

SUSTAINABLE ENERGY FOR ALL

PROGRESS TOWARD SUSTAINABLE ENERGY

GLOBAL TRACKING FRAMEWORK 2015 KEY FINDINGS

Key findings

The first SE4All *Global Tracking Framework (GTF 2013)* established a consensus-based methodology and identified concrete indicators for tracking global progress toward the three SE4All objectives. One is to ensure universal access to modern energy services. The second is to double the global rate of improvement in energy efficiency. And the third is to double the share of renewable energy in the global energy mix. *GTF 2013* also presented a data platform drawing on national data records for more than 180 countries, which together account for more than 95 percent of the global population. And it documented the historical evolution of selected indicators over 1990–2010, establishing a baseline for charting progress.

GTF 2015 presents an update on how fast the world has been moving toward the goal of sustainable energy for all.

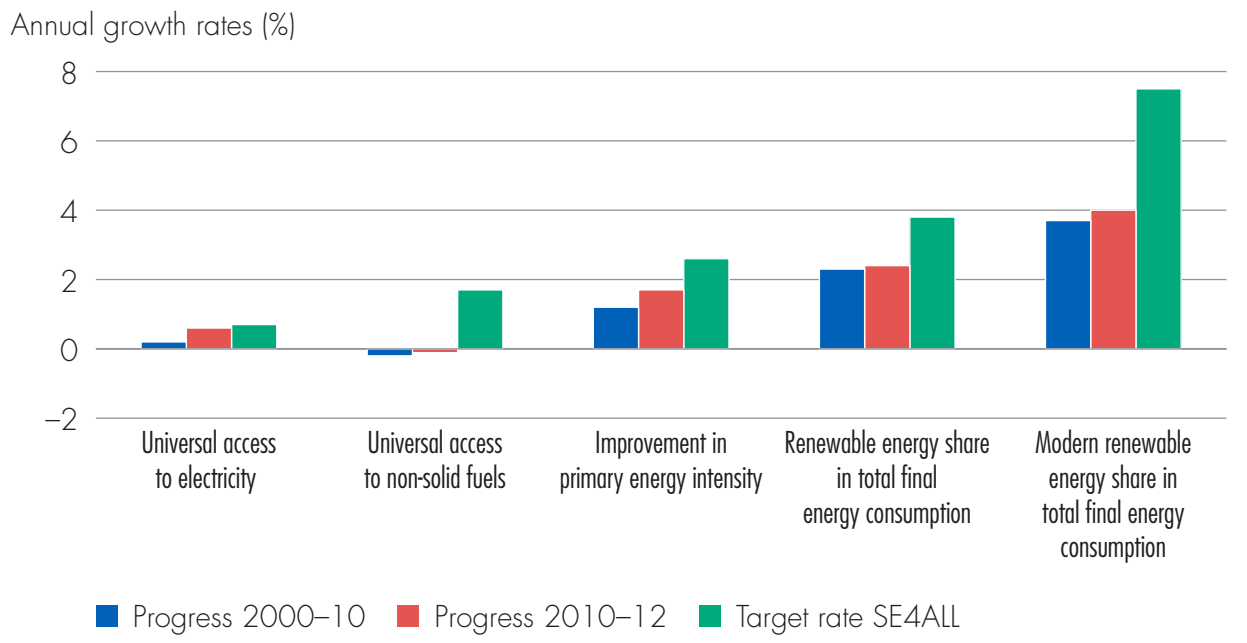
This second edition of the SE4All *Global Tracking Framework (GTF 2015)* provides an update on how fast the world has been moving toward the three objectives. Based on the latest data, it reports progress on selected indicators over the two-year tracking period 2010–12 and determines whether movement has been fast enough to meet the 2030 goals.

Overall progress over the tracking period falls substantially short of what is required to attain the SE4All objectives by 2030.

Across all dimensions of sustainable energy for all—whether access, efficiency, or renewables—the rate of progress during the 2010–12 tracking period falls substantially short of the rate that would be needed to ensure that the three objectives are met by 2030 (figure 1). Nevertheless, the 2010–12 tracking period does present some encouraging acceleration in progress relative to what was observed in prior decades.

Efforts must be redoubled to get back on track; particularly in countries with large access deficits and high energy consumption whose rate of progress carries substantial weight in the global aggregate.

Figure 1. **How far is the rate of progress from that required to attain SE4All?**



Source: World Bank Global Electrification database 2015; IEA, UN, and WDI data (2014); analysis by the International Renewable Energy Agency based on IRENA (2014).

