplemented with geospatial tools, can provide the comprehensive picture needed to set priorities, make more informed decisions, and better target electrification efforts.

FIGURE 1.8 • Gains in electricity access in low-income countries and fragile and conflict-affected countries, 2010, 2017, and 2019



Source: World Bank 2021.

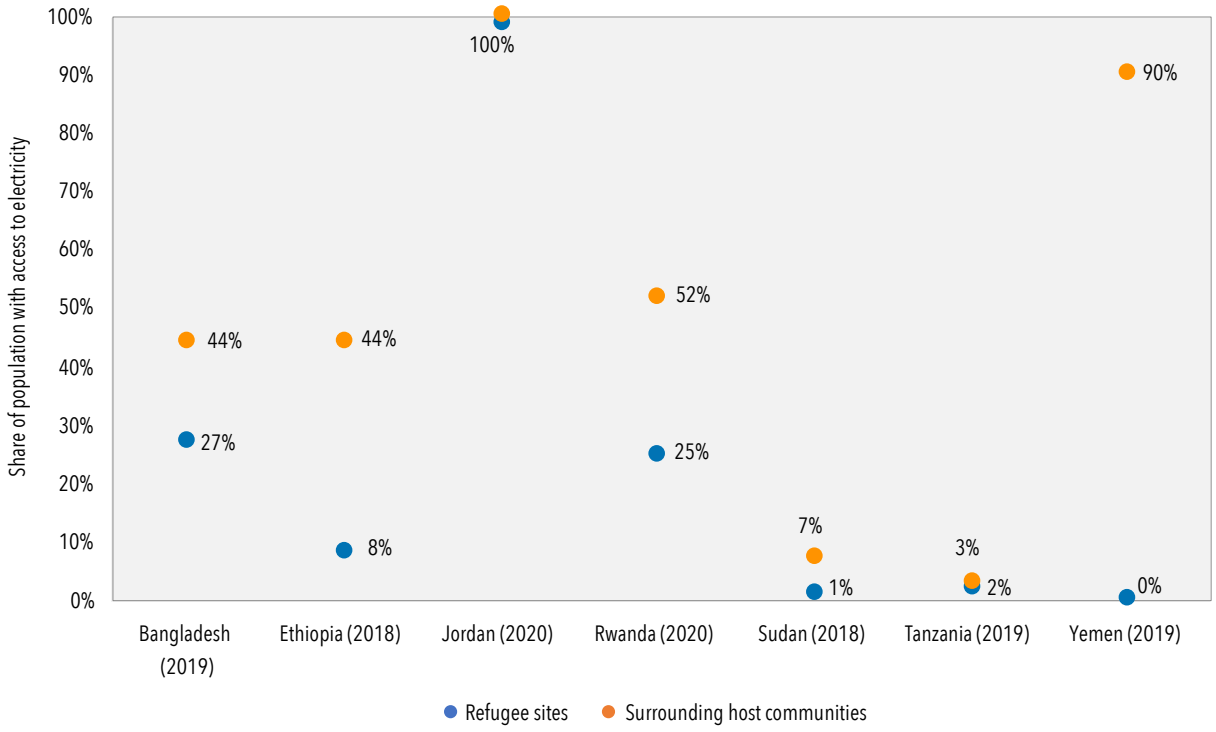
FIGURE 1.9 • Annual increase in electrification and population in fragile and conflict-affected countries, 2017–19, by region



Source: World Bank 2021.

Do refugees and other forcibly displaced persons enjoy rates of access to electricity similar to those of their surrounding host communities? Although more data are needed to understand energy access for the forcibly displaced, recent data gathered in 18 countries by the UNHCR show that, on average, surrounding host communities have twice the access to electricity of the forcibly displaced: 34 percent vs. 19 percent (UNHCR 2021). Jordan, at 100 percent for both groups in 2020, is an exception (figure 1.10). The most conspicuous disparities in coverage are found in Yemen, where the refugee site at Kharaz had no access at all in 2019, whereas the host community had 90 percent. Refugees at 27 sites in Ethiopia, five in Sudan, and three in Tanzania suffered from far lower electricity coverage than in other countries.[14] The host communities in Tanzania also had a very low access rate (3 percent).

FIGURE 1.10 • Access to electricity for refugee sites and nearby host communities



Source: UNHCR 2021.

THE URBAN-RURAL DIVIDE

Despite starting from a lower point, access to electricity has improved more quickly in rural areas than in urban areas since 2010, boosted by the uptake of decentralized energy and greater attention to the agenda of "leaving no one behind" (ESMAP 2020). The access gap between rural and urban shrank from 26 percentage points in 2010 to 16 in 2019 (figure 1.11). Nevertheless, access remains lower in rural areas than in urban areas. Whereas 81 percent of rural residents were connected to electricity in 2019, leaving 640 million without access, 97 percent of urban dwellers had access (with 116 million unserved).[15] Each year between 2017 and 2019, 49 million rural residents gained access to electricity (vs. 81 million in urban areas), outpacing rural population growth over the same period (figure 1.12). In Central Asia and Southern Asia, annual progress in rural access (an additional 46 million people per year) surpassed annual population growth almost sevenfold

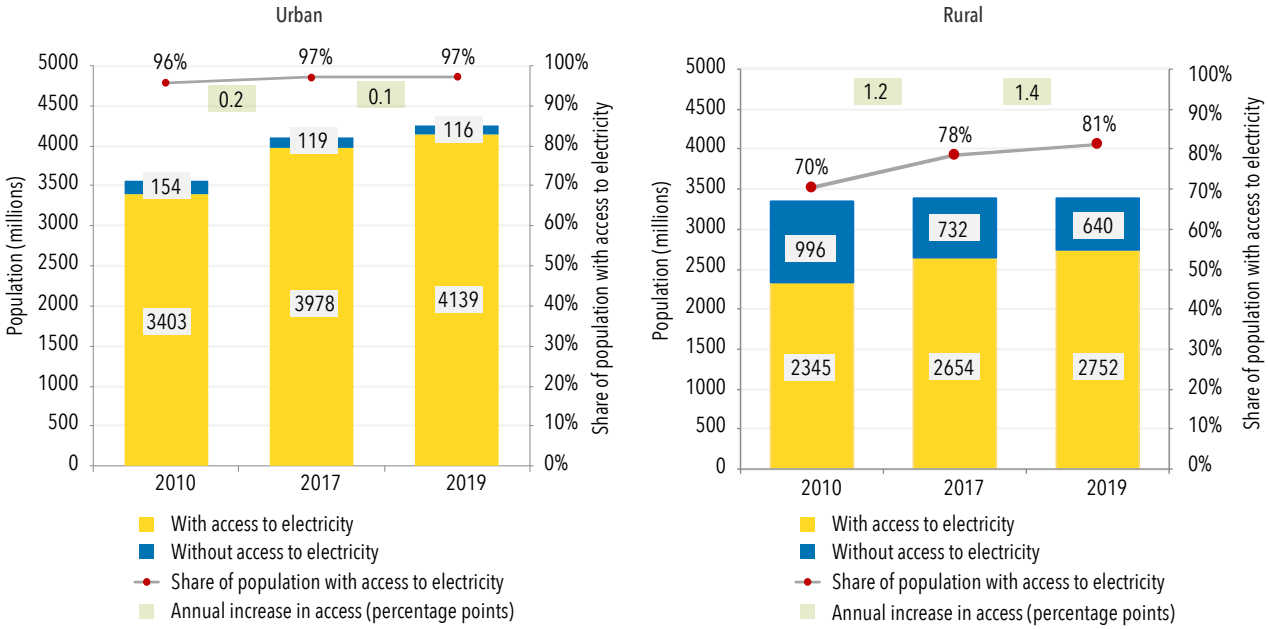
14 The 27 sites in Ethiopia were Adi Harush, Awbarre, Aysaita, Bambasi, Barahle, Bokolmanyo, Buramino, Dilo, Endabaguna, Gure Shombola, Hilaweyn, Hitsats, Jewi, Kebribeyah, Kobe, Kule, Magado, Mai Aini, Melkadida, Okugo, Pugnido, Sheder, Sherkole, Shimelba, Tierkidi, Tongo, and Tsore. The five sites in Sudan were Abuda, Fau 5, Girba, Kilo 26, and Wad Sharifey. The three sites in Tanzania were Mtendel, Nduta, and Nyarugusu.

15 Due to the lack of population data, the numbers of people without access in rural and urban areas do not sum to the total access deficit.

between 2017 and 2019. In the meantime, rural electrification in Sub-Saharan Africa, where more than half of the world's unserved rural population lives, kept pace with population growth, shrinking the access deficit.

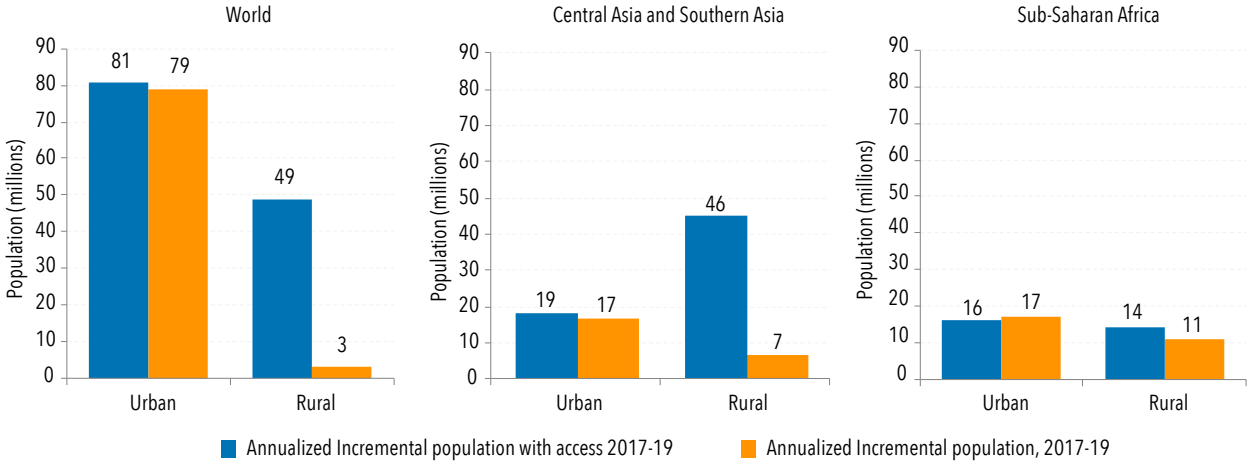
Compared with advancing rural access from its low baseline, sustaining the pace of electrification in urban areas faces several complexities. Major efforts will be required to keep up with population growth in urban areas, in part because the latter (at 78 million) was 13 times higher than in rural areas (6 million) over the 2010–19 period. Urban access efforts brought electricity to 81 million additional people each year, on average, outpacing population growth by 1.5 million between 2017 and 2019. While annualized incremental urban access in Central Asia and Southern Asia kept pace with population growth, it trailed population growth in Sub-Saharan Africa. Globally, 84 percent of the urban deficit in 2019 was in Sub-Saharan Africa.

