CHAPTER 1

ACCESS TO ELECTRICITY

Photo: © World Bank

Main messages

- **Global trend:** The pace of electrification slowed between 2023 and 2024, as individuals lacking access fell by just 11.5 million; 655 million people worldwide have no electricity, and the global access rate is unchanged at 92 percent. The average annual gain of 0.35 percent from 2020 to 2024 is half the 0.70 percent achieved the previous decade. Reaching universal access by 2030 requires more than tripling this rate to 1.35 percent per year. To accelerate progress, the World Bank Group and African Development Bank have launched Mission 300—an initiative to electrify 300 million Africans by 2030.
- **Regional highlights:** Reflecting rapid grid expansion and rising incomes, Central and Southern Asia shrank its global access deficit from 36 percent in 2010 to just 3 percent in 2024. Sub-Saharan Africa remains the center of the global challenge, as it is home to 563 million of the 655 million people without electricity. Eastern Africa made rapid gains, while the deficit in Central Africa worsened.
- **Top 20 access-deficit countries:** In 2024 the 20 countries with the largest electricity access deficits accounted for 78 percent of people lacking access, up from 75 percent in 2022. Eighteen are in Sub-Saharan Africa, 17 are least-developed countries (LDCs), and 12 are affected by conflict or fragility. The DRC (85 million), Ethiopia (57 million), and Nigeria (87 million) together account for roughly one-third of the global deficit. Chad (13 percent), Malawi (16 percent), and South Sudan (5 percent) have the lowest national electrification rates, having seen only scant improvements since 2010.
- **Access needs across the rural-urban continuum:** Urban access rates rose from 96 percent to 98 percent between 2010 and 2024. Rural coverage improved from 73 percent to 85 percent, though the rural access deficit grew in Sub-Saharan Africa from 376 million to 447 million people, making targeted interventions essential. Urban areas also warrant attention: many connected households have poor service quality or rely on access intermediated through landlords and informal resellers.
- **People served with decentralized renewable energy (DRE):** An estimated 449 million people were served with Tier 1 and Tier 2 off-grid solar solutions in 2024, up from 385 million in 2023—an increase of 64 million. Mini grids provided a Tier 4 or above level of service to nearly 48 million people. Roughly 65 percent of off-grid solar customers are benefiting from first-time access.[2]
- **The remaining populations lacking access:** Those who have not yet accessed electricity tend to have low household incomes and live in remote rural areas in settings marked by fragility or conflict. Income and access are correlated, with large gaps in many countries between the top and bottom quintiles. An uptake gap persists where households remain unconnected despite their proximity to grid infrastructure because of high connection fees and internal wiring costs.

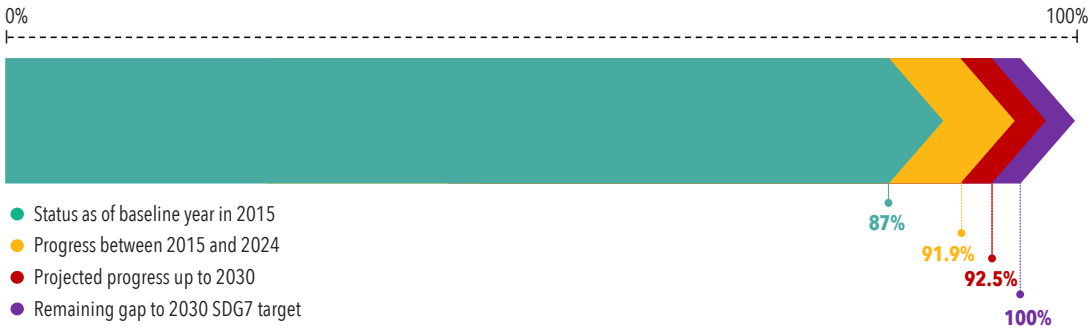
2 The Multi-Tier Framework captures household electricity access across seven attributes—capacity, availability, reliability, quality, affordability, formality, and health and safety—using six tiers. Solar home systems typically provide partial Tier 1, Tier 1, or Tier 2 access, whereas mini grids and grid electricity generally offer Tiers 3, 4, or 5 levels of service. This report series considers Tier 1 the minimum level of service to constitute electricity access, aligned with IEA's basic bundle threshold; it is the standard most governments use in countries with access deficits (IEA 2023). For more information, see annex 1.

- **Policy insights:** For progress to accelerate, several interconnected challenges must be met. Least-cost electrification planning—using geospatial data to optimize the mix of grid, mini grid, and off-grid solutions—is essential to deploy scarce public funding, calibrating subsidies to household affordability and fiscal sustainability. Conditions conducive to private sector delivery and private co-investment are also essential. These require strong institutional capacity, clear regulatory mandates, and blended-finance instruments, including results-based financing and local currency debt. DRE should be fully integrated into national electrification plans that promote productive use of electricity to enhance economic and fiscal impact. Access initiatives must be gender inclusive in ways that specify explicit targets, financial incentives, and disaggregated tracking. Finally, governments should measure access in a harmonized, multidimensional fashion, integrating questions from the Multi-Tier Framework (MTF) into household surveys to inform planning and policy.
- **Accelerating progress through Mission 300:** Mission 300, which is led by the World Bank Group and African Development Bank, and supported by a coordination group of more than 35 partners, aims to connect 300 million people in Sub-Saharan Africa by 2030. The World Bank Group has pledged USD 35 billion in financing whilst the African Development Bank has pledged USD 18 billion. Thirty countries have launched National Energy Compacts - covering least-cost planning, regional integration, DRE scale-up, private investment and utility reform - with more planned for 2026. Partnerships are at the core of Mission 300, with the World Bank Group and the African Development Bank working closely with the Rockefeller Foundation, the Global Energy Alliance for People and Planet, Sustainable Energy for All, the Energy Sector Management Assistance Program donors, and others to align financing, policy support, and expertise.

Are we on track?

Between 2022 and 2023, the number of people with no access to electricity fell by 19 million. The pace of electrification slowed from 2023 to 2024; those lacking access fell by just 11 million. The global access rate stalled at 92 percent. As a result, 655 million people are now living without electricity, this after having risen from 87 percent in 2015 (figure 1.1). If trends continue, the access rate will rise only incrementally to 92.5 percent by 2030 (figure 1.3).

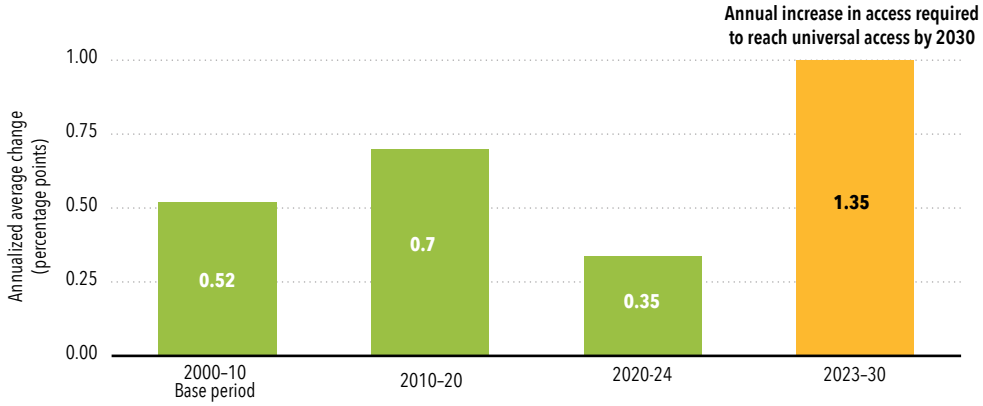
Figure 1.1 • Percentage of population with access to electricity



Source: World Bank and IEA 2026.

The pace of electrification has slowed. Between 2010 and 2020, the average annual increase in people with access was 0.70 percent. Then it dropped to 0.35 percent from 2020 to 2024. The slowdown is attributed in part to COVID and the war in Ukraine, which raised import costs while constraining affordability. The slowing pace was also linked to characteristics of the unconnected population itself: low incomes and living in remote areas affected by conflict, fragility, or displacement. These conditions affect supply costs and risks as well as the required magnitude of subsidies to address affordability. The remaining population lacking access continues to persist in Sub-Saharan Africa, where the rate of new connections must exceed the region's high rates of population growth. To reach universal access by 2030, the pace of electrification would need to be 1.3 percentage points annually—more than triple the latest rate (figure 1.2). To accelerate progress, the World Bank Group and African Development Bank launched Mission 300 in 2024—a new initiative to electrify 300 million Africans by 2030. Results from Mission 300 will be reflected in SDG 7 tracking data in the future.

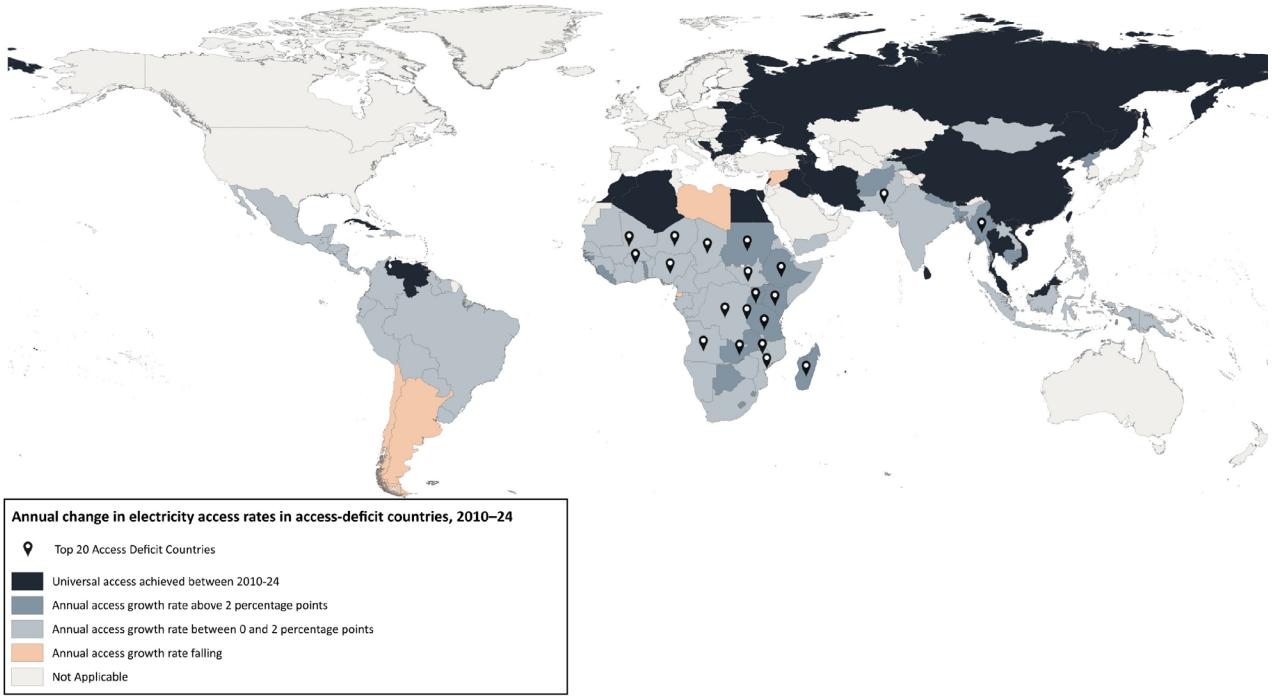
Figure 1.2 • Average annual increase in access to electricity, 2000–24



Source: World Bank and IEA 2025.