Note: Figure shows average annual growth rates for access to electricity and non-solid fuels, and compound annual growth rates for renewable energy and energy efficiency.



Energy has a key enabling role in food security and nutrition.

Vanessa Lopes Janik/© World Bank

There have been notable advances in electrification—driven primarily by India—but progress in Africa remains far too slow.

The annual growth in access to electricity during the tracking period reached 0.6 percent, approaching the target growth rate of 0.7 percent required to reach universal access by 2030, and certainly much higher than the growth of 0.2 percent registered over 2000–2010 (see figure 1).

As a result, the global electrification rate rose from 83 percent in 2010 to 85 percent in 2012. This means that an additional 222 million people—mainly in urban areas—gained first time access to electricity; more people than the population of Brazil, and well ahead of the 138 million population increase that took place over the same period. Overall, the global electricity deficit declined from 1.2 billion to 1.1 billion. Global progress was driven by significant advances in India, where 55 million people gained access over 2010–12.

In order to advance towards universal access to electricity, countries need to expand electrification more rapidly than demographic growth. Out of the 20 countries with the largest electrification deficit, only 8 succeeded in doing so (figure 2a). For Sub-Saharan Africa as a whole—the region with by far the highest access deficit—electrification only just managed to stay abreast of population growth; although even this represents progress compared to earlier decades.

By contrast, access to clean cooking continues to fall behind population leading to negligible progress overall.

The annual growth in access to non-solid fuels during the tracking period was negative 0.1 percent, comparable to what was registered during the 2000–2010 period, and woefully short of the 1.7 percent target growth rate required to reach universal access by 2030 (see figure 1).

As a result, primary access to non-solid fuels barely rose from 58 percent in 2010 to 59 percent in 2012. This means that only 125 million additional people—mainly in urban areas—gained first time access to non-solid fuels; no more than the population of Mexico and falling behind the 138 million population increase that took place over the same period. Overall, the global access deficit barely moved from 2.9 billion; concentrated in rural areas of Africa and Asia. Out of the 20 countries with the largest access deficit, only 8 succeeded in expanding access to non-solid fuels more rapidly than population growth (figure 2b).

Traditional methods for measuring energy access significantly underestimate the scale of the challenge.

Traditional measures of energy access reported above, which focus on grid connections, are not able to capture broader deficiencies in the affordability, reliability and quality of service. This report presents an emerging multi-tier approach to access measurement that is able to capture these broader dimensions.

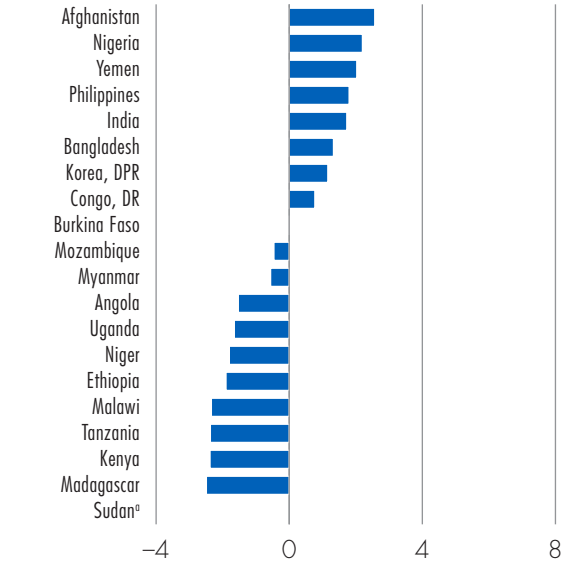
New evidence from the city of Kinshasa in the Democratic Republic of the Congo shows that—whereas traditional access indicators report 90 percent access to electricity due to widespread grid connections in the city—the multi-tier approach rates access at only 30 over 100 due to extensive limitations in hours of service, unscheduled blackouts and voltage fluctuations. The reality is that the streets of Kinshasa are dark on most nights and that few households can actually use the electrical appliances they own.

Progress in reducing global primary energy intensity over the tracking period was substantial, though still only two-thirds of the pace needed to reach the SE4All objective.