FIGURE 1.11 • Gains in electricity access in urban and rural areas, 2010, 2017 and 2019



Source: World Bank 2021.

FIGURE 1.12 • Annual incremental growth in access and population in urban and rural areas of Central Asia and Southern Asia and Sub-Saharan Africa, 2017–19

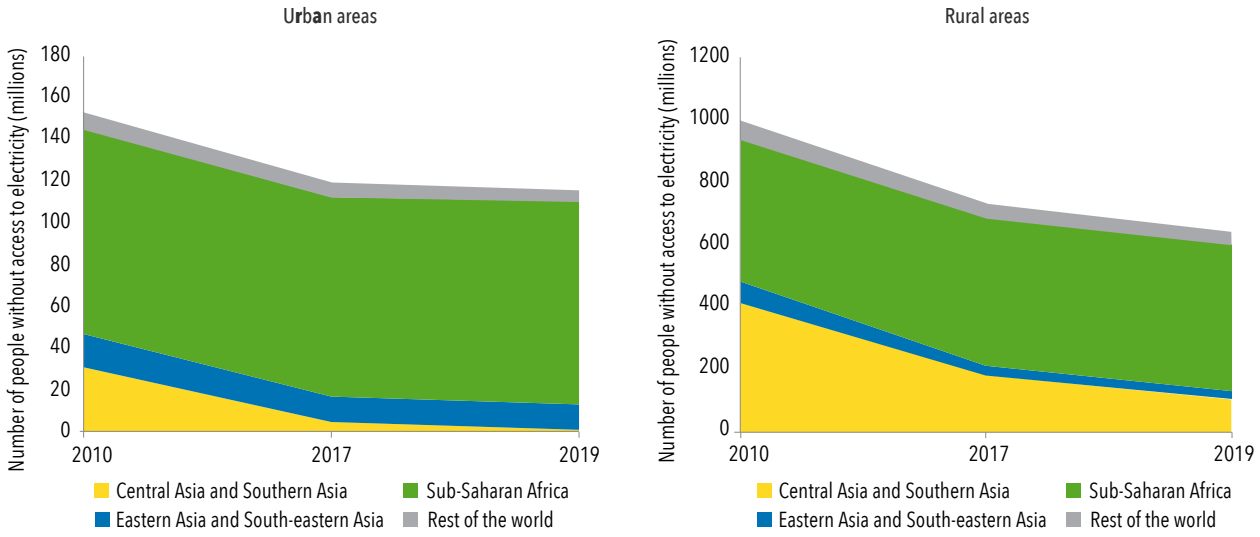


Source: World Bank 2021.

The access deficit for both urban and rural areas has been increasingly concentrated in Sub-Saharan Africa since 2010 (figure 1.13). In 2019, 97 million urban residents in the region and 471 million rural residents lacked

access. By contrast, the access deficit of Central Asia and Southern Asia shrank in both urban and rural areas over the 2010–19 period as a result of major electrification efforts in both settings. The annual decrease in the deficit between 2010 and 2019 was 3 million in urban areas and 34 million for rural areas. The rural access deficit in the region was particularly sharp: from 409 million in 2010 to 101 million in 2019. Likewise, since 2010, the access deficits for urban and rural areas in Eastern Asia and South-eastern Asia have fallen annually by 0.5 million and 5 million, respectively. As a result, the region's access deficit in 2019 was 12 million in urban areas and 28 million in rural.

FIGURE 1.13 • Evolution of access deficits in urban and rural areas, by region, 2010, 2017, and 2019



Source: World Bank 2021.

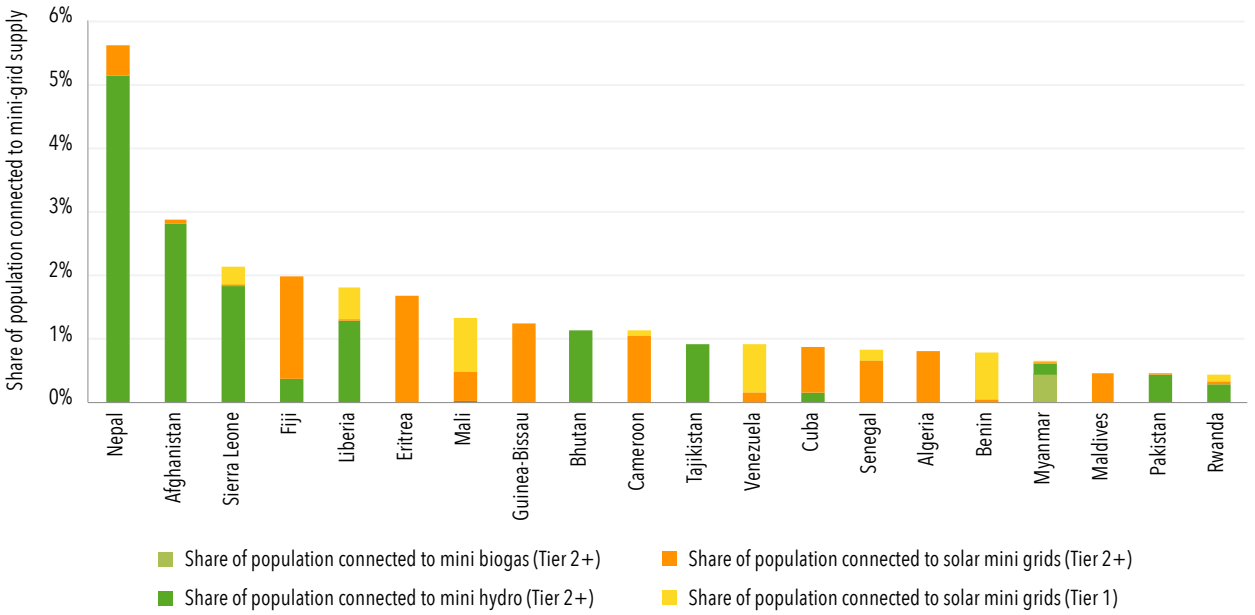
DECENTRALIZED ELECTRIFICATION

Tracking growth in access to electricity through decentralized renewables-based solutions has been challenging for several reasons, including market structures, the variety of solutions and systems, and the multiplicity of players involved along value chains. Today, supply-side data are available in databases maintained by the International Renewable Energy Agency (IRENA) and the association of producers of off-grid solar energy (GOGLA); demand-side figures are made available through the Multi-Tier Framework.

Electrification through decentralized renewables-based solutions has grown significantly since 2010, accelerating in the last few years. The number of people connected to mini-grids using solar, hydro, and biogas technologies has more than doubled between 2010 and 2019, with 11 million people connected in 2019 (IRENA 2020c).[16] In 2019, India, Nepal and Afghanistan had the most people connected to mini-grids (regardless of technology). Nepal, Afghanistan, and Sierra Leone had the highest share of the population served by mini-grids (figure 1.14). Connections to solar mini-grids have grown almost sixfold over the period, to 3.4 million people. In 2019, 67 percent of those connected to solar mini-grids enjoyed Tier 2+ access. Indonesia, India, and Algeria had the largest number of people connected to solar mini-grids in 2019.

16 For the purpose of measuring energy access, IRENA defines mini-grids as distribution networks supplying electricity to residential consumers and not connected to a country's main grid.

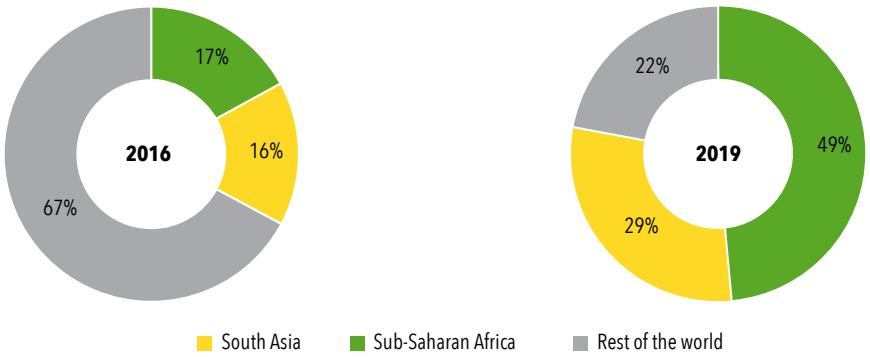
FIGURE 1.14 • Top 20 countries with the highest rates of access to mini-grid supply (Tier 1 or higher), 2019



Source: IRENA 2020c.

In 2019, 105 million people had access to off-grid solar solutions, up from 85 million in 2016.[17] As shown in figure 1.15, almost half lived in Sub-Saharan Africa, and 29 percent in South Asia (GOGLA 2021a). The countries with the largest number of people connected to off-grid solutions in 2019 were India (28 million), Kenya (17 million), and Ethiopia (8 million). Access to Tier 1 solutions expanded significantly between 2016 and 2019, from 38 million to 62 million people (figure 1.16). Access to Tier 2 solutions grew even faster, expanding fivefold over the same period to 10 million people in 2019. Progress in Sub-Saharan Africa was especially notable, with off-grid solar sales nearly tripling between 2016 and 2019 (figure 1.15). Fifty-one million people in the region were connected to off-grid solar solutions in 2019 (all tiers). Kenya (17 million), Ethiopia (8 million), and Uganda (4 million) are the top three.

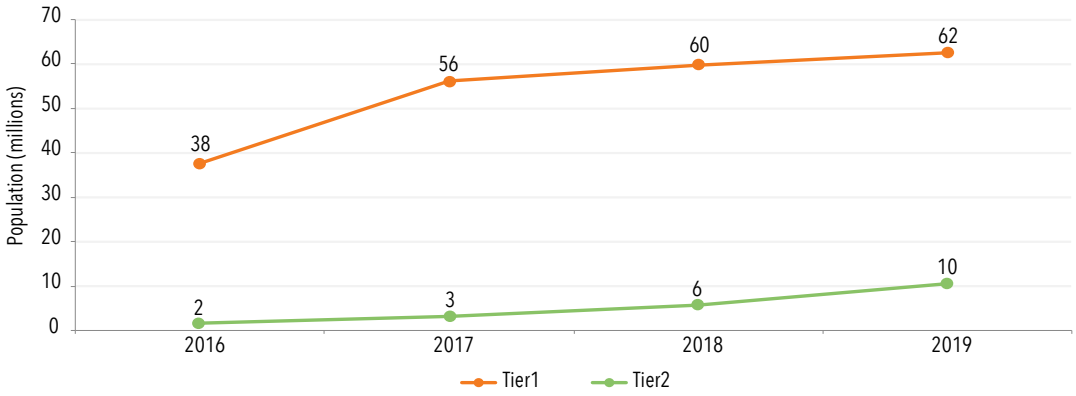
FIGURE 1.15 • Share of people connected to off-grid solar solutions, 2016–19



Source: GOGLA 2021a.