Between 2010 and 2024, 46 countries achieved universal access to electricity. Most of these were in North America and Europe (eleven countries) and Latin America and the Caribbean (ten countries). The remaining countries were spread across Western Asia and Northern Africa and Oceania (seven countries each), Central and Southern Asia (five countries), and Eastern and South-eastern Asia (four countries). In Sub-Saharan Africa, only Seychelles and Mauritius reached universal access during this period. Access deficits were found in 94 countries at the end of the period, heavily skewed towards Sub-Saharan Africa. One-quarter of the top-20 access-deficit countries registered annual electrification gains of more than 2 percent and the rest progressed.[3]

Figure 1.3 • Annual change in electricity access rates in access-deficit countries, 2010–24



Source: World Bank 2025.

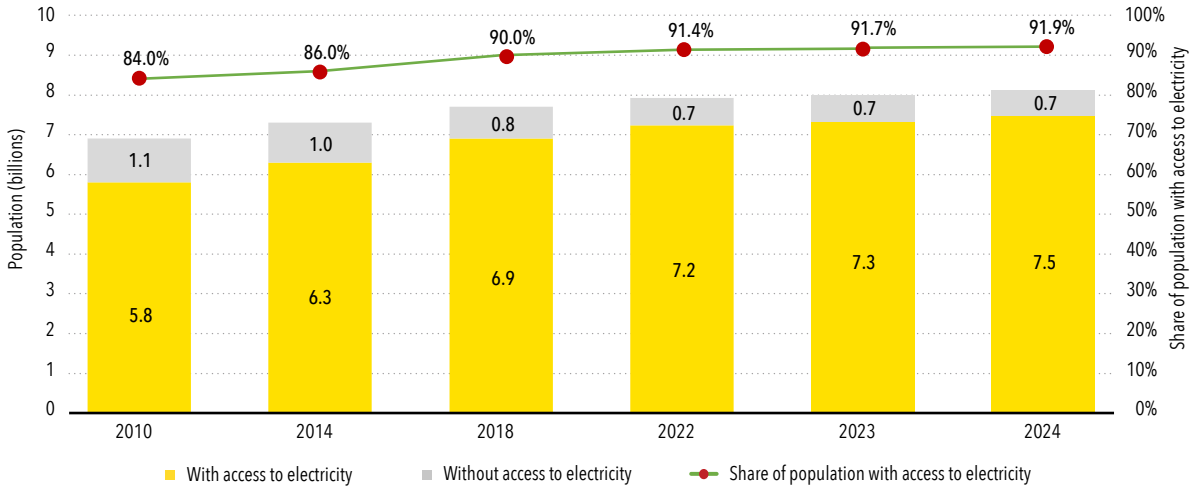
3 Following a detailed reconciliation of national statistics with the latest Organización Latinoamericana y Caribeña de Energía (OLACDE) energy outlook data, five countries in Latin America previously classified as having achieved universal access after applying standard extrapolation methods—have been reclassified as having "near universal access" in the 98–99.8 percent range. This new status reflects the fact of small remnants of unserved populations in remote areas. These countries include Argentina, Chile, Costa Rica, Jamaica, and Mexico. https://www.olade.org/publicaciones/panorama-energetico-de-america-latina-y-el-caribe-2025/. (OLACDE 2025).

Looking beyond the main indicators

Access deficits and population growth

The global electricity access rate rose between 2010 and 2022, from 84 percent to 91.4 percent (figure 1.4), with an average annual increase of 0.70 percent. Over this period, 121 million people received new connections annually. Meanwhile the population grew by 82 million per year, resulting in an average annual decrease in the population lacking access of 39 million. Between 2022 and 2024 the rate tiptoed up, from 91.4 percent to 91.9 percent, or an average annual increase of 0.27 percent. While 110 million people received new connections annually, the population grew by 95 million people per year, resulting in a more modest decrease of 15 million in the population lacking access.[4]

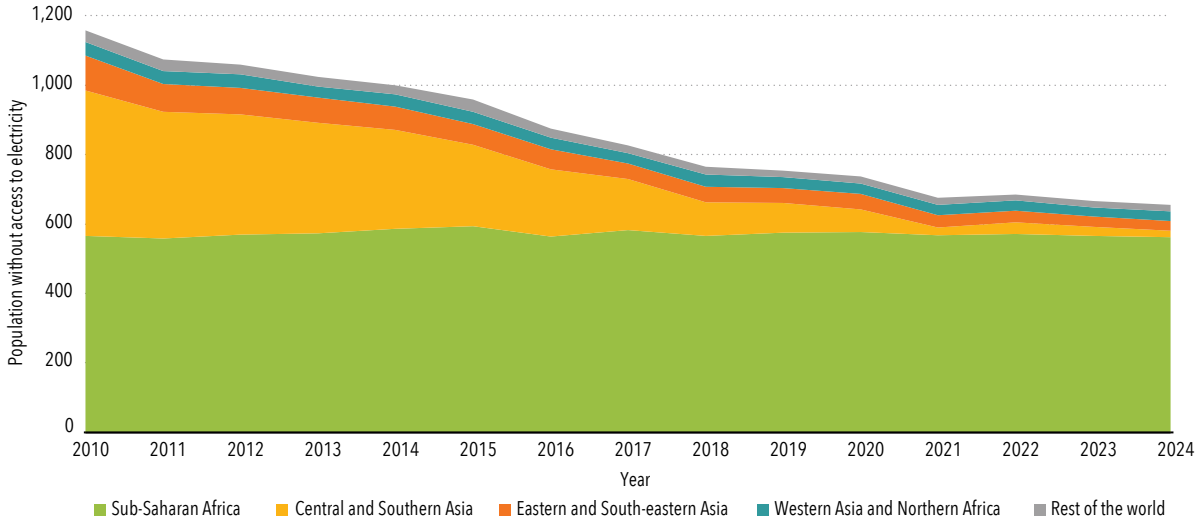
Figure 1.4 • Gains in global electricity access and population growth, 2010–24



While the number of people worldwide lacking access has fallen from 1.1 billion in 2010 to 655 million in 2024, progress has been deeply uneven. Sub-Saharan Africa's share of the global access deficit has grown from 49 percent to 86 percent over this period, as the number of people lacking access in the region dipped from 565 to 563 million. Meanwhile, Central and Southern Asia made dramatic gains, reducing their share of the total population lacking access from 36 percent to 3 percent (figure 1.5).

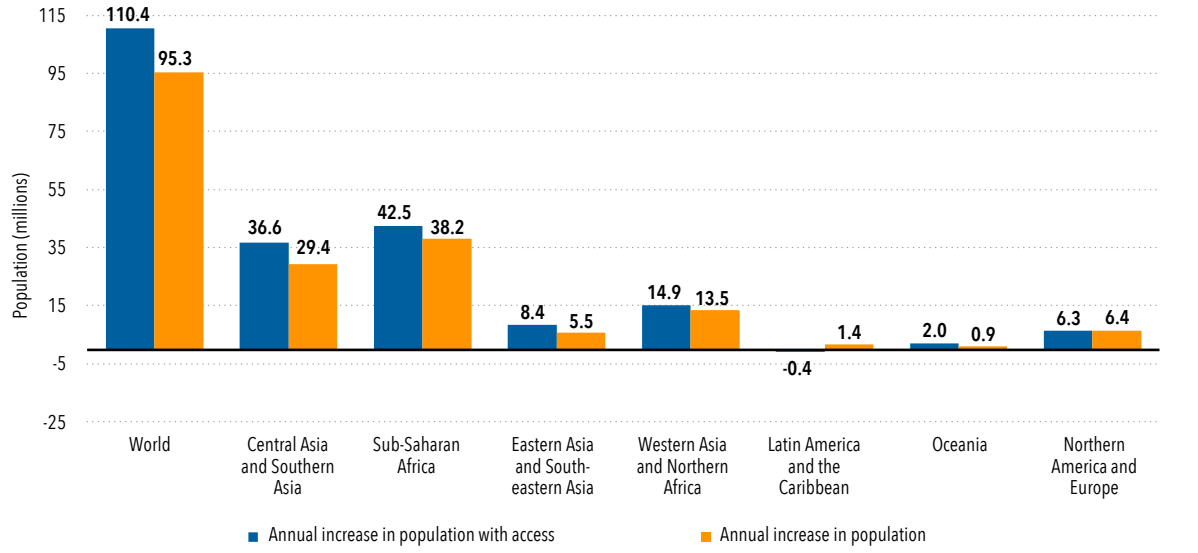
4 Access rates are calculated by subtracting population growth from total new connections. But this cannot not take account of several factors, including the likelihood of higher fertility rates in unconnected areas; higher infant mortality rates in unconnected areas; and rapid urbanization, as people move from unconnected rural to connected urban households. No reliable data are available on which to base assumptions in these areas.