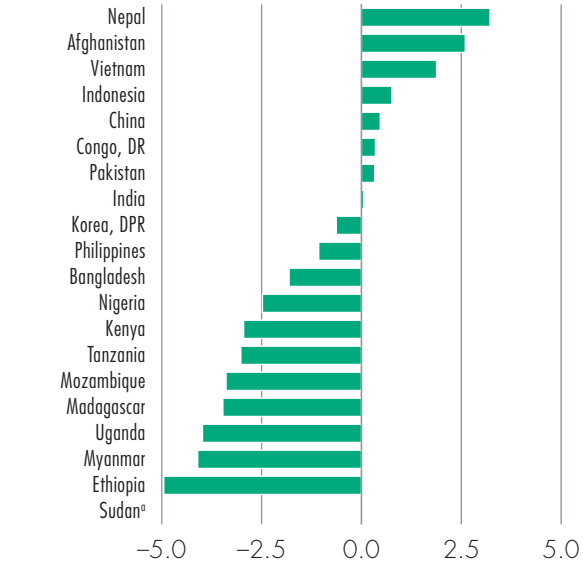
Primary energy intensity—the global proxy for energy efficiency, and influenced as well by changes in the

Figure 2. **High-impact countries, progress toward targets, 2010–12**

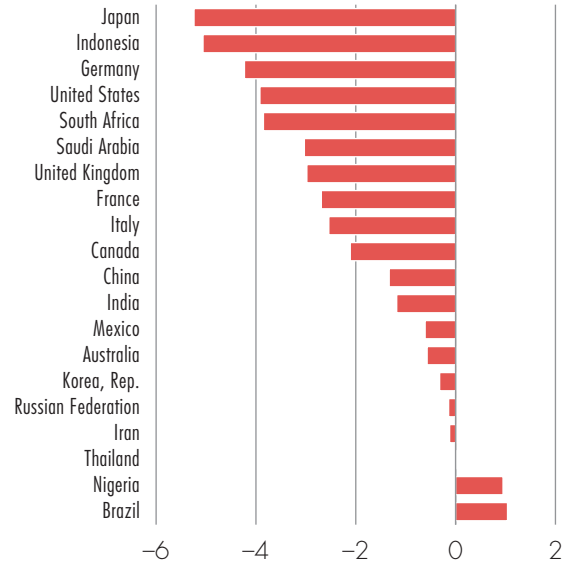
a. Access to electricity, average annual growth rate (%)



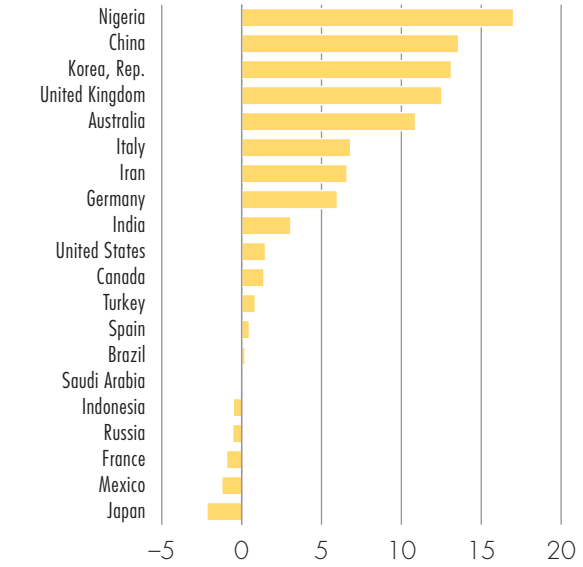
b. Access to non-solid fuels, average annual growth rate (%)



c. Energy intensity, compound annual growth rate (%)



d. Modern renewable energy, compound annual growth rate (%)



Source: IEA and UN data.

Note: Growth rate calculation involves two parameters—population with access and total population of the country.

a. Data from Sudan show a very high growth rate in access. This is not shown in the figure as it is due to a lower population in 2012 compared with 2010, resulting from the split with South Sudan.

structure of the world economy—improved by more than 1.7 percent a year over the tracking period, considerably more than in the base period 1990–2010. The incremental change in energy intensity from 2010 to 2012 alone avoided primary energy use of 20 exajoules (EJ) in 2012, or more energy than Japan used that year. Still, the rate of improvement is nearly a full percentage point slower than the SE4All objective of an average annual 2.6 percent improvement between 2010 and 2030 (see figure 1).

Eight of the top 20 energy consumers—collectively responsible for nearly three-quarters of global energy use in 2012—had intensity improvements exceeding the 2.6 percent a year objective (figure 2c). These were mainly high-income countries recovering from recession, including Japan, Germany, the United States, France, Italy, and Canada, demonstrating that mature economies can achieve significant economic growth decoupled from rising energy consumption. But several large emerging countries also had high rates of improvement, notably Indonesia, South Africa, and (in a reversal from previous performance) Saudi Arabia. Russia, the most energy-intensive of the group due in part to its large fossil fuel production, showed only a marginal decline in energy intensity. Among the top energy consumers, only Brazil and Nigeria experienced rising intensity in the tracking period.