17 GOGLA defines eligible off-grid solar lighting products as systems that include a solar panel, a battery, and at least one light point.

FIGURE 1.16 • Number of people (millions) connected to off-grid solar products by tier, 2016-19

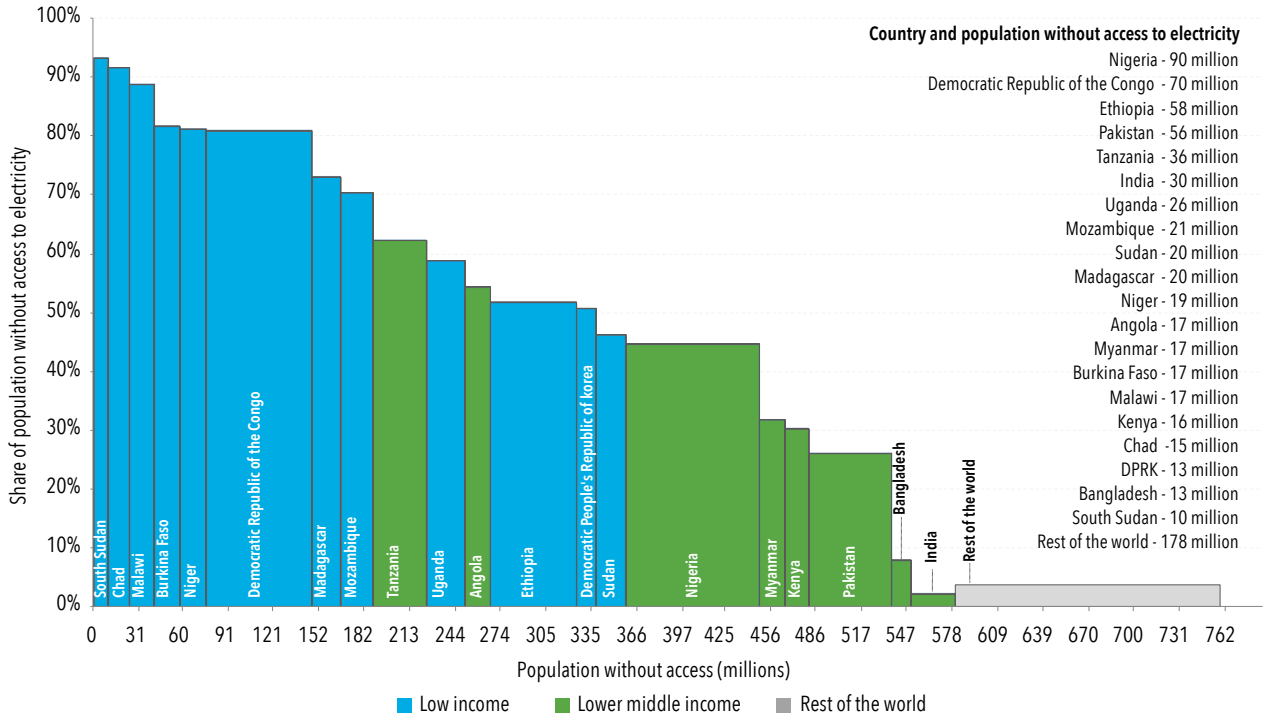


Source: GOGLA 2021a

COUNTRY TRENDS

In 2019, 76 percent (580 million) of the world's unserved population lived in the top 20 access-deficit countries (figures 1.17 and 1.18). The top three countries are in Sub-Saharan Africa: Nigeria (90 million), DRC (70 million), and Ethiopia (58 million). India rounded out the top five access-deficit countries and instead, Tanzania newly joined in 2019. India, which had the third-largest deficit in 2018, achieved a significant reduction in its population without access to electricity in 2019. South Sudan is new in the top 20, replacing Yemen.

FIGURE 1.17 • Share of population and total population without access to electricity, top 20 access-deficit countries, and rest of world, 2019



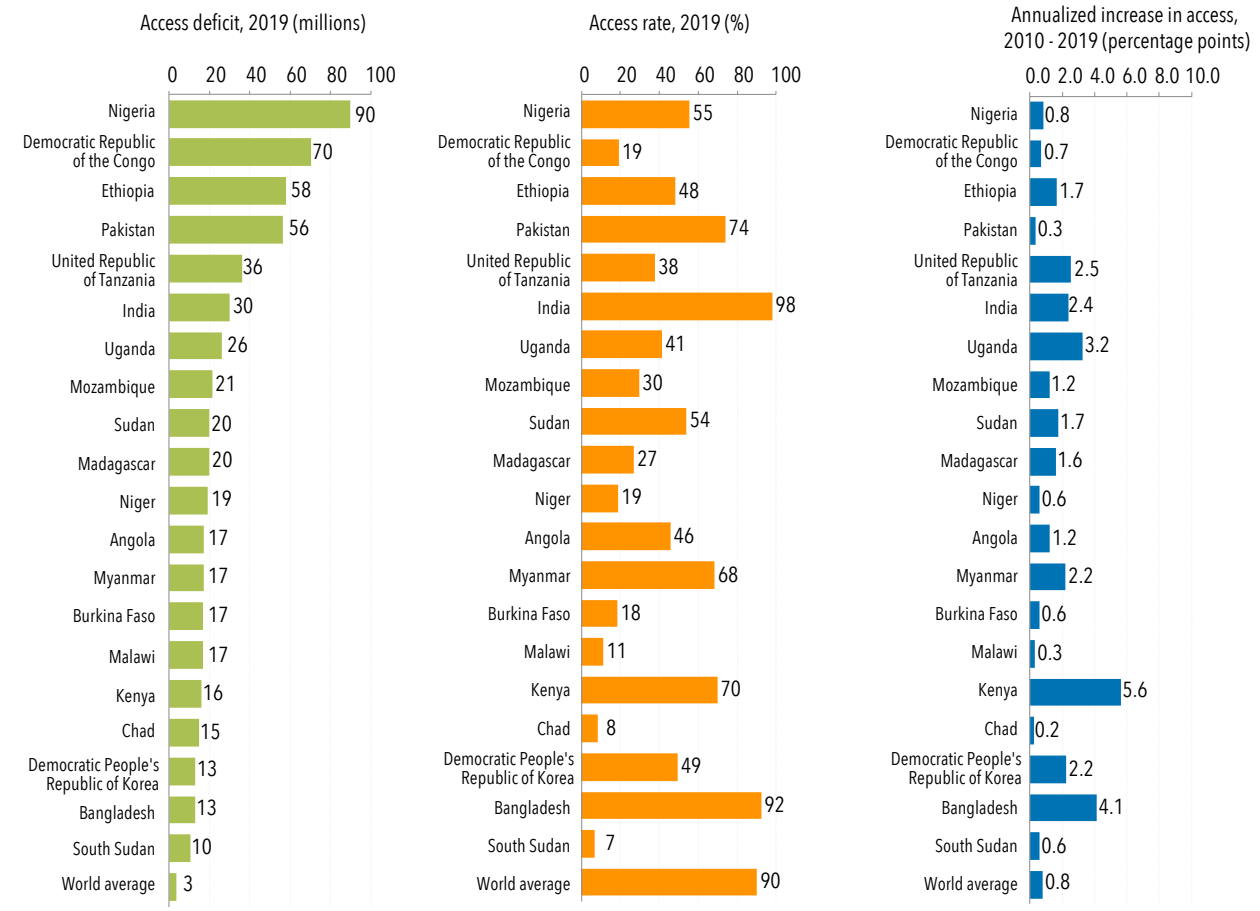
Source: World Bank 2021.

In about half of the top 20 deficit countries, access did not keep pace with population growth. In Nigeria, where 90 million people lacked access to electricity in 2019 (12 percent of the global access deficit), the deficit expanded by 1.3 million each year between 2017 and 2019. Nigeria's access rate grew by 0.8 percentage points each year from 2010 to 2019 period—not as fast as the total population. As a result, the number of people without access increased by 7 million from 2010, bringing the total deficit to close to 90 million in 2019. Similarly, for the DRC, the access rate improved by 0.7 percentage points annually over the same period, not enough to keep up with population growth. The population without access in the DRC rose by about 14 million after 2010, reaching 70 million in 2019.

Ethiopia and Pakistan, both of which had unserved populations of more than 50 million in 2019, increased their access rates by 1.7 and 0.3 percentage points annually after 2010. Electrification outperformed population growth in Ethiopia during the 2010–19 period, but not in Pakistan. In India, the access rate reached 98 percent in 2019, following annual growth in access of 2.4 percentage points since 2010. With electrification efforts outpacing population growth, the number of people without access to electricity in India dropped from 101 million in 2017 to 30 million in 2019, an annual decrease of 36 million.

Among the 20 countries with the largest deficits, Bangladesh, Kenya, and Uganda have made the most progress in electrification, as they achieved annual growth in access of more than 3 percentage points between 2010 and 2019 (figure 1.18). Consequently, the access deficits in these countries have shrunk over the past decade.

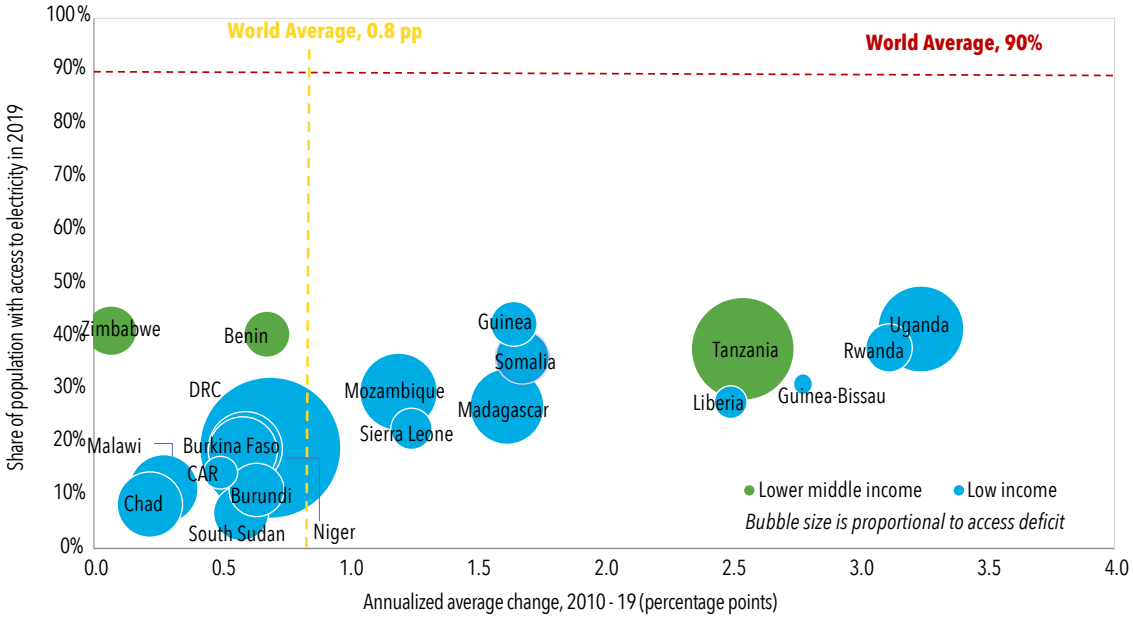
FIGURE 1.18 • Electricity access in the top 20 access-deficit countries by population, 2010–19



Source: World Bank 2021.