Figure 1.5 • Number of people without access to electricity, by region, 2010–24



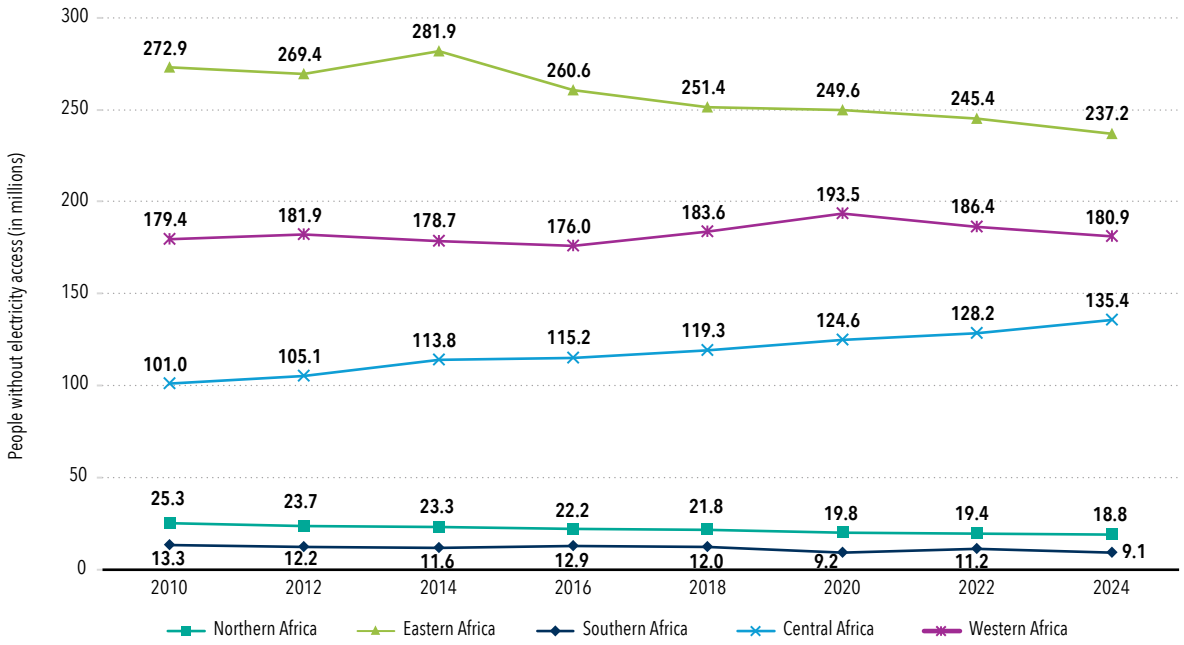
From 2022 to 2024, Eastern Asia, Western Asia, and Latin America established new connections faster than their populations grew. Central and Southern Asia added roughly 37 million new connections per year–8 million more than their annual population growth rate, while Sub-Saharan Africa added 42 million new connections per year–4 million more than their annual population growth rate (figure 1.6).

Figure 1.6 • Annual increases in electrification and population, by region, 2022–24



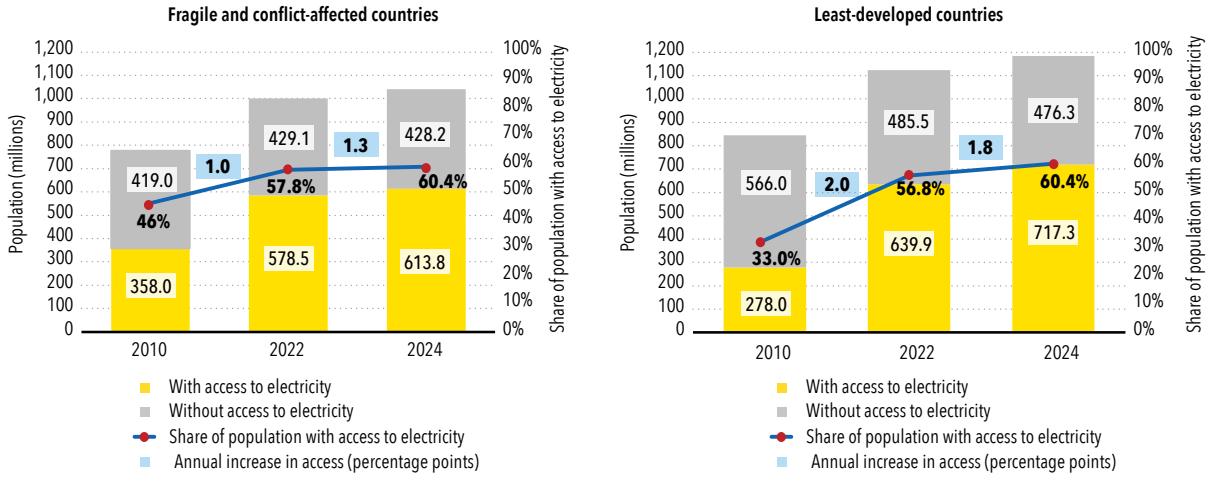
Between 2010 and 2024, progress in closing Africa's electricity access gap was markedly uneven (figure 1.7). In Southern Africa, the access deficit declined by 4 million, largely driven by gains in South Africa and Botswana. Northern Africa recorded consistent advances, reducing its deficit by 6 million, reflecting strong progress in Algeria, Morocco, and Tunisia. Eastern Africa made rapid headway with its larger deficit contracting by 35 million, supported by notable progress in Rwanda, Kenya, Mauritius, and Seychelles. In contrast, Central Africa saw a deterioration, with the deficit widening by 34 million, mainly due to persistent challenges in the Central African Republic, Chad, and the Democratic Republic of Congo. Western Africa displayed a mixed trajectory: the deficit rose from 179 million in 2010 to 186 million in 2022 before edging down slightly to 181 million in 2024, reflecting varied country performance across the region.

Figure 1.7 • Electricity access deficits in Africa by subregion



The access deficit is becoming more concentrated in LDCs and countries affected by fragility, conflict, and violence (FCV). From 2022 to 2024, LDCs saw the numbers of people without electricity dip from 485 million to 471 million, while FCV countries remained almost unchanged, moving from 429 million to 428 million. Burkina Faso, Ethiopia, and Nigeria have made notable progress. LDC households continue to struggle with persistently low incomes, dispersed rural settlement patterns, and limited institutional capacity, while FCV settings continue to constrain electrification. In many FCV contexts, access to electricity has declined in absolute terms in recent years. Communities affected by displacement are typically the hardest hit, consistently exhibiting lower access rates than national averages (United Nations 2025).

Figure 1.8 • Increases in global access to electricity in LDCs and FCV-affected areas, 2010, 2022, 2024

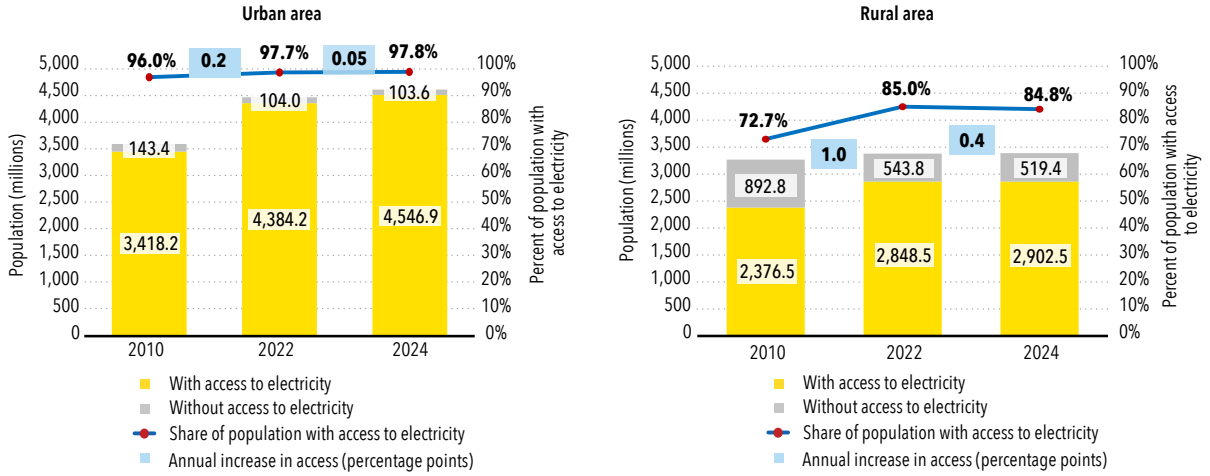


FCV = fragility, conflict, and violence; LDCs = least-developed countries.

Access needs along the rural-urban continuum

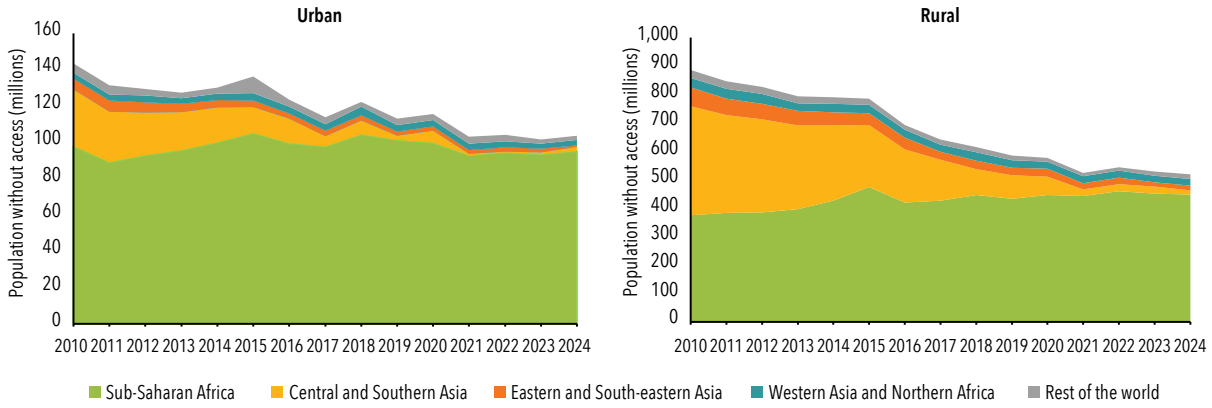
Urban electrification rates are nearing universal access worldwide, rising from 96 percent in 2010 to 98 percent in 2024—or an additional 1.1 billion additional urban connections (figure 1.9). In rural areas, access rose from 73 percent in 2010 to 85 percent in 2024, with 527 million people gaining access. While these numbers highlight the persistent challenge posed by rural access, urban electrification also warrants attention.