All of the world's 20 least-electrified countries are in Sub-Saharan Africa, where a majority of the global unserved population live (figure 1.19). South Sudan had the lowest access rate in 2019 (7 percent), followed by Chad (8 percent), Burundi (11 percent), and Malawi (11 percent). Uganda's annualized increase in access of more than 3 percentage points from 2010 to 2019 was the largest among the 20 countries. Half of the 20 least-electrified countries expanded access at an annual rate greater than the world average between 2010 and 2019. In the 2017–19 period, annual access growth in 6 of the 20 countries outpaced population growth. Those countries were Uganda, Tanzania, Rwanda, Liberia, Guinea-Bissau, and Guinea. With annual access growth more than 3 percentage points, Uganda and Guinea showed greater progress in electrification than the rest of the group over the period.

FIGURE 1.19 • Electricity access in the 20 least-electrified countries, 2010–19

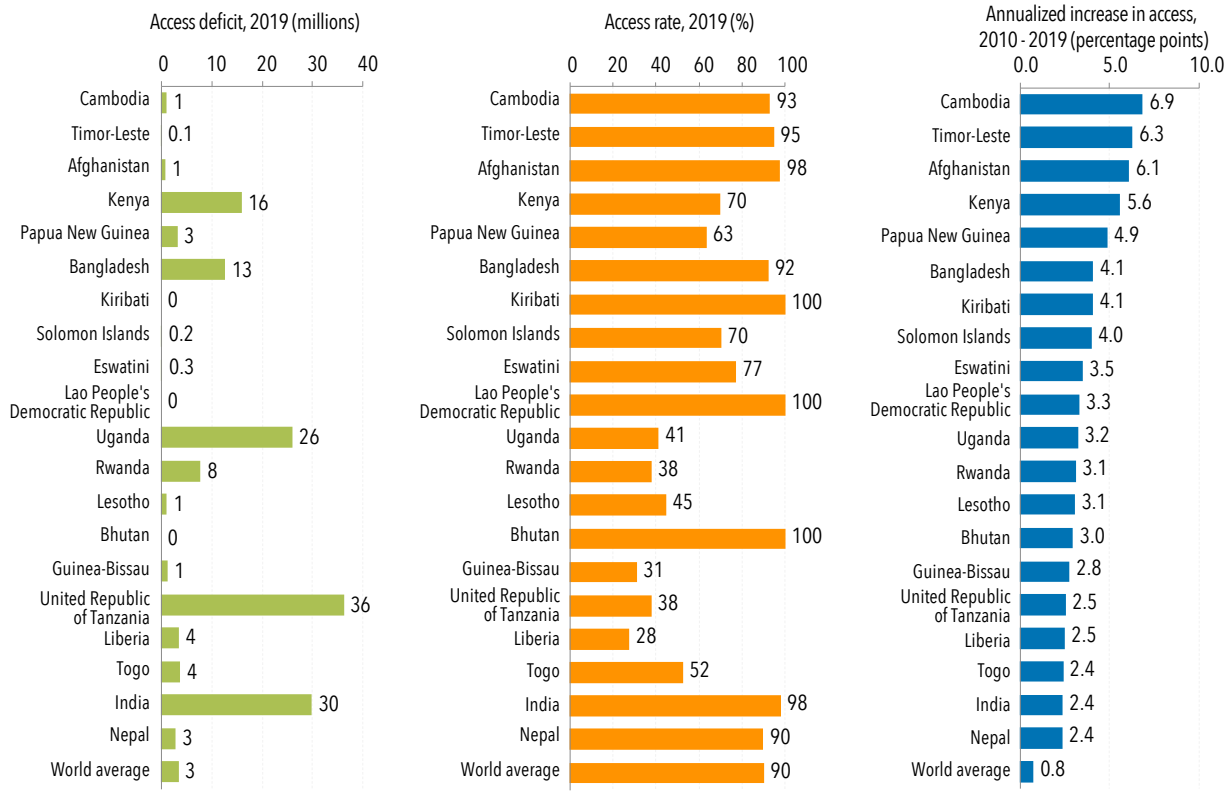


Source: World Bank 2021.

Four countries—Cambodia, Timor-Leste, Afghanistan (where only about 35 percent of the population has grid access), and Kenya—electrified at rates exceeding 5 percentage points annually between 2010 and 2019 (figure 1.20) by pursuing electrification strategies adapted to each country's circumstances (such as fragility or population density). Some countries with low access rates, such as Guinea-Bissau and Liberia, were among the fastest-electrifying, underscoring the importance of policies that promote an enabling environment for fast growth.

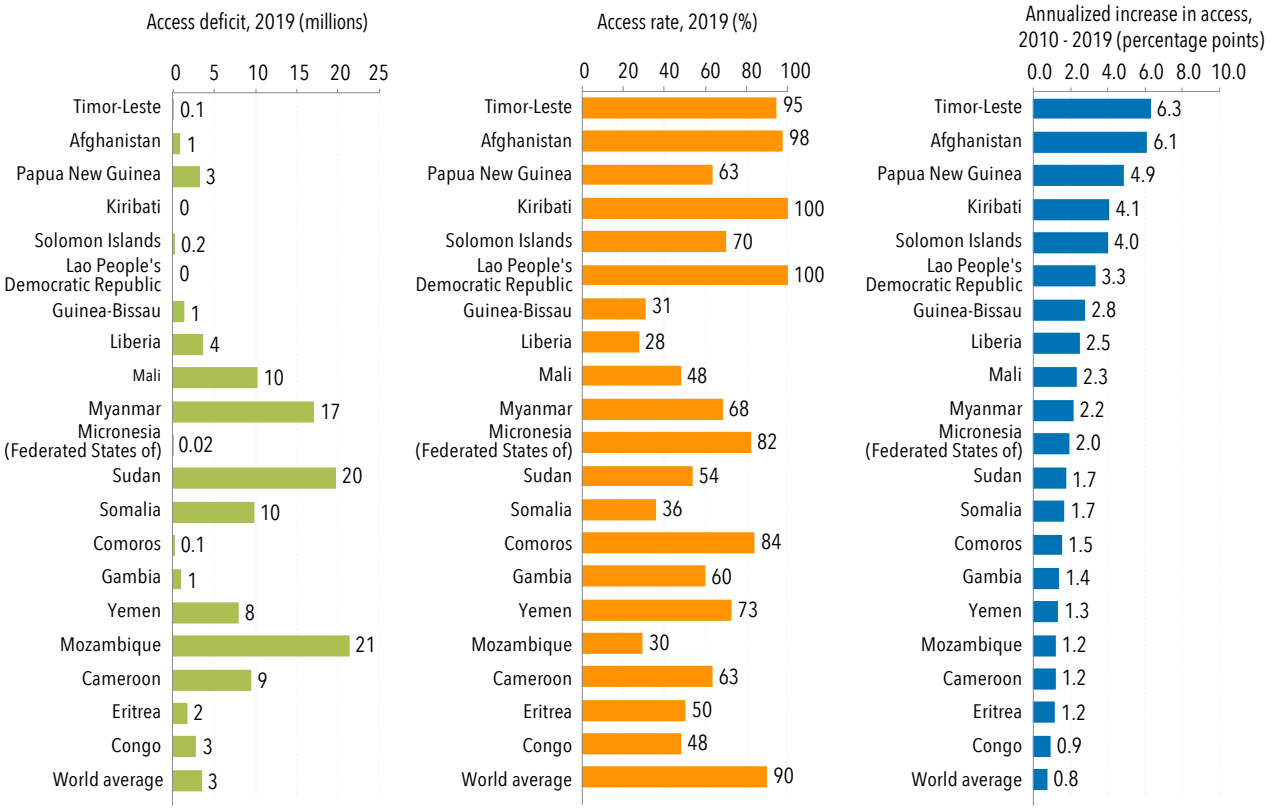
Some countries facing fragility, conflict, and violence made progress over the 2010–19 period (figure 1.21). Nigeria, Myanmar, and Cameroon, for example, began to adopt electricity access regulations over the period covered by this report (ESMAP 2020a). The access deficit in Cameroon and Myanmar dropped each year after 2010, falling to 9 million and 17 million, respectively, in 2019. The lesson is that a relevant regulatory framework can enable advances in electrification.

FIGURE 1.20 • Electricity access in the 20 fastest-electrifying countries, 2010–19



Source: World Bank 2021.

FIGURE 1.21 • Electricity access in the 20 fastest-electrifying countries characterized by fragility, conflict, and violence, 2010–19



Source: World Bank 2021.

POLICY INSIGHTS

Governments and the international community have built up a great deal of momentum toward meeting the 2030 target for universal access to electricity. Promising results can be seen in many countries. With less than a decade remaining to reach the target, new challenges—first and foremost the COVID-19 pandemic—are threatening these auspicious trends, placing additional pressure on stakeholders to meet the 2030 target. Although the full impact of the pandemic on electricity access is not yet clear, continued disruptions (for example, in supply chains and to consumers' incomes) are expected to impede electrification, slowing and in some cases even reversing progress as utilities and decentralized energy providers grapple with financial difficulties and governments suffer constraints in their capacity to make necessary investments. The pandemic has also highlighted the centrality of reliable electricity to the delivery of public services and the ability to respond resiliently to social and economic challenges. As countries deploy funds to stimulate a rapid and inclusive recovery from the economic devastation wrought by COVID-19, expanding access to electricity, within the wider context of SDG 7, must remain a priority (IRENA 2020a).

IMPERATIVE: AN IMMEDIATE RESPONSE TO SUSTAIN ELECTRIFICATION EFFORTS

As policy makers prepare recovery packages, policies and regulations to support electrification will underpin access strategies and invite private sector participation. The 2020 edition of Regulatory Indicators for Sustainable Energy (ESMAP 2020a) shows that electrification policies have made strong advances since 2010, with progress quickening after 2017. As the least-cost way to provide power to more than half the population without access by 2030, mini-grid and off-grid sources of electricity are expected to play a key role in achieving the SDG 7 goal of universal access (IEA 2020a). Happily, regulatory frameworks for such systems are increasingly common, attesting to their perceived potential. Even in fragile, conflict-prone, and violent settings, there are clear signals of the success of mini-grids and stand-alone systems, with the result that about half of fragile countries developing legal frameworks to support electrification since 2010.[18] Integrated approaches based on data-driven, least-cost electrification planning have been shown to be effective in making progress toward universal energy access (in Nepal and Togo, for example). But because gaps too often appear between policies and regulations as written and how those policies and regulations are implemented, policy makers should ensure that beneficial policies and regulations are properly implemented.