Figure 1.9 • Increases in global access to electricity in urban and rural areas, 2010, 2022, and 2024



Progress has been uneven across regions from 2010 to 2024. While Central and Southern Asia slashed its rural unelectrified population from 383 million to just 16 million, the access deficit in rural Sub-Saharan Africa grew from 376 million to 447 million. Targeted interventions to address the rural access change in Sub-Saharan Africa are now essential (figure 1.10). The urban electricity access deficit narrowed worldwide from 145 million people to 104 million in 2024, driven primarily by Central and Southern Asia. Sub-Saharan Africa provided electricity to nearly 250 million people in urban settings. Rapid urbanization, however, caused the deficit in urban access to fall from 98 million in 2010 to only 95 million in 2024.[5]

Figure 1.10 • Access deficits in urban and rural areas, by region



The 519 million rural people worldwide that remain unelectrified are highly diverse. In Latin America and the Caribbean, the 11 million people who are unelectrified live in isolated, remote, and often indigenous communities. The rural access deficit grew in Sub-Saharan Africa by 72 million people between 2010 and 2024. People who live in these remote areas (often marked by conflict or fragility) have low household incomes. Some areas with a rural designation nevertheless have urban-like population densities and economic characteristics and are often functionally a part of nearby cities, but have yet to be reclassified as urban (OECD 2020; Kersey and Koo 2024).

Rapid urbanization is reshaping patterns of electricity access, particularly in Sub-Saharan Africa, where the urban population is projected to double from 600 million today to 1.1 billion by 2050 (OECD and others 2025). Despite high headline connection rates, urban households often face poor service quality, uncertain reliability, and marginal affordability. These shortcomings prevent them from attaining the social and economic benefits associated with a higher level of service. In informal low-income urban communities, many connected end-users rely on intermediated forms of access, such as shared meters with landlords or informal resellers tapping electricity from the grid (Kersey and others 2025). For these households, the availability and affordability of electricity are further constrained by intermediated access arrangements, which suppresses demand.

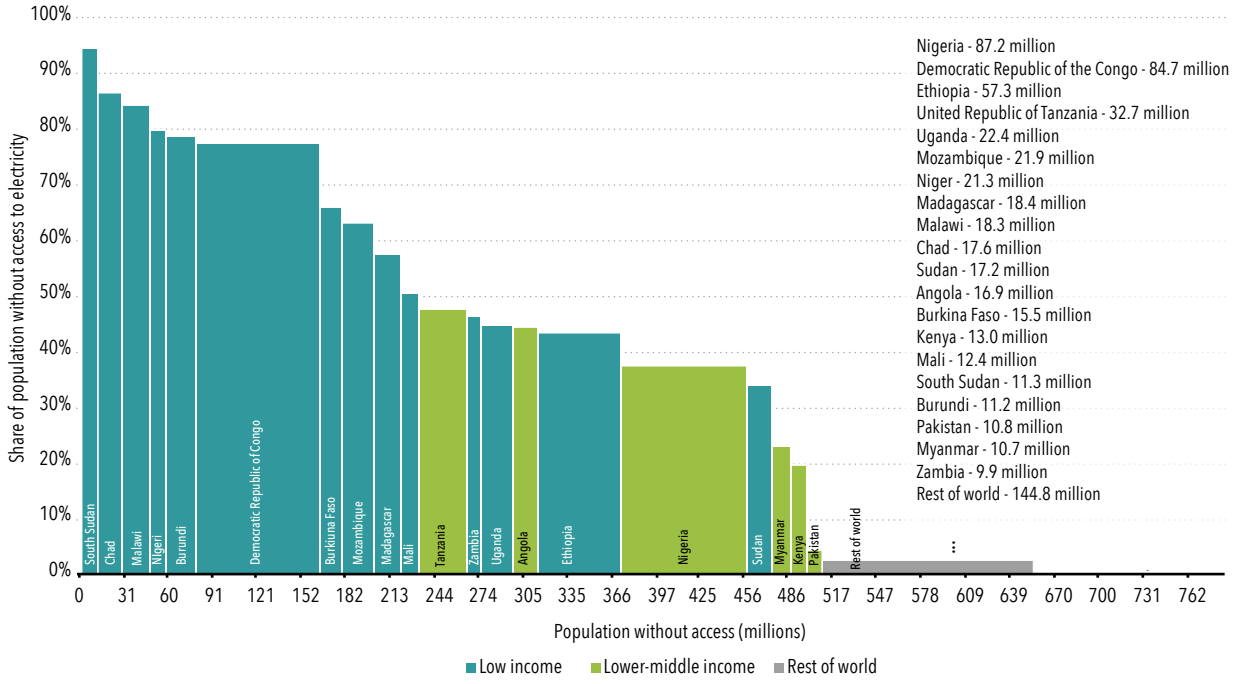
To address these problems, governments should invest in improving the reliability and affordability of grid electricity supply in urban settings, alongside providing new connections. Affordability constraints can be addressed through subsidies, or by passing on savings made on the supply-side through better planning or more competitive procurement of new generation.

5 Sub-Saharan Africa's urban population increased from ~313 million in 2010 to ~542 million in 2023 (73 percent), while the rural population increased from ~562 million to ~718 million (28 percent). For more information, see World Urbanization Prospects 2025, UN DESA, https://population.un.org/wup/. (United Nations, 2025)

Country trends

Progress has been uneven across countries and regions. In 2024, the top-20 access-deficit countries accounted for 78 percent of the global population lacking access, up from 75 percent in 2022. Eighteen are in Sub-Saharan Africa, 17 are LDCs, and 12 are affected by conflict or fragility. Fifteen countries are hosting large numbers of refugees or internally displaced people. Of the global population lacking access, three countries can claim nearly a third of them: the Democratic Republic of Congo, 85 million; Ethiopia, 57 million; and Nigeria, 87 million people (figure 1.11). Outside of Sub-Saharan Africa, Pakistan and Myanmar, each have 11 million people without electricity access.

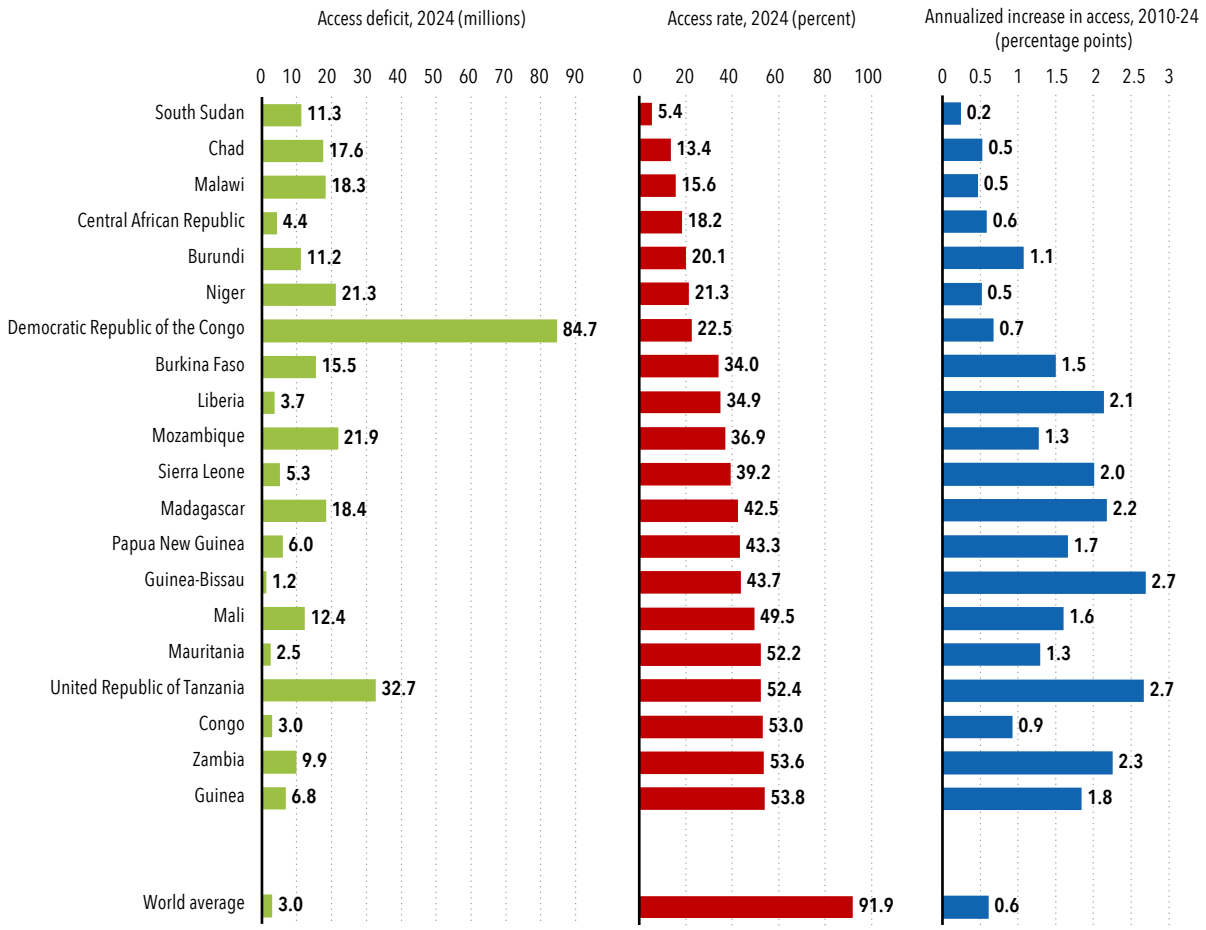
Figure 1.11 • Share and absolute size of population lacking access to electricity in the top-20 access-deficit countries, 2024



Countries with the lowest electricity access rates continue to make slower than average progress. The three countries with the lowest rates of access remain unchanged from the previous SDG 7 tracking report—Chad with 13.4 percent, Malawi at 15.6 percent, and South Sudan with 5.4 percent—have achieved only limited average annual gains of 0.5, 0.5, and 0.2 percent, respectively, since 2010 (figure 1.12).[6]