For policy makers intent on sustaining the pace of electrification, mitigating the adverse impacts of the pandemic on both national utilities and the nascent mini-grid and off-grid solar industries has become a priority. Still, the crisis has hamstrung these vibrant but still developing industries, which consist chiefly of startups and small-to-medium-sized businesses. Acquiring customers and servicing even existing customers have been hampered by supply-chain disruptions, lockdown provisions, and lower incomes in the pockets of consumers. In the first half of 2020, global sales fell 26 percent compared with the same period in 2019 (GOGLA 2019), depriving some 5 million people from gaining access to electricity. According to a survey carried out by EnDev (2020), the collection rate of more than 40 of the 600 responding companies dropped by more than half. And the vast majority of companies have not been able to obtain any financial support since the outbreak of the pandemic. While their only revenue stream is under intense pressure, companies must continue to service their debt, straining their cash flow.

In many developing countries where utilities were already under financial duress, the pandemic has made matters worse—to the point of jeopardizing their ability to provide essential services. This is particularly problematic since state-owned enterprises account for more than a third of global energy investment and 90 percent of grid spending in developing economies (IEA 2020a). The recession, along with restrictive measures, has led to a sudden drop in energy sales from the most profitable industrial and commercial consumers, which account for more than 70 percent of their revenues. In India, the demand for electricity is expected to be 7 to 17 percent lower by 2025 due to the COVID-19 economic shock. In Nepal, the bill

18 At the same time, policies for on-grid electrification have not advanced much over the past decade. Improvements in utility creditworthiness have made scant progress since 2010 (ESMAP 2020a).

collection rate dropped to less than 10 percent from an average of around 95 percent (IFC 2020). Preliminary analysis shows that the average cost of supply will increase by 13.5 percent. In countries such as Nepal, the adjusted cost of supply for an unreformed electric utility is projected to increase much more (by 72 percent) from NPR 12/kWh (USD 0.10) per unit in fiscal year 2020 to NPR 20.7/kWh (USD 0.175) in fiscal year 2024 (IFC 2020). Meanwhile, the drop in revenue collections and the rise in operational costs put utilities at an even greater risk of under-recovery of costs. Only half of African utilities were recovering their operation and maintenance costs before the COVID-19 crisis. That share will drop to 14 percent if demand drops by 15 percent and collections by 10 percent (Elahi, Srinivasan, and Mukurazhizha 2020). In addition, sector-specific policies introduced by a number of countries (such as bill reductions, cancellations, or deferrals) will have the greatest short-term, negative impact on utility finances. So far, out of 67 surveyed countries, only 8 were found to offer direct or indirect government liquidity support to utilities (IFC 2020).

In this context more than ever, energy service providers—including utilities, mini-grid operators, and off-grid companies—require access to low-cost working capital and project finance with lengthy repayment periods.[19] As a response to COVID-19's threat to the survival of the nascent energy access industry, and to preserve the gains in energy access achieved in the past decade, several initiatives have emerged. An example is the COVID-19 Energy Access Relief Fund (EARF), a global fund established by multiple public and private financiers and the African Development Bank's COVID-19 Off-Grid Recovery Platform, which provides relief and recovery capital to businesses that expand access to energy.

Beyond short-term responses, however, broader support is needed to bring both utilities and decentralized energy service providers to the point where they can again support accelerated electrification. As part of their efforts to support governments, the development community must expand the options for blended finance. For instance, impact bonds could be structured around concrete, measurable impacts in order to attract impact investors and unlock equity finance for small and medium-sized energy enterprises. Risk-mitigation instruments could raise the availability, and improve the terms, of local commercial debt financing for energy service providers and electric appliance distributors, among others, thereby leveraging this type of finance to unlock equity and other forms of investment. Financing for appliances and technical assistance to stimulate demand for productive uses are also critical. Both would stimulate demand from households that presently consume very little efficient energy. The effort would entail collaboration with utilities and asset financiers to obtain flexible payment arrangements for appliance users. With digitalization (such as integration of the Internet of things in devices, smart metering, and other real-time data capabilities), these innovations could transform the sector, improve accountability, reduce costs, and provide efficiencies across the value chain. Data derived from end users can provide unprecedented insight into consumer affordability, propensity to pay, credit scoring and risk, and so on, to help design more effective interventions that expand energy access.

The pandemic has exposed weaknesses in the health infrastructure of the developing world. The electrification of health facilities, in particular, is expected to be the focus of greater governmental efforts to improve that infrastructure. Electrification of health facilities is critical for COVID-19 prevention, response, including for vaccine deployment and storage, and resilient recovery from the pandemic. Yet more than 70 percent of health facilities located in Sub-Saharan Africa have no access to reliable electricity, and one in four has no electricity at all. The adverse impacts of such deficiencies on human capital development are well known. In 2017, only 35 percent of primary schools in Sub-Saharan Africa and 50.7 percent of those in Southeast Asia had access to electricity (UNESCO 2019). Even before the pandemic, efforts to increase public institutions' access to electricity were intensifying (Elahi, Srinivasan, and Mukurazhizha 2020), as improvements in renewable energy and battery storage technologies for mini-grids and stand-alone systems have made service provision not only more affordable but also rapidly deployable. But in many cases plans for longer-term operation and maintenance (O&M) of such systems are inadequate, jeopardizing their sustainability. Public institutions require long-term service provision supported by dedicated O&M budgets and implemented through innovative business models (public and private) to ensure technical, operational, and financial sustainability. Quality standards and enhanced monitoring systems suited to local contexts are also necessary.

Long-term O&M should be designed in light of each country's institutional and governance framework. Countries with a centralized governance structure might have a more centralized approach to managing it than countries with strong subnational (state or regional) governance structures. In some cases, energy ministries or national utilities will be responsible for ensuring smooth operation of stand-alone systems, whereas in other cases a specialized authority within the health or education ministry may be responsible.

19 Public financing has played an especially pivotal role in the financing of off-grid renewables, providing, on average, 32 percent of commitments during 2013–18, compared with an average public share in total renewable energy investments of 14 percent (IRENA and CPI 2020, especially box 1 in chapter 5).

Solar-battery systems might be facility-owned but managed by local private companies specializing in off-grid solar and mini-grid systems. Alternatively, the battery systems might be owned and operated entirely by the private sector under a service model or leasing scenario. In some countries utilities are highly capable in rural areas and can install, operate, and maintain solar-battery systems; Kenya and Ethiopia are examples. In others, local mini-grid developers can play this role (Nigeria, Myanmar)—for example, by integrating the facility's electricity system into its mini-grid or by supporting the facility under a service contract. Off-grid service led by the private sector is currently being explored in Niger and Uganda, with longer-term power purchase agreements for supply, installation, and O&M. Service contracts for extended O&M under public procurement have been implemented in Myanmar.

CLOSING THE ACCESS GAP

Over time, the access gap will become more challenging to close. Annual investment of USD 41 billion is required to achieve universal residential electrification, but only one-third of that, or USD 16 billion, was destined in 2018 for the 20-odd high-impact countries that have a particularly large weight in aggregate global performance (SEforAll 2020a).[20] Unserved people continue to live mainly in scattered, hard-to-reach settlements with weak infrastructure, making the equation between affordability and financial viability ever harder to solve. Beyond rural populations, pandemic-related measures (including lockdowns) have disproportionally affected those who are already the most vulnerable.

In fragile, conflict-affected, and violent settings, countries face additional constraints to expanding access, such as security, as well as other forms of fragility that can make service more difficult to supply and less affordable. In addition to an enabling ecosystem—one featuring ambitious targets, dedicated policies and regulations, tailored delivery models, financing for consumers and businesses, technology innovation, and capacity building (IRENA 2019b)—more out-of-the-box thinking is needed on appropriate business models and methods of leveraging public and private resources in such settings.

More than 90 percent of refugees in camps have limited access to electricity (UNHCR 2021). Access to sustainable electricity has a tremendous impact on all aspects of life for refugees and local host communities, safe water, ensuring adequate hygienic conditions, preventing gender-based violence, improving the quality of education for children and youth, and ensuring the reliability of healthcare services. UNHCR's Global Strategy for Sustainable Energy aims to boost access to safe and sustainable energy solutions, while minimizing environmental impact. Promoting integrated approaches is critical to increase the inclusiveness, effectiveness, and sustainability of interventions in emergencies as well as protracted refugee situations. This includes supporting joint efforts among humanitarian, development, governmental, and private actors to finance interventions in settings characterized by displacement, while also advocating for innovative financing mechanisms and inclusive, predictable, and simplified regulatory frameworks. In Jordan for example, large-scale solar plants installed in refugee camps boosted access to electricity within the camp and in neighboring communities. Promoting policies that encourage large-scale investments in access to electricity in areas hosting refugees will make a tremendous contribution to local communities' development, scale up livelihood opportunities, attract additional investments from the private sector, and establish a solid foundation for sustainable development.

ADDRESSING THE AFFORDABILITY GAP

By 2019, measures of consumers' ability to afford electricity showed rapid improvement across regions (ESMAP 2020a). Since then, however, the economic impact of the pandemic has hit electricity customers hard, widening the affordability gap and provoking payment delays or defaults. In Sub-Saharan Africa, the pandemic will push as many as 40 million people into extreme poverty (World Bank 2020c). Most interventions have been focused on building robust enabling environments and providing supply-side subsidies (concessional financing, results-based financing, and grants) as a first step in closing the access gap. These have provided governments with various tools for reducing risks or costs for energy providers and strengthening commercial markets, striving to reach economies of scale and bring down the market price. But they have not been able to bridge the affordability gap that prevents the poorest and most vulnerable consumers from obtaining electricity.

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20 The high-impact countries account for about two-thirds of the global electrification deficit. They are Angola, Bangladesh, Burkina Faso, Chad, Congo (Democratic Republic of), Ethiopia, India, Kenya, Korea (Democratic People's Republic of), Madagascar, Malawi, Mozambique, Myanmar, Niger, Nigeria, Pakistan, Sudan, Tanzania, Uganda and Yemen.

Demand-side subsidies in the off-grid sector have emerged as a new instrument to enable governments to leave no one behind. Widely used in grid electrification, where grid connections are increasingly subsidized and where low-income consumers often benefit from so-called lifeline tariffs, demand-side subsidies in the off-grid sector aim directly at lowering the price consumers pay and making solutions affordable to the poorest households. Subsidies may go directly to the household through cash transfers or vouchers, or they may be channeled through companies that offer pro-poor, results-based financing or lifeline tariffs. In the latter case, they must be designed to target specific groups depending on their energy needs, including the different needs of women and men (SEforAll 2020b).