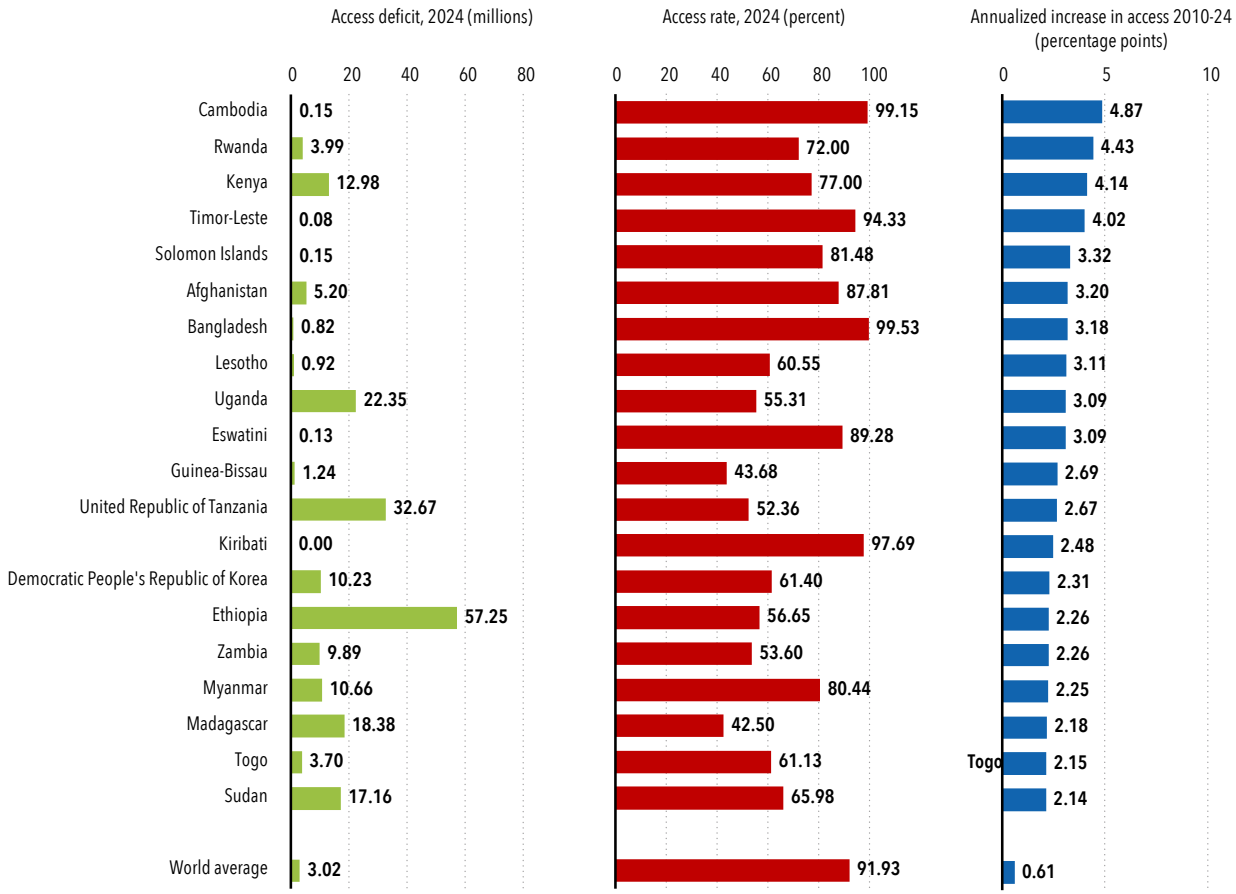
6 South Sudan was established in 2011.

Figure 1.12 • Annualized increase in access in countries with the lowest access rates, 2010–24



From 2010 to 2024, Cambodia, Kenya, and Rwanda recorded the highest annual average percentage gains. Each advanced from a low baseline to more than two-thirds of their population gaining access over the period, with Cambodia standing out at 99 percent access. The progress in these countries reflects sustained government commitment, large-scale investments in grid expansion and off-grid solutions, and effective policy coordination under national electrification programs.

Figure 1.13 • Access to electricity in the 20 fastest-electrifying countries, 2010–24

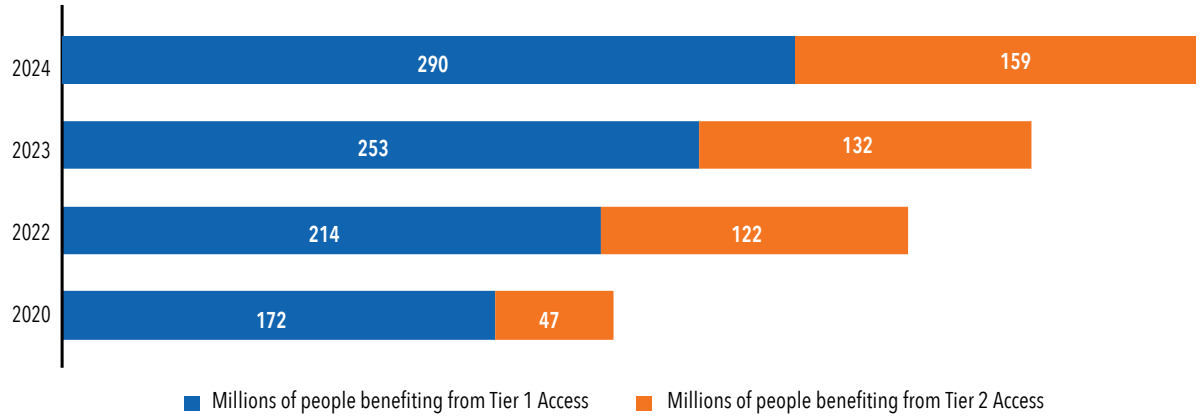


People served with distributed renewable energy

An estimated 449 million people were being served with Tier 1 and Tier 2 off-grid solar solutions in 2024. This is up from 385 million in 2023, an increase of 64 million.[7] The proportion of people benefiting from Tier 1 solutions rose 15 percent, while the proportion with Tier 2 solutions fell 20 percent. After a COVID-related dip in 2020, sales of quality-verified Tier 1+ off-grid solar solutions rebounded to a record high in 2022, followed by a plateau from 2022 to 2024. Year-on-year gains continued in people being served from 2020 onwards, with Kenya, Nigeria and Uganda the largest markets (figure 1.14). In other words, there was a robust, ongoing demand for off-grid solar solutions despite macroeconomic headwinds, high inflation, and climate-linked natural disasters. Roughly 65 percent of people benefiting from off-grid solar have no access to the grid and would otherwise have remained unelectrified, while the other 35 percent use their off-grid solar system as power backup (60 Decibels 2025).

7 This estimate is based on sales data reported by GOGLA affiliates selling quality-verified solar products. GOGLA affiliates are estimated to have a 29 percent market share based on the MTF dataset, the only data source tracking the proportion of quality-verified off-grid solar products across multiple countries. Product lifespans are assumed to be 1.5x warranty periods, calculated at individual product level–typically three years for solar home systems. A 3 percent discount rate for repeat sales is applied to Tier1+ products in the 3–100Wp range. A PAYG discount rate is also applied to PAYG sales, to account for default/repossession. For more information, see GOGLA's Market Insights and Data, https://gogla.org/market-insights-data/.

Figure 1.14 • Estimated number of people served with Tier 1 and Tier 2 standalone off-grid solar solutions



Source: GOGLA 2026.

The most comprehensive recent estimate of people reached with mini grids finds that they are serving nearly 48 million people at a Tier 4 and above level of service (ESMAP 2022a). This translates to more than 21,500 installed systems—half of which rely on solar PV technology. An additional 29,400 mini grids are planned for development and projected to connect over 35 million people. Of these millions, 95 percent of them live in Africa and South Asia and nearly all of them are expected to use solar (99 percent). Reliable, robust data on the global mini grid sector is outdated—with the most comprehensive analysis carried out by the World Bank in 2022. The World Bank, Sustainable Energy for All (SEforALL), and the Africa Minigrid Developers Association (AMDA) are jointly undertaking a market assessment; updated data are expected to be available in early 2027.[8]

These trendlines for people who have both off-grid solar solutions and mini grids are broadly corroborated by IRENA's dataset.[9] IRENA finds that 31 million people living off-grid were served with quality-verified Tier 1+ SHS in 2024, up from 29 million in 2023 (7 percent increase), and people served with mini grids increased from 13.67 to 13.72 million people (0.4 percent increase). The World Bank's estimates are higher than IRENA's because they include off-grid solar products sold by companies that are not GOGLA affiliates (GOGLA is the global association for the off-grid solar energy industry), and mini grid data were drawn from a broader range of sources.[10]

8 Data for Sub-Saharan Africa—by far the fastest growing market for private sector-led mini grid deployment—is particularly fragmented. The primary sources of project-level data—AMDA's *Benchmarking African Mini Grids* report and the Odyssey software platform—each have significant coverage gaps, which make it difficult to state with confidence the number of operational mini grids or total customer connections. The World Bank and SEforALL are undertaking a joint comprehensive global mini grid market data collection exercise, with the goal of producing an updated dataset to complement the existing World Bank ESMAP *Mini Grids for Half a Billion People Handbook* and the Mini Grid Partnership's *State of the Global Mini Grid Market Report* databases. In addition, AMDA is currently undertaking a comprehensive review of the mini grid sector in Sub-Saharan Africa—covering both private and public deployments—with the aim of producing reliable aggregate figures. Updated data is expected to be available in early 2027. Until that review is complete, figures cited in this report reflect the best available estimates at the time of writing and should be interpreted accordingly. https://www.africamda.org/wp-content/uploads/2025/04/Benchmarking-Africas-Minigrids-Report-2024-Online-version.pdf. (AMDA 2025).

9 IRENA defines off-grid renewable systems as "renewable technologies that serve people in areas that have no physical connection to a main or national power grid." For more information, see Off-grid Renewable Energy Statistics, IRENA, https://www.irena.org/Publications/2025/Dec/Off-grid-Renewable-Energy-Statistics-2025

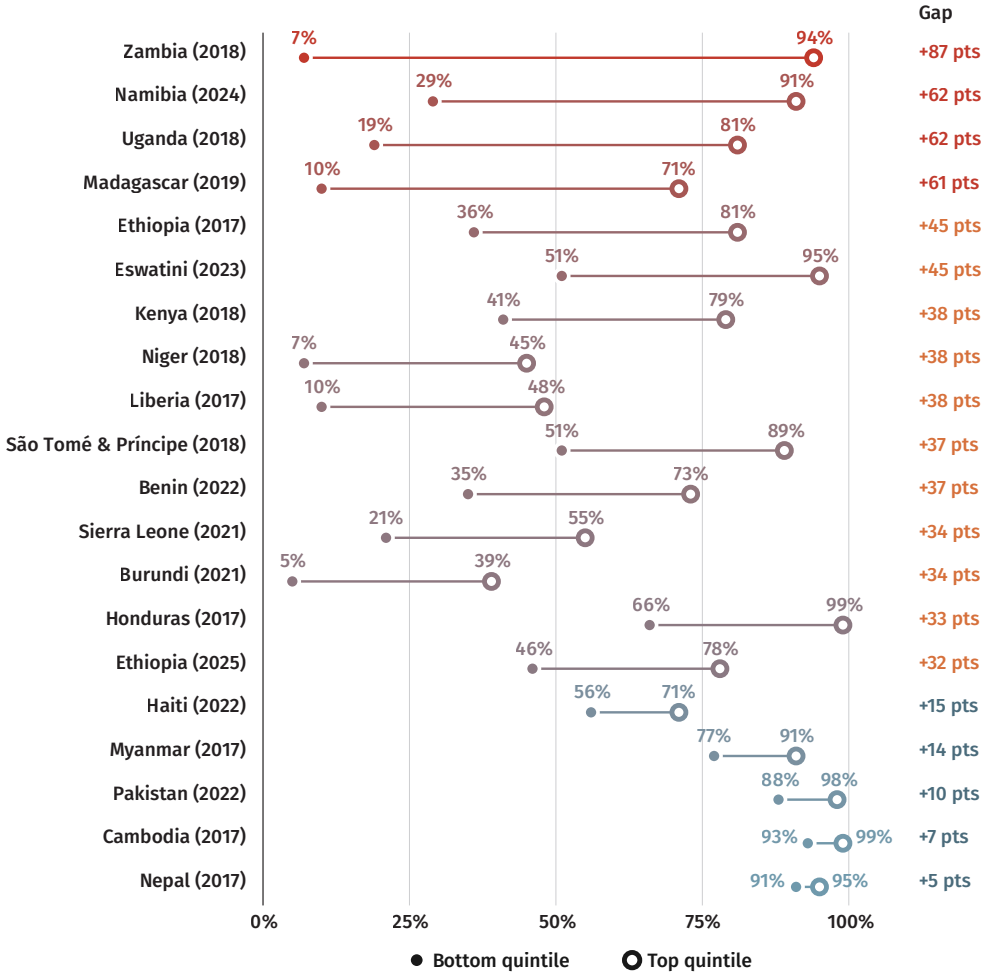
10 The World Bank's methodologies produce a much higher figure for total people served than IRENA's methodology. For off-grid solar, this is a result of including off-grid solar products sold by companies that are not GOGLA affiliates, sales reported in non-access-deficit countries (on the assumption that these products are en route to access-deficit countries), and products sold as power backup in on-grid areas. For mini grids, this stems from relying on a comprehensive market data-gathering exercise undertaken in 2022, which drew upon a wide range of sources.

The remaining population lacking access

Those who remain without access tend to have low household incomes, experience multidimensional poverty, and live in remote rural areas affected by fragility, conflict, or displacement (Alkire and others 2020). Despite national progress, remote populations, women, informal settlements, and indigenous communities are often left behind.

MTF survey data suggest that household income correlates with electricity access. Countries with low electrification rates tend to have sharp disparities in access among income groups, while those with high rates show smaller gaps. In countries with limited access, such as Zambia (2018), income is the main factor determining access (figure 1.15). In contrast, countries with high rates of electrification, like Cambodia (2017), have achieved a more equal distribution of access. Haiti stands out as an exception. Limited grid availability constrains access rates across all quintiles, while all income groups use off-grid solutions.

Figure 1.15 • Access rates for top and bottom income quintiles for selected countries

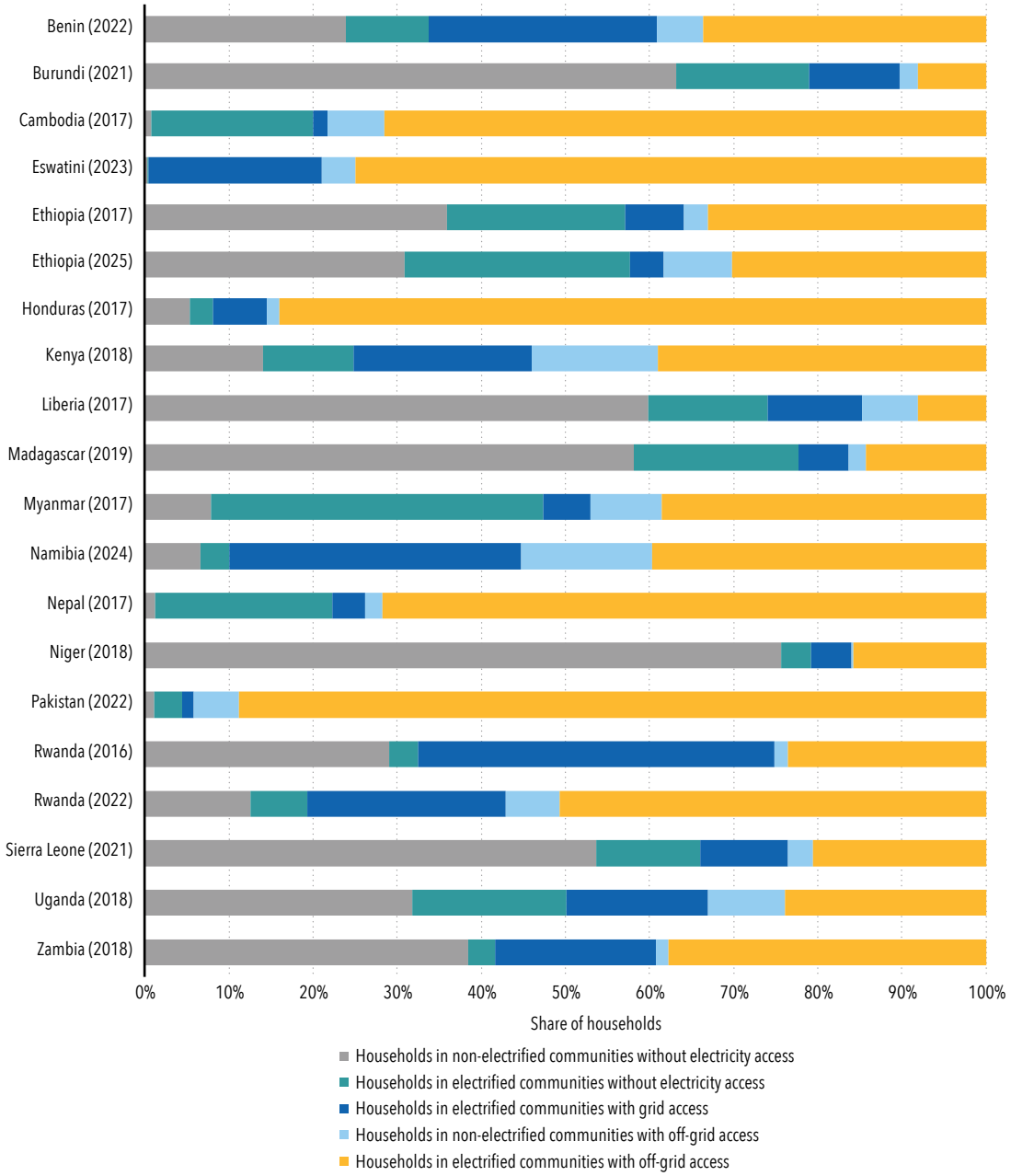


Source: MTF survey data.

Note: Horizontal lines bridge the access gap between the bottom quintiles (left), and top quintiles (right). Longer lines signal wealth-based barriers, while shorter lines indicate more equitable distribution.

An uptake gap exists in countries where households remain unconnected to the grid despite their proximity to grid infrastructure.[11] Low grid uptake rates of 31 percent to 38 percent persist in Burundi, Liberia, and Rwanda, for example, because of high upfront connection fees and the costs of internal wiring (figure 1.16). These countries have therefore introduced dedicated initiatives to help households with such costs. Demand-side challenges to boost uptake in grid-connected areas are often less capital intensive than expanding the grid or offering off-grid solutions in unelectrified areas.

Figure 1.16 • Grid and off-grid uptake rates in electrified and non-electrified communities in selected countries



Source: MTF survey data.

11 A grid-electrified community or settlement is classified as one where at least one household surveyed reported having a grid connection.

Policy insights

Governments seeking to accelerate progress face a daunting task. Public funding must meet affordability constraints; at the same time, fiscally sustainable, least-cost electrification plans require planning and care. Private sector delivery and co-investment involve further leveraging of DRE, while the productive use of energy will need to extend both access and gender-inclusive interventions.

Limited public funding

Current investment falls short of what the DRE sector needs to fulfil its potential, and fiscal space is tightening—both for governments in the Global South and providers of official development assistance. An estimated USD 21 billion is needed through 2030 to provide off-grid solar to the 398 million for whom this solution is least cost. This represents a six-fold increase on the total investment the sector has received to date—equivalent to USD 3.5 billion a year—with public funding providing 40 percent to leverage a further 60 percent in private co-investment (ESMAP and others 2024). The mini grid financing gap is estimated to be much larger. Public funding needs to cover ~60 percent of mini grid connection costs today, while dropping to ~30 percent as markets mature (ESMAP 2022a).

Limited public funding means it is critical to leverage the private sector while attracting private co-investment (ESMAP 2022b). Total investment in off-grid solar fell, however, to USD 300 million in 2024—a 30 percent year-on-year drop from 2023. The decline mirrors the contraction in the mini grid sector and the broader African venture capital ecosystem, which fell 25 percent due to macroeconomic headwinds and currency volatility (GOGLA 2025). The decline was even steeper for early-stage ventures, where start-up capital plunged 70 percent. As with many emerging industries, the DRE sector surged early on. After a reality check, the sector is moving into a phase marked by stronger business models and rising demand. Business fundamentals are improving, successful companies are reaching scale, and the addressable market remains vast and underserved.

More encouragingly, over USD 900 million in results-based financing has been committed to the DRE sector so far—with more than half pledged in 2023–24 (GOGLA 2025). These programs are now moving toward implementation and disbursement. For example, Nigeria's Distributed Access through Renewable Energy Scale-up (DARES) project has allocated USD 300 million for off-grid solar. The Energy Access Scale Up Project in Uganda also demonstrated strong results, financing 200,000 off-grid solar sales in record time. Other schemes have launched in Mozambique, Madagascar, and elsewhere.

Addressing affordability constraints through fiscally sustainable, least-cost electrification plans

Least-cost electrification planning involves using geospatial data and economic modeling to identify the most cost-efficient mix of grid, mini grid, and standalone off-grid solar solutions to meet demand. This approach is essential to the efficient use if scarce public funding. It aligns electricity supply with affordability and demand. Least-cost approaches need to consider the return on electrification investments. In grid settings, high-consumption customers generate enough tariff revenue to cover connection and electricity supply costs, while low-consumption customers do not. This could leading to high, recurring subsidy bills. In mini grid and off-grid settings, investments can create returns through job creation, leading to higher income tax receipts and lower kerosene lighting subsidy bills (Cabraal and others 2021).