Governments will need to implement parallel supply- and demand-side subsidies to reach universal access. Rwanda decided to launch an end-user subsidy pilot in 2019 to complement supply-side subsidies that were not enough to reach certain customers (GOGLA 2021b). With implementation support from the Development Bank of Rwanda (BRD) and Energy Development Corporation Limited, Rwanda's government is delivering a consumer subsidy scheme valued at USD 47 million for solar home systems and clean cooking solutions. The subsidy is paid directly to participating off-grid solar companies in multiple disbursements. Eligible households must make a customer contribution. Companies can use an online platform to determine if a household is eligible for the subsidy or has already received a subsidized system.

When designing such mechanisms, governments should consider early on the long-term sustainability of subsidy programs and potential exit strategies. To minimize the risk of market distortion and fit the mechanisms to the country's context, it is important to consult with all stakeholders at the outset of the design process and think about subsidies in an integrated manner—considering those in reach of the grid, potential customers of decentralized technologies, and the variety of service models. In Uganda, the Electricity Connection Policy was introduced in 2018 with the ambition of increasing Uganda's electricity access to 60 percent by 2027 through connection subsidies for consumers located close to the existing network. About 300,000 households and businesses have received free electricity connections, benefiting 1.5 million Ugandans. Implemented by the Rural Electrification Agency, the policy also provides low-cost wiring solutions (such as "ready boards") for the poor and bulk supplies of connection materials to service providers to enable them to make new connections.

BUILDING BACK BETTER: ELECTRICITY ACCESS TO SUPPORT A SUSTAINABLE RECOVERY

In both pandemic and post-pandemic contexts, there will be calls for urgent action on health care, water and sanitation, livelihoods, job creation, education, and safety (through street lighting and better communication). The expansion of electricity access through the modernization of existing grids and the development of mini-grid and off-grid solutions can contribute to recovery efforts while building resilience against future shocks (climate, health, and other).

To draw maximum socioeconomic benefits from electrification, the access gap should be closed by promoting productive uses of electricity (box 1.2). Kenya's recent efforts at last-mile electrification have not resulted in any real increase in consumption of electricity beyond basic services, putting into question the viability of costly grid connections. Thinking beyond simple electricity connections requires a holistic approach. To date, Kenya's electrification programs, like most, have encouraged supply while overlooking the need to stimulate demand, especially demand for productive uses of electricity. The components of a holistic program include:

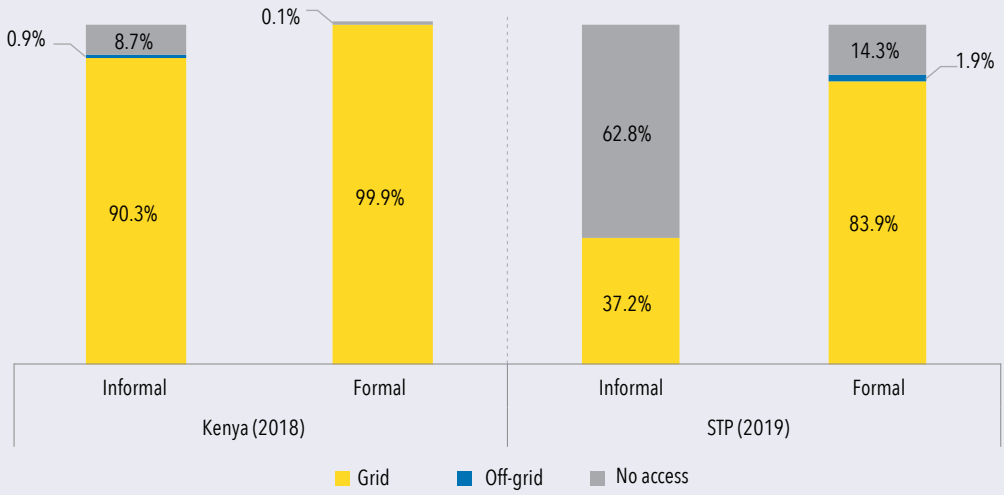
- A favorable policy and regulatory environment cutting across sectors, such as agriculture, cottage industry, dairy, fisheries, etc.;
- Public awareness of the benefits of electricity and their links with livelihood activities;
- Access to markets and other infrastructure services;
- Access to tailored financing for both end users and enterprises;
- Affordable energy-efficient appliances;
- Microenterprise training and business development services; and
- Understanding of underlying gender gaps that limit women's access to finance.

BOX 1.2 • ELECTRICITY ACCESS FOR PRODUCTIVE USES: A SNAPSHOT FROM THE MULTI-TIER FRAMEWORK[A]

Effective electrification is linked to its potential to create jobs and generate income. The right data can help planners design electrification programs in a way that maximizes their benefits for jobs and income generation—including assessing the impact of the quality and reliability of energy supply. Information from formal and informal manufacturing and services firms in Kenya (2018), Nepal (2018), and São Tomé and Príncipe (2019) was collected through the MTF.

The national grid is the primary source of electricity for enterprises in surveyed countries (figure B1.2.1). However, access to grid electricity varies widely, ranging from a nationwide average of 95 percent in Kenya (99.9 percent for formal and 90.3 percent for informal enterprises) to 60.6 percent in São Tomé and Príncipe (83.9 percent for formal and 37.2 percent for informal enterprises). The challenge of electrification is severe for São Tomé and Príncipe, where 62.8 percent of the informal enterprises and 14.3 percent of formal enterprises did not have access to any source of electricity. The share of off-grid sources is negligible, with just 0.9 percent of informal and 0.1 percent of formal firms in Kenya, and 2 percent of formal enterprises in São Tomé and Príncipe using off-grid sources to power their business. In Nepal, the sample included only grid-connected enterprises.

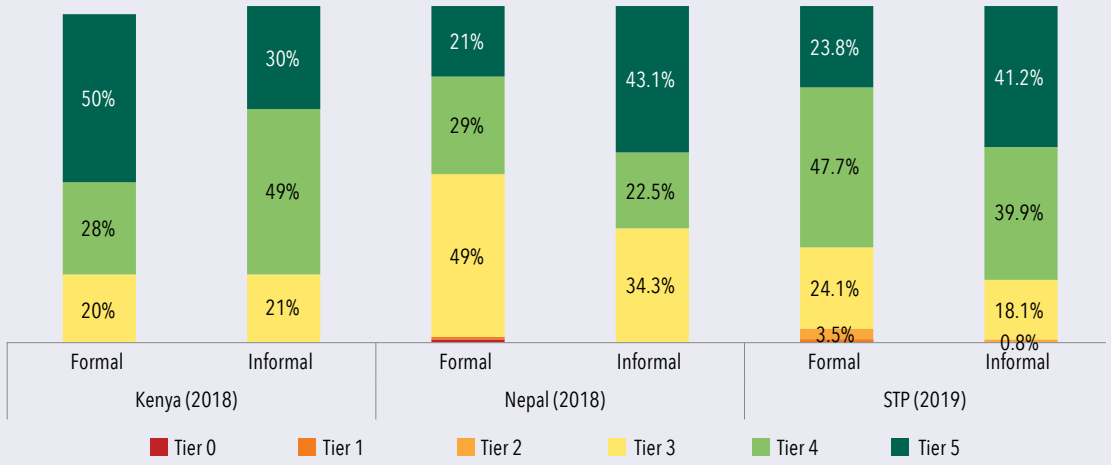
FIGURE B1.2.1 • Energy access by source in Kenya (2018) and São Tomé and Príncipe (2019)



Source: ESMAP forthcoming a, b, and c.

Given the varying degrees of grid access in the surveyed countries, the MTF framework (which looks at access in a multidimensional way) provides a good understanding of the overall level of service the firms receive from their electricity source. Almost all of the enterprises received from the grid service at Tier 3 or above once they were connected (figure B1.2.2). This included enterprises in São Tomé and Príncipe, where grid penetration was very low, especially for informal enterprises. At the aggregate level for the three countries, 35 percent of grid connected enterprises had Tier 5 service; 28 percent were in Tier 3.

FIGURE B1.2.2 • MTF Tier distribution for grid connected enterprises



Source: ESMAP forthcoming a, b, and c.

Poor reliability and quality of service affects the functioning of enterprises and ultimately the creation of jobs and the generation of income. Reliability of service (unscheduled interruptions) was one of the main constraints that enterprises faced with their electricity service. At the country level, 65 percent of enterprises in Kenya, 52 percent in Nepal, and 68.7 percent in São Tomé and Príncipe reported having between four and fourteen service interruptions a week (figure B1.2.3). Quality of service (low or fluctuating voltage) was a constraint for 19.5 percent of enterprises in Kenya and 38.8 percent in Nepal (figure B1.2.4). Quality was also an issue in São Tomé and Príncipe, with 56.4 percent of formal enterprises reporting voltage issues.[a,b] To cope with these issues, enterprises use backup energy solutions, which add costs and reduce profits.

FIGURE B1.2.3 • Reliability of grid (unscheduled interruptions)

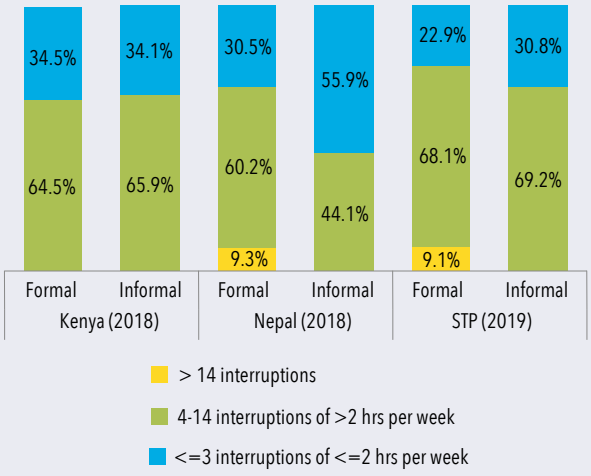
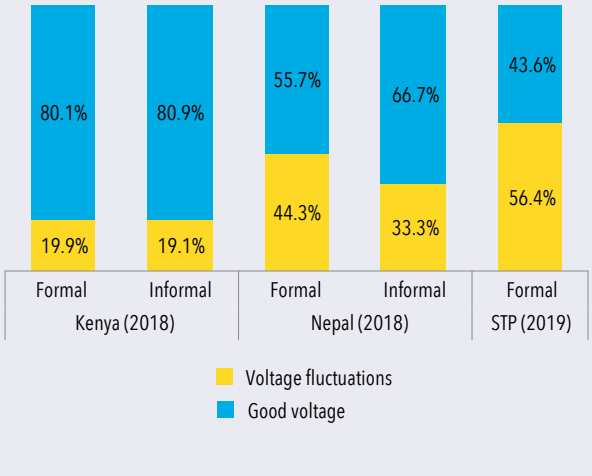


FIGURE B1.2.4 • Quality of grid service (voltage fluctuations)



Source: ESMAP forthcoming a, b, and c.

a. The MTF measures not only whether users receive energy services, but also whether these services are of adequate quality, reliable, affordable, safe, and available when needed (ESMAP 2016; Bhatia and Angelou 2014).

b. Due to data limitations, quality tier analysis was not available for the informal sector in São Tomé and Príncipe.

ELECTRICITY ACCESS AS A CATALYST FOR GENDER EQUALITY AND ECONOMIC GROWTH

Women continue to face challenges that hinder their full inclusion in the energy sector. These trends constrain the inclusion of women as leaders in the sector and detract from their roles as policy makers and decision makers. For example:

- Most households lacking electricity services live in poverty. For every 100 boys living in extremely poor households there are 105 girls (UNSD 2015).
- The energy sector attracts and hires science, technology, engineering, and mathematics (STEM) professionals; yet, worldwide, women comprise only 35 percent of STEM students in higher education (UNESCO 2017).
- Women represent 32 percent of the renewable energy workforce—a low figure yet considerably higher than in the oil and gas sector, where women make up only 22 percent of the workforce (IRENA 2019a).

Solutions are available; the way forward, clear. Studies from several regions show that women are 9 to 23 percentage points more likely than men to gain employment outside the home following electrification (Rewald 2017). Evidence shows that over the past decade, the income generated from women's labor participation explained 30 percent of the reduction of extreme poverty in Latin America and the Caribbean, ameliorating the precarious financial circumstances of millions of families (World Bank 2012).

The energy sector, in cooperation with relevant industries, must deepen global knowledge and replicate best practices related to the status of women. For example, the Energy Sector Management Assistance Program at the World Bank published "Stepping Up Women's STEM Careers in Infrastructure" (Schomer and Hammond 2020), which is intended to underpin and expand existing knowledge on gender equality issues. The report includes case studies, best practices, and entry points for World Bank projects.

The necessary knowledge creation should provide evidence about what types of investments work for attaining gender equality in the sector. Those who work on intervention design must have data that both quantifies and illuminates the various dimensions of gender inequities in various contexts.[21] They should consult with women's groups and others who are working to bridge persistent gender gaps in the sector. The design of interventions should draw on programs that encourage women's participation or improve access to energy service. In the energy access context, a global survey found that the lack of access to training and skills development was the biggest challenge to facilitate women's participation in the off-grid sector (IRENA 2019a). Finally, mechanisms are needed that allow programs and tools to be monitored and evaluated in ways that support transparency and accountability. If governments are to unleash the potential of women as change agents in reducing both poverty and inequality, then the energy sector must redouble its efforts to bring women into each stage of this sector by bridging gender gaps in opportunity and access.

21 For example, within the World Bank, ESMAP is undertaking data analysis to understand the drivers behind gender gaps in energy access and identify patterns. A first stream of statistical analyses uses MTF data to analyse gaps between female and male-headed households across several indicators of electricity access, while taking into account the effect of location and household expenditure. Additional analysis will be conducted using national expenditure or budget surveys (compiled and harmonized by the World Bank's Global Poverty Working Group database) that explore the impact of additional factors behind gender gaps in household electricity access—such as marital status, education, occupation, age of the household head, household size, dependency ratio, etc. Similar work on gender gaps in access to modern energy cooking solutions is slated to follow.

METHODOLOGY

DATABASE

The World Bank's Global Electrification Database compiles nationally representative household survey data and census data from 1990 to 2019. It also incorporates data from the Socio-Economic Database for Latin America and the Caribbean, the Middle East and North Africa Poverty Database, and the Europe and Central Asia Poverty Database, all of which are based on similar surveys. At the time of this analysis, the Global Electrification Database contained 1,282 surveys from 139 countries, excluding surveys from high-income countries (as classified by the United Nations). In general, since 2010, 28 percent of countries have published or updated their electricity data each year in time for global data collection. Greater investment in data collection and capacity building is needed to permit a more comprehensive and accurate understanding of the electricity access picture (chapter 6).

ESTIMATING MISSING VALUES

Surveys are typically published every two to three years, but they can be irregular and infrequent in many regions. To estimate values, a multilevel, nonparametric modeling approach developed by the World Health Organization to estimate clean fuel usage[22] was adapted to predict electricity access and used to fill in the missing data points for the time period between 1990 and 2019. Where data are available, access estimates are weighted by population. Multilevel nonparametric modeling takes into account the hierarchical structure of data (country and regional levels), using the regional classification of the United Nations.

The model is applied for all countries with at least one data point. In order to use as much real data as possible, results based on survey data are reported in their original form for all years available. The statistical model is used to fill in data only for years where they are missing and to conduct global and regional analyses. In the absence of survey data for a given year, information from regional trends was borrowed. The difference between real data points and estimated values is clearly identified in the database.

Countries considered "developed" by the United Nations and classified as high-income are assumed to have electrification rates of 100 percent from the first year the country joined the category.

In the period between 1990 and 2010, the statistical model is generally based on insufficient data points or outdated household surveys. To avoid having electrification trends from 1990 to 2010 overshadow efforts since 2010, the model was run twice in the present report:

- With survey data + assumptions from 1990 to 2019 for model estimates from 1990 to 2019
- With survey data + assumptions from 2010 to 2019 for model estimates from 2010 to 2019

The first model extrapolates electrification trends for the years from 1990 to 2019 given the available data points. The second considers only real data collected from 2010 and estimates the historical evolution in the most recent years. Eventually, the outputs from the two models are combined to draw a final value of access to electricity. If survey data are available, the original observations remain in the final database. Otherwise, taking account of a positive linear trend in electrification, a larger value between the two models is chosen as a final data point.

22 The model draws from the solid-fuel-use modeling for household cooking used in Bonjour and others (2013).

MEASURING ACCESS TO ELECTRICITY THROUGH OFF-GRID SOURCES

Off-grid dataGOGLA's off-grid solar and energy access and tier estimates shared for the purpose of compiling this report are calculated using the off-grid solar sales data shared by "affiliates" in the bi-annual data collection undertaken by GOGLA, Lighting Global, and the Efficiency for Access Coalition. Affiliates include GOGLA members, companies selling products that meet Lighting Global's quality standards, and appliance companies affiliated with the Low Energy Inclusive Appliances program.

Eligible off-grid solar lighting products included in the affiliate data collection are defined as systems that include a solar panel, a battery and at least one light point. Every six months, affiliated companies fill out a questionnaire on their product sales by country, system type/size, and business model, also sharing specific product specifications and capacities. Although companies are ultimately responsible for the accuracy of the self-reported data submitted, the data are quality checked by an independent consultancy (Berenschot), as well as GOGLA, Lighting Global, and the Energy Savings Trust. While both the manufacturers and distributors of off-grid solar products report their sales to GOGLA, the results of this data collection shared in public reports cover products sold by manufacturers of off-grid solar products only. This is to avoid double counting sales reported by both manufacturers and distributors. The product sales reported by manufacturers include both business-to-business transactions (sales to distributors, governments, and nongovernmental organizations) as well as direct business-to-customer sales. The latest Market Trends Report (ESMAP 2020b) estimates that sales of affiliate companies represent 28 percent of the total off-grid solar market — although estimates of percentages by country, as well as by system size and business model, vary significantly.

In addition to using the standardized impact metrics created by the GOGLA Impact Working Group, to calculate the tiers of energy access, additional steps are taken:

- *Tier 1:* To estimate Tier 1 energy access, a "SEforAll factor" is applied to sales numbers. Here, a calculator tool developed under the SEforAll initiative has been applied to the database to estimate the service-level impact of smaller technologies. The tool reviews the system size and capacity of each product and estimates whether a product has helped to unlock either partial or full Tier 1 access. It then calculates the total number of people who have achieved partial or full Tier 1 access so as to provide an overall estimate of the number of people with Tier 1 access.
- *Tier 2:* Products that have a capacity of more than 50 Watt peak (Wp) or are over 20 Wp and come packaged with a television, are deemed to provide Tier 2 energy access. This approach is designed to align product specifications or energy service with the requirements for Tier 2 access included in ESMAP's Multi-Tier Framework. Please note that products that have enabled a household to achieve Tier 2 access are not included in the final Tier 1 estimates.

Outputs destined for inclusion in this report were compiled by analyzing sales data for 2016, 2017, 2018, and 2019 and calculating the estimated impact using GOGLA's impact metrics for the off-grid solar energy sector[23] and the Tier 1 and Tier 2 approaches.

MINI-GRID DATA

IRENA's 2021 decentralized energy database compiles mini-grid data; data from national rural electrification programs; and data from international development projects, commercial vendors, and nongovernmental organizations. It covers only developing countries. Data are obtained from large databases (e.g., GOGLA and government agency websites and reports) as well as websites of other agencies and institutions active in the decentralized energy sector. The latter is obtained by reviewing data from previous years and by monitoring IRENA's daily media briefs. In merging of data from these sources, care is taken not to double-count observations from different sources and to ensure that planned projects and programs have been implemented. More details of the methodology used to compile the data can be found in IRENA (2021).

23 GOGLA Impact Metrics can be found at https://www.gogla.org/impact/gogla-impact-metrics.

CALCULATING THE ANNUAL CHANGE IN ACCESS

The annual change in access is calculated as the difference between the access rate in year 2 and the rate in year 1, divided by the number of years:

(Access Rate Year 2—Access Rate Year 1) / (Year 2 – Year 1)

This approach takes population growth into account by working with the final national access rates.

COMPARING THE ELECTRIFICATION DATA METHODS OF THE WORLD BANK AND THE IEA

The World Bank and IEA maintain separate databases of global electricity access rates. The World Bank's Global Electrification Database derives estimates from a suite of standardized household surveys and censuses that are conducted in most countries every two to three years, in conjunction with a multilevel nonparametric model used to extrapolate data for the missing years, as described in the section on "Estimating missing values," above. This ensures that demand-side data are being collected. The IEA Energy Access Database sources data, where possible, from government reports of household electrification (usually based on utility connections), which focus more on supply side electrification data. IEA considers a household to have access if it receives enough electricity to power a basic bundle of energy services. The World Bank utilizes a similar structure called the Multi-Tier Framework that classifies access along a tiered spectrum, from Tier 0 (no access) to Tier 5 (highest level of access).

The two approaches can sometimes yield different estimates. Access levels based on household surveys are moderately higher than those based on energy sector data because they capture a wider range of phenomena, including off-grid access, informality, and self-supply systems.

A comparison of the two datasets in the previous edition of this report (and updated in this edition) highlights their respective strengths. Household surveys, typically conducted by national statistical agencies, offer two distinct advantages for measures of electrification. First, with longstanding efforts internationally to harmonize questionnaire designs, electrification questions are largely standardized across country surveys. Although not all surveys reveal detailed information on the forms of access, survey questionnaire designs can now capture emerging phenomena such as off-grid solar access. Second, data from surveys convey user-centric perspectives on electrification. Survey data capture all forms of electricity access, painting a more complete picture of access than may be possible from data supplied by service providers.