Of households worldwide lacking access, only 22 percent can afford the monthly pay-as-you-go (PAYG) fee for a Tier 1 solar home system. Of the 22 percent that can afford grid or mini grid electricity at Tiers 3, 4, or 5, the rest could be electrified with Tier 1 off-grid solar solutions without subsidy (ESMAP and others 2024). The remaining 78 percent need to be electrified through a subsidy. An integrated approach (subsidies combined with credit lines or technical assistance) could address affordability constraints while maintaining the commercial health of DRE companies, which would allow them to attract private co-investment (ESMAP and others 2024).

Least-cost plans need to consider what tier of access to aim for when seeking to connect these households. When setting targets for tiers of access, governments need to consider the cost of supply, affordability, and subsidy needed to make a given level of service affordable, and the fiscal sustainability of subsidies—both for initial connections and supply over time. Further reflections on the MTF framework, what it takes to enable households to move to a higher level of service, are outlined in annex 1.

Although there is no one-size-fits-all solution, governments have recourse to innovative approaches that help them analyze affordability and inform the setting of subsidy levels. For example, Togo combined household survey data, satellite imagery, and mobile phone data to estimate incomes, while Rwanda linked subsidy levels to predefined socioeconomic categories (ESMAP and others 2024). Nigeria's DARES project uses a "vulnerability index" to consider affordability alongside higher distribution costs and risks in remote or insecure areas (Nigeria Rural Electrification Agency 2024).

Creating the conditions for private sector delivery and co-investment

Recent internal World Bank research has revisited the determinants of progress on electricity access worldwide since 1990, in addition to identifying the characteristics of lower-income countries that have high access rates. The resulting study covers 118 countries and offers detailed analysis of 48 low- and lower-middle income countries that have achieved universal access, including rapid improvers such as Bangladesh, Ghana, Nepal, and lower-middle-income countries that have surpassed 95 percent access rates.

Countries that gained universal access before 1990 did so largely as a byproduct of industrialization, urbanization, and economic growth. Their electrification was driven by industrial and commercial demand. Once countries had met nonresidential demand, dedicated programs were put in place to expand access to households, which in most cases took between five to eight years. This grid-focused approach worked well in more densely populated countries enjoying high rates of economic growth, with rising incomes driving electricity demand and facilitating utility cost-recovery. Around 75 percent of countries achieved universal electricity access only after reaching upper-middle or high income status. These patterns underscore the roles of fiscal capacity, institutional maturity, and sustained public investment. This slow-paced approach, however, and tended to focus on economic activity and infrastructure; remote and marginalized communities were the last to benefit.

Countries making progress after 1990 pursued welfare-oriented electrification strategies. They focused on households—leveraging DRE, working through the private sector, and leveraging private co-investment. By depending on geospatial, least-cost planning to reach rural and underserved populations, these countries used grid extension and distributed renewable energy deployed through national access programs; subsidies addressed affordability constraints. Taking advantage of new DRE technologies and business models, countries with low demand and dispersed populations in Sub-Saharan Africa and elsewhere made rapid gains. Between 2015 and 2023, Kenya connected an additional 20 percent of its population using off-grid solar solutions, while Rwanda connected more than 10 percent and Uganda more than 30 percent. https://trackingsdg7.esmap.org/sites/default/files/download-documents/chapter1_accesstoelectricity.pdf. (World Bank and others 2025).

A range of determinants (supply- and demand-side) enabled governments to leverage private sector capacity and co-investment to deliver access quickly and at scale. These determinants, outlined below, are positively correlated with speedy progress toward universal access (Parker and Liddle 2026).

Supply-side determinants

Costs and financing: Rising infrastructure costs pose a challenge as grids expand to remote and sparsely populated areas. Many countries face limited access to concessional finance, financially weak utilities, low private investment, and high upfront capital requirements for rural electrification. Countries that overcome these constraints have generally established electrification funds and used public subsidies to de-risk private investment. Concessional loans, blended finance, and public-private partnerships are common, alongside optimized grid design and least-cost technology mixes that combine grid extension, mini-grids, and solar home systems. Climate finance and results-based financing are also used to support DRE deployment.

Planning and tracking: Weak planning and data systems undermine electrification efforts. Outdated least-cost plans and poor integration of DRE reduce efficiency and discourage private investment. Effective countries rely on national geospatial electrification plans supported by GIS-based tracking systems that benefit from regular updates. They integrate grid and off-grid planning, streamline licensing procedures, and strengthen monitoring and evaluation systems so electrification strategies remain aligned with settlement patterns and demand.

Inclusion: Structural barriers, lack of legal recognition and insufficient consultation, as well as broader power and knowledge gaps, contribute to exclusion. Community-led electrification programs, gender-responsive design, targeted subsidies for poor households, and interventions devoted to displaced people can help to achieve inclusive outcomes. Solar home systems and mini-grids are generally used to reach remote and nomadic groups, while legal frameworks ensure indigenous consultation and protection of rights.

Institutional capacity is a critical determinant of success. Common challenges include the absence of dedicated electrification agencies, limited technical expertise, unclear mandates of government agencies, and weak coordination across ministries, regulators, and utilities. Countries with strong outcomes typically establish national electrification agencies with clear mandates, empower independent regulators, and create inter-ministerial coordination mechanisms. Technical assistance and regional power pool cooperation further strengthen institutional performance.

Demand-side determinants

Affordability and uptake: Once electricity supply is available, high connection fees, internal wiring costs, and household liquidity constraints can prevent uptake. Unreliable supply and unaffordable tariffs lead to affordability outages, particularly in conjunction with prepaid metering systems. Effective demand-side strategies include connection subsidies, output-based aid, PAYG solar financing, and instalment payment plans. Critical measures for improving uptake include lifeline tariffs, targeted social protection, and support for internal wiring (such as standardized kits or ready boards). Some countries have promoted the productive use of electricity to make electrification more economically viable.

Sociocultural factors: Low trust in utilities, inadequate information, unsafe housing, and reluctance to adopt wiring solutions slow adoption in some contexts. Countries address these challenges through awareness campaigns, simplified engineering standards, standardized wiring, and access to microfinance for household wiring, reducing both perceived and actual barriers to connection.

Characteristics of low- and low-middle income countries with high access rates

Low- and lower-middle-income countries with high electricity access rates share several defining features. Above all, there is strong government ownership of the electricity access agenda and commitment to creating an enabling environment for private sector delivery and co-investment. Private sector participation is enabled through clear frameworks for independent power producers, mini-grid operators, and off-grid solar companies that are active in the sector. Streamlined approvals, risk-mitigation tools, and tax or duty exemptions help crowd in investment. Strong planning and tracking underpin these efforts. National electrification plans use GIS-enabled least-cost analysis and fully integrate grid, mini grid, and standalone off-grid solar solutions. Annual public reporting, disaggregated data, and dashboards support evidence-based policy adjustment. Inclusion is prioritized, with programs targeting women, indigenous communities, and informal settlements.

Successful countries maintain stable, multiyear financing frameworks through rural electrification funds, levies, and blended donor finance. Subsidy systems—often backed by output-based aid—are targeted and well designed. They cover connection fees, internal wiring, and access to PAYG solar home systems. Subsidies are often linked to social registries, while institutional arrangements are strengthened through dedicated agencies, defined roles, and coordination mechanisms. Using lifeline blocks, cross-subsidies, and targeted support, tariff structures balance financial sustainability with equity to protect vulnerable consumers while moving toward cost-reflective pricing.

Success depends on effective implementation of national plans. In addition to strong government ownership and commitment, the effort requires capable institutions with clear mandates, staffed by qualified personnel ideally with private sector experience. By tracking the progress of agencies in charge of electricity access initiatives, governments can act when implementation falters. Implementation of national plans can also be bolstered by the application of digital solutions in procurement, monitoring, reporting, verification, and claim processing. Public-private dialogue helps government agencies identify company challenges early, so they can take action before delivery of results is put at risk.

Further leveraging DRE to deliver least-cost access

Alongside investments in grid generation, transmission, and distribution, DRE has enabled governments to meet demand more quickly, and at lower cost, than they could have managed with grid electrification. Proven DRE technologies and business models—such as PAYG off-grid solar—help governments deliver a Tier 1+ level of service to the remaining population, quickly and at scale, which leverages private sector capacity and co-investment. With limited public funding, a least-cost planning approach is best: service in line with demand and cost-efficient payments made with funding mechanisms like results-based financing. As those lacking access become harder to reach, DRE solutions are likely to create first-time access (ESMAP 2024).

The DRE sector is benefiting from powerful tailwinds. As solar PV costs fall, digital enablers (including geospatial planning tools, mobile money, PAYG) are expanding market reach and accelerating mini grid deployment now driven by a growing cohort of developers. Sector consolidation, emerging local supply chains, and innovative public-private financing instruments (such as those used in Nigeria's DARES program) further improve conditions for scale up (ESMAP and others 2024; ESMAP 2022a).

Governments are perfectly positioned to address the structural barriers constraining DRE sector growth. For example, public funding mechanisms can be designed to incentivize credit quality, avoiding over-indebtedness for households and high default rates for companies. Local currency financing can mitigate FX risks, which have been exacerbated by currency devaluations. In addition to subsidizing unprofitable, last-mile, first-time access, public funding mechanisms can support the sector's commercial health, enabling governments to attain private co-investment targets (ESMAP and others 2024; ESMAP 2022a).

DRE can be used to create jobs and accelerate economic growth through productive use of electricity, while supporting human capital development through the electrification of health facilities, schools, and community infrastructure. For example, solar water pumps boost agricultural productivity and food security, off-grid cooling technologies prevent food loss and reduce heat stress, and agricultural processing technologies save time and reduce costs (Efficiency for Access 2024). Provision of financing for income-generating appliances such as pressure cookers, grain mills, bench saws, grinders, and electric motors in mini grid–connected areas could boost average consumption per user by up to 48 percent, improving the financial viability of electricity supply (Crossboundary 2022). Public facilities can be electrified more sustainably through fee-for-service models that incentivize (and ensure sufficient financing for) long-term operations and maintenance through blended financing (WHO and others 2023).