Government data on electrification reported by national ministries of energy take the form of supply-side data on utility connections. Although not published by every government, these kinds of data offer two principal advantages over national surveys. First, administrative data are often available on an annual basis and, for this reason, may be more up to date than surveys, which are updated only every two to three years. Second, administrative data are not subject to the challenges that can arise when conducting field surveys. Household surveys (particularly those taken in remote and rural areas) may suffer from sampling errors that may lead to underestimation of the access deficit.

REFERENCES

Bhatia, M., and N. Angelou. 2014. "Capturing the Multi-Dimensionality of Energy Access." *Live Wire 2014/16*. Energy and Extractives Global Practice, World Bank, Washington, DC. http://hdl.handle.net/10986/18677

Bonjour, S., H. Adair-Rohani, J. Wolf, N. G. Bruce, S. Mehta, A. Prüss-Ustün, M. Lahiff, E. A. Rehfuess, V. Mishra, and K. R. Smith. 2013. "Solid Fuel Use for Household Cooking: Country and Regional Estimates for 2018–2010." *Environmental Health Perspectives* 121, 7. https://pubmed.ncbi.nlm.nih.gov/23674502/

CLASP (Collaborative Labeling and Appliance Standards Program). 2020. *Off-grid Appliance Market Survey*. Washington, DC: CLASP. https://storage.googleapis.com/clasp-siteattachments/CLASP-MarketSurvey-2020.pdf

Dubey, S., E. Adovor, D. Rysankova, and B. Koo. 2020. "Kenya—Beyond Connections: Energy Access Diagnostic Report Based on the Multi-Tier Framework." ESMAP Papers, World Bank, Washington, DC. https://openknowledge.worldbank.org/handle/10986/35268

Elahi, R., R. Srinivasan, and T. Mukurazhizha. 2020. "Increasing Human Capital by Electrifying Health Centers and Schools through Off-Grid Solar Solutions." *Live Wire 2020/104*. World Bank, Washington, DC. http://hdl.handle.net/10986/33276

EnDev (Energising Development). 2020. *Global Survey: COVID-19 Energy Access Industry Barometer.* Bonn/Eschborn: EnDev. https://endev.info/COVID-19-energy-access-industry-barometer-presentation-of-results-in-a-webinar-hosted-by-endev/

ESMAP (Energy Sector Management Assistance Program). 2014. *Capturing the Multi-Dimensionality of Energy Access*. Washington, DC: World Bank. http://documents1.worldbank.org/curated/en/937711468320944879/pdf/88699-REVISED-LW16-Fin-Logo-OKR.pdf

ESMAP. 2015. *Beyond Connections*: Energy Access Redefined. Washington, DC: World Bank. https://openknowledge.worldbank.org/bitstream/handle/10986/24368/Beyond0connect0d000technical0report.pdf?sequence=1&isAllowed=y.

ESMAP. 2016. "Measuring Energy Access: Introduction to the Multi-Tier Framework." Presentation. World Bank, Washington, DC. https://www.seforall.org/sites/default/files/MTFpresentation_SE4ALL_April5.PDF

ESMAP. 2020a. *Sustaining the Momentum: Regulatory Indicators for Sustainable Energy 2020.* Washington, DC: World Bank. https://rise.esmap.org/data/files/reports/rise-electricityaccess.pdf

ESMAP. 2020b. *Off-Grid Market Trends Report.* Washington, DC: World Bank.

ESMAP. Forthcoming a. "São Tomé and Príncipe: Energy Access Diagnostic Report for Enterprises Based on the Multi-Tier Framework." World Bank Group, Washington, DC.

ESMAP. Forthcoming b. Nepal: Energy Access Diagnostic Report for Enterprises Based on the Multi-Tier Framework. World Bank Group. Washington, DC.

ESMAP. Forthcoming c. Kenya: Energy Access Diagnostic Report for Enterprises Based on the Multi-Tier Framework. World Bank Group, Washington, DC.

GOGLA (Global Off-Grid Lighting Association). 2019. *Global Off-Grid Solar Market Report, in Partnership with Lighting Global and Efficiency for Access Coalition.* Amsterdam. https://www.gogla.org/global-off-grid-solar-market-report

GOGLA. 2020. *Powering Opportunity: Energising Work, Enterprise, and Quality of Life with Off-Grid Solar.* Amsterdam: GOGLA. https://www.gogla.org/powering-opportunity.

GOGLA. 2021a. "Bespoke Analysis of Data Compiled for the Semi-Annual Global Off-Grid Solar Market Reports: H1 2016 to H2 2019." www.gogla.org/global-off-grid-solar-market-report

GOGLA. 2021b. "How End-User Subsidies Can Help Achieve Universal Energy Access." Discussion Paper. https://www.gogla.org/sites/default/files/resource_docs/gogla_discussion-paper-subsidies_def_2.pdf

IEA (International Energy Agency). 2020a. *World Energy Outlook 2020*. Paris: IEA. https://www.iea.org/reports/world-energy-outlook-2020

IEA. 2020b. "Defining Energy Access: 2020 Methodology." https://www.iea.org/articles/defining-energy-access-2020-methodology

IFC (International Finance Corporation). 2020. "Lessons for Electric Utilities from COVID-19 Responses in Emerging Markets," EM Compass Note 90, September, Washington, DC. https://www.ifc.org/wps/wcm/connect/d198ce33-4b5a-4538-9c5a-c7259769057d/EMCompass_Note_90-web.pdf?MOD=AJPERES&CVID=nj05eVj

IRENA (International Renewable Energy Agency). 2019a. *Renewable Energy: A Gender Perspective.* Abu Dhabi: IRENA. https://www.irena.org/newsroom/articles/2019/Jan/Gender-equality-for-an-inclusive-energy-transition

IRENA. 2019b. *Off-Grid Renewable Energy Solutions to Expand Electricity Access: An Opportunity Not to Be Missed*. Abu Dhabi: IRENA. https://www.irena.org/publications/2019/Jan/Off-grid-renewable-energy-solutions-to-expand-electricity-to-access-An-opportunity-not-to-be-missed

IRENA. 2020a. *Post-Covid Recovery : An Agenda for Resilience, Development and Equality*. Abu Dhabi: IRENA. https://www.irena.org/publications/2020/Jun/Post-COVID-Recovery

IRENA. 2020b. *Renewable Energy and Jobs: Annual Review 2020*. Abu Dhabi: IRENA.

IRENA. 2020c. *Off-grid Renewable Energy Statistics 2020*. Abu Dhabi: IRENA.

IRENA and CPI. 2020. *Global Landscape of Renewable Energy Finance, 2020*: Methodology. International Renewable Energy Agency, Abu Dhabi.

Kenya National Bureau of Statistics. 2019. 2019 *Kenya Population and Housing Census, Volume IV: Distribution of Population by Socio-Economic Characteristics*. Nairobi: Kenya National Bureau of Statistics. https://www.knbs.or.ke/?wpdmpro=2019-kenya-population-and-housing-census-volume-iv-distribution-of-population-by-socio-economic-characteristics

Lakner, C., D. G. Mahler, M. Negre, and E. B. Prydz. 2020. "How Much Does Reducing Inequality Matter for Global Poverty?" Global Poverty Monitoring Technical Note 13, World Bank, Washington, DC. June. http://documents1.worldbank.org/curated/en/765601591733806023/pdf/How-Much-Does-Reducing-Inequality-Matter-for-Global-Poverty.pdf

Power for All. 2019. *Powering Jobs Census 2019: The Energy Access Workforce*. San Francisco, CA: Power for All. https://www.powerforall.org/application/files/8915/6310/7906/Powering-Jobs-Census-2019.pdf

Rewald, R. 2017. "Energy and Women and Girls: Analyzing the Needs, Uses, and Impacts of Energy on Women and Girls in the Developing World." Oxfam Research Backgrounder Series. Oxfam, Oxford, England. https://www.oxfamamerica.org/explore/ research-publications/energy-women-girls

Schomer, I., and A. Hammond. 2020. "Stepping Up Women's STEM Careers in Infrastructure: Case Studies." ESMAP Paper, World Bank, Washington, DC.

SEforAll. 2020a. "Energizing Finance: Understanding the Landscape 2020." https://www.seforall.org/publications/energizing-finance-understanding-the-landscape-2020#8

SEforAll (Sustainable Energy for All). 2020b. *Energy Safety Nets: Using Social Assistance to Close Energy Access Gaps for the Poor*. Vienna, Austria: SEforAll. https://www.seforall.org/system/files/2020-02/ESN-SEforALL.pdf

SELCO Foundation, 2020. "Solar-Powered Digital Service Centres supporting Communities during COVID 19" http://www.COVID-19.selcofoundation.org/solar-powered-digital-service-centres-supporting-communities-during-COVID19-stories-of-resilience/

Shupler and others. 2020. COVID-19 Lockdown in a Kenyan Informal Settlement: Impacts on Household Energy and Food Security.

United Nations. 2020. "List of Least Developed Countries." Committee for Development Policy, UN Economic and Social Council, New York. https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/publication/ldc_list.pdf

UN DESA (United Nations Department of Economic and Social Affairs). 2020. *Standard country or area codes for statistical use (M49)*. New York: UN DESA. https://unstats.un.org/unsd/methodology/m49/

UNESCO (United Nations Educational, Scientific and Cultural Organization). 2017. *Cracking the code: girls' and women's education in science, technology, engineering and mathematics (STEM).* Paris: UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000253479

UNESCO. 2019. "*What Makes a Good Classroom? New UIS Data on School Conditions."* Paris: UNESCO. https://en.unesco.org/news/what-makes-good-classroom-new-uis-data-school-conditions

UNHCR (United Nations High Commissioner for Refugees). 2021. "Integrated Refugee and Forcibly Displaced Energy Information System." UNHCR, Geneva. https://eis.unhcr.org/home

UNSD (United Nations Statistics Division). 2015. *The World's Women 2015*. New York: UNSD. https://unstats.un.org/UNSD/gender/downloads/Ch8_Poverty_info.pdf

World Bank. 2012. "The Effect of Women's Economic Power in Latin America and the Caribbean." Latin America and Caribbean Poverty and Labor Brief. World Bank, Washington, DC. August. http://hdl.handle.net/10986/11867

World Bank. 2020a. "FY21 FCS List." World Bank, Washington, DC. https://www.worldbank.org/en/topic/fragilityconflictviolence/brief/harmonized-list-of-fragile-situations

World Bank. 2020b. "World Bank Country and Lending Groups." World Bank, Washington, DC. https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups

World Bank. 2020c. "Covid-19 and the Future of Work in Africa," *Africa's Pulse 23:* April. World Bank, Washington, DC. https://openknowledge.worldbank.org/bitstream/handle/10986/34587/9781464816482.pdf

World Bank. 2021. *World Bank Global Electrification Database.* World Bank, Washington, DC. https://databank.worldbank.org/source/world-development-indicators

World Bank and IEA (International Energy Agency). 2015. *Progress Toward Sustainable Energy: Global Tracking Framework Report.* Washington, DC: World Bank. https://trackingsdg7.esmap.org/downloads