Promoting productive use of electricity to enhance economic and fiscal impacts

Given the urgent need to stimulate economic growth, create jobs, and boost revenues, governments are exploring new ways to enhance the economic and fiscal impact of energy access interventions. Interventions to promote productive use—which accelerates uptake of electric appliances and machinery through financing and other forms of support—are widely regarded as critical to this effort. Potential approaches include scaling up existing productive use assets to leverage established value chains and supporting farmers and businesses to switch from "low capex/high opex" fossil fuel–powered assets to "high capex/low opex" renewable solutions that have lower lifetime costs. The economic and fiscal impact of energy access interventions depends less on connections and more on demand-side realities. Still, productive-use appliances and machinery are available and affordable thanks to financing and subsidies. Whether businesses can access other forms of support—such as business advice, business-to-business matchmaking, capacity building, and access to markets—is also critical. Efforts to promote productive use need to be scaled up across grid, mini grid, and off-grid settings.

Household electrification programs can also have strong economic and fiscal impacts. For example, the IDCOL solar home system program in Bangladesh generated USD 1.5 billion in economic and financial benefits after accounting for the cost of the program; this amount included the USD 654 million in benefits for the government, amassed primarily through SHS taxes and forgone kerosene subsidies (Cabraal and others 2021).

Gender-inclusive interventions in electricity access

Women are disproportionately vulnerable to energy poverty and have untapped potential as end-users, employers, and entrepreneurs. Access initiatives need tailored strategies to reach women as end-users, encourage their entry into the workforce, and support them as business leaders. For example, the Rwanda Renewable Energy Fund Project achieved strong results for women by pairing targeted subsidies with financing from local savings and credit cooperatives. By delivering subsidies and loans through cooperatives rather than commercial banks, the project made access affordable and access to finance for women-headed and low-income households, while also tracking gender outcomes and encouraging inclusive hiring by solar firms. This cooperative approach boosted women's share to 52 percent of beneficiaries. They received over one-third of the loans and held around 45 percent of the jobs in off-grid solar companies. Electricity access can transform gender-based outcomes. In India, the availability of rural electricity produces lower rates of gender-based violence and more reproductive autonomy (Pakrashi and others 2024).

Access initiatives can promote gender-inclusive business practices in the private sector through financial incentives, technical assistance, or eligibility requirements. Gender-inclusive practices include explicit hiring targets, upskilling initiatives, anti-harassment or equal-pay policies, and measures that strengthen business performance overall while strengthening women's safety or mobility and expanding its base of customers (Value for Women 2018). The Nigeria Electrification Project offered companies financial incentives for hiring women, set specific targets for electrifying households and small enterprises run by women, and promoted the use of electricity for income-generating activities

traditionally managed by women. A technical internship program enabled hundreds of young women to move into technical roles traditionally dominated by men. The number of women employed in DRE companies more than doubled over the course of the project, which delivered access to 470,000 women-run households and 3,600 women-owned businesses.

Setting targets and monitoring progress are critical. At the project level, these efforts go beyond counting female beneficiaries to tracking workforce trends as well. The unique challenges facing women-led enterprises are described, along with the forms of empowerment derived from greater access (IEA 2025). At a global level, following the launch of the Policy Brief on Gender Indicators in Sustainable Energy in 2025, a coalition of partners is mapping gender across the energy sector (ESMAP and others 2025). The map will provide a base of evidence for a global report aimed at strengthening gender-responsive measurement frameworks in renewable energy.

Defining, measuring, and tracking access

SDG 7.1 aims to "ensure access to affordable, reliable, sustainable, and modern energy for all by 2030," but SDG 7 tracking relies on binary electrification data collected by governments from national utilities and household surveys. Since 2015, the MTF has sought to recognize access as multidimensional and to capture attributes such as availability, capacity, reliability, affordability, quality, safety, and legality (Bhatia and Angelou 2015). Governments now routinely use the MTF's tiers to set household access targets, and MTF surveys cover 28 countries so far. MTF surveys have small sample sizes, take long timelines to develop and implement, and hence are done sporadically, mostly using donor funding. 0These limitations affect their ability to capture spatial variation as well as change over time. The MTF needs to be updated and to continuously evolve. For example, capacity thresholds need to be updated, as Tier 1 SHS can now power appliances previously associated with Tier 2. Ongoing refinement of attributes is also needed to ensure the framework continues to reflect meaningful access and to support sound interpretations of policy.

To measure electricity access, governments are best served by taking a harmonized, multidimensional approach that integrates a subset of MTF survey questions into national household surveys. This ensures the regular collection of gender-disaggregated data, national ownership, and alignment with planning and budgeting processes. Standardization, digital data collection, and automated analysis can shorten survey timelines. Strengthening the capacity of national statistics offices would also be essential to regularly measure electricity access using a multidimensional approach.

Accelerating progress through Mission 300

Mission 300 is a joint initiative led by the World Bank Group and the African Development Bank, supported by a coordination group that includes more than 35 organizations working together to advance progress. The mission is to connect 300 million people in Sub-Saharan Africa to reliable, affordable electricity by 2030. As of March 2025, the World Bank Group and AfDB have helped connect nearly 48 million people by bringing power to homes, businesses, schools, and hospitals across Africa. The WBG is delivering access through around 150 projects that span the entire energy value chain. The WBG has pledged USD 30 billion in financing from the International Development Association and USD 5 billion through the International Finance Corporation and the Multilateral Investment Guarantee Agency to catalyze private sector investment. Another USD 18 billion are pledged by the African Development Bank for the 2024–30 period.

At the center of Mission 300 are National Energy Compacts, developed by African governments with support from the World Bank Group and the African Development Bank. These ambitious, time-bound reform packages set targets to expand access, boost renewable energy use, and attract private capital, while introducing reforms to make power sectors and utilities more sustainable. To date, 30 countries have launched these compacts with the ambition to connect around 470 million people by 2030, with several more scheduled for launch in June 2026. The compacts

focus on five priority reform areas: (1) least-cost power generation through competitive tendering and integrated power planning; (2) regional integration to facilitate cross-border power trade; (3) distributed renewable energy and clean cooking solutions; (4) private investment across the energy value chain; and (5) financially viable power utilities.

Partnerships are at the core of Mission 300. The World Bank Group and the African Development Bank work with the Rockefeller Foundation, the Global Energy Alliance for People and Planet, SEforALL, the Energy Sector Management Assistance Program donors, and others to align financing, policy support, and expertise. This coordinated engagement has helped rally nearly USD 9 billion in WBG commitments to date, and approximately USD 1.4 billion in co-financing for World Bank Group projects alone. Key partners include the Asian Infrastructure Investment Bank, the European Commission, the European Investment Bank, the Islamic Development Bank, Italy, the OPEC Fund for International Development, and the Japan International Cooperation Agency.

The slower pace of electrification from 2020 to 2024 means that speedy action is needed both within and beyond Mission 300 to leverage the private sector and mobilize public and private financing. Scarce public funds should be used as efficiently as possible through least-cost solutions that supply electricity in line with demand, affordability, and a fiscally sustainable level of subsidy. Quick private sector delivery at scale with private co-investment is critical, as governments seek to maximize the social, economic, and fiscal impact of access initiatives.

Appendix 1 • Helping households move to a higher level of service

The Multi-Tier Framework (MTF) captures household electricity access across seven tiers—capacity, availability, reliability, quality, affordability, formality, and health and safety—using six tiers (figure A1.1). Solar home systems typically provide partial Tier 1, Tier 1, or Tier 2 access, whereas mini-grids and grid electricity generally offer Tiers 3, 4, or 5 levels of service. The MTF covers households, but not productive uses, or public institutions.

Figure A1.1 • The Multi-Tier Framework for electricity supply

ATTRIBUTES	INDICATOR	TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
Peak capacity	Power capacity ratings (in W or daily Wh)		Min 3 W	Min 50 W	Min 200 W	Min 800 W	Min 2 kW
			Min 12 Wh	Min 200 Wh	Min 1.0 kWh	Min 3.4 kWh	Min 8.2 kWh
Availability (duration)	OR Services		Lighting of 1,000 lmhr/day	Electrical lighting, air circulation, television, and phone charging are possible			
Availability (duration)	Hours per day		Min 4 hrs	Min 4 hrs	Min 8 hrs	Min 16 hrs	Min 23 hrs
	Hours per evening		Min 1 hr	Min 2 hrs	Min 3 hrs	Min 4 hrs	Min 4 hrs
Reliability						Max 14 disruptions per week	Max 3 disruptions per week of total duration < 2 hrs
Quality						Voltage problems do not affect the use of desired appliances	
Affordability					Cost of a standard consumption package of 365 kWh/year < 5% of household income		
Legality						Bill is paid to the utility, prepaid card seller, or authorized representative	
Health & safety						Absence of past accidents and perception of high risk in the future	

Source: Bhatia and Angelou 2015.

Consumption levels are typically low among the remaining population lacking access, whether they are connected using grid or DRE solutions, especially in rural Sub-Saharan Africa. When Ethiopia, Kenya, and other countries extended the grid to low-income households, low consumption strained utilities, which could not recover their costs (World Bank 2017). AC mini grids make Tier 5 power available 24/7. In practice, however, most household mini grid connections are Tier 3–4 as consumption is constrained by affordability.

With affordability a major constraint, households at all tiers struggle to access a higher level of service. But household access to a higher tier of service does not automatically translate into higher incomes, broader economic impact, and job creation. Productive uses that raise incomes, creates jobs, and drives economic growth takes place mainly in businesses and on farms, rather than in family homes. Evidence from mini grid and grid-connected settings suggests it can take five to ten years or longer for productive demand to emerge organically.

Productive uses of electricity are essential for boosting incomes in a range of settings: grid, mini grid, and off-grid. Through them, households can afford to consume more electricity. But they require distinct interventions that are tailored to the markets. After appliance financing was introduced, consumption jumped by more than 50 percent in mini grid settings. Finance, not just electricity supply, drives demand. In addition to subsidies and affordable financing, businesses need advice, B2B matchmaking, capacity building, and market access. These kinds of support help them convert the acquisition of assets for productive uses into more productivity, job creation, and economic growth. This support is often best delivered through cross-sector collaboration, for example, between energy and agriculture sector programs.

Technical constraints are also a factor. For example, quality-verified off-grid solar products tend not to be modular or interoperable, which makes it harder for off-grid products to access a larger system, especially during a PAYG repayment period. Least-cost Tier 3+ connections are generally delivered by grids or mini grids, which tend to target areas with higher population density. They are therefore less feasible in remote, rural areas.