Of end-use sectors, industry was the largest contributor to reduced energy intensity between 2000 and 2012, both as efficiency increased and as the share of output from energy-intensive products declined. Transport followed closely in contribution to lower intensity, since fuel economy standards have had a major impact even as motor vehicle use has surged. Energy supply sectors have seen some improvement in efficiency, as with the declining midstream losses in the natural gas industry. Electricity transmission and distribution losses are falling, and many countries are using more-efficient gas-fired plants. But continued expansion of coal-fired capacity has led the average thermal efficiency of fossil power generation to stagnate.

The growth of renewable energy final consumption continued to accelerate in recent years, but to achieve the SE4All objective, the rate of progress will need to increase over 50 percent.

The share of renewable energy in total final energy consumption (TFEC) grew from 17.8 percent in 2010 to 18.1 percent in 2010–12. This represents a net increment in annual RE consumption of 2.9 exajoules (EJ), equivalent to energy consumption of Pakistan or Thailand in 2012. The increment resulted from both an acceleration in the growth of renewable energy and a deceleration in the growth of TFEC. Global renewable energy consumption grew at a compound annual growth rate (CAGR) of 2.4 percent over the tracking period, while global final energy consumption grew at only 1.5 percent. But the annual growth to attain the SE4All objective in renewable energy—including traditional uses of solid biofuels—is estimated at 3.8 percent (see figure 1).

The consumption of modern renewables (which exclude solid biofuels used for traditional purposes) grew even more rapidly, at a compound annual growth rate of 4 percent. Still, an annual growth rate of 7.5% would be required to attain the SE4All objective with modern renewables.

Five out of the top 20 largest energy consumers succeeded in increasing their annual growth in the consumption of modern renewables above 7.5% during the tracking period 2010–12 (figure 2d). These countries included Nigeria, China, Korea, United Kingdom and Australia. In large middle income countries, such as China and Nigeria, increases in the share of modern renewables (such as hydro, wind and solar) were offset by reductions in the share of traditional uses of solid biofuels. Thanks largely to China, East Asia increased consumption of modern renewables more than other regions.



Modern energy provision is a critical enabler of universal health coverage.

Nick van Praag/© World Bank

The uptake of renewable energy was stronger in electricity generation than in heat production or transport during the tracking period. The share of renewable energy consumption in the electricity sector rose by 1.3 percent over the tracking period, compared with much smaller increases in heating at 0.3 percent and transport at 0.1 percent. In both tracking years, renewable energy power generation capacity additions accounted for half of all capacity additions.

Declining technology costs have certainly helped foster growth of renewable consumption. In particular, solar PV (photovoltaic) saw rapidly declining costs, with PV module prices halving between 2010 and 2012. Increased use of solar energy accounts for a fifth of the increase of modern renewable energy consumption over the tracking period, behind wind (a fourth) and hydro (a third).

Today's investment flows of $400 billion a year would need to triple to achieve the necessary pace of progress.

A partial explanation for slow progress on sustainable energy objectives is the shortfall in investment. Global investment in areas covered by the three objectives was estimated at around $400 billion in 2010, while requirements are in the range of $1.0–1.2 trillion annually, requiring a tripling of current flows (table 1).



Energy and water resources are inextricably tied together.

Grant County Public Utility District/© NREL 12487

The bulk of these resources are needed for energy efficiency and renewable energy—about $500 billion per year for each—although the shortfall in energy efficiency investment is substantially larger than the shortfall of investment

Table 1. **Annual global investment—actual and required ($ billion)**

Annual investment	**Universal access to modern energy services**	**Universal access to modern energy services**	**Doubling the global rate of improvement in energy efficiency**	**Doubling the share of renewable energy in the global mix[a]**	
Source	Electrification	Cooking	Energy efficiency	Renewable energy	Total
Actual for 2012[b]	9	0.1	130	258	397
Required to 2030[c]	45	4.4	560	442–650	1,051–1259
Gap	36	4.3	430	184–392	654–862

a. This is the range for significantly increasing the share of renewable energy in total final energy consumption.

b. The total assumes 2010 investment in access figures for 2012.

c. Estimates are derived from various sources: Energy access, electrification: *SE4All Finance Committee Report,* World Bank (2014); Energy access, cooking: Energy for All Scenario, *WEO* (IEA, 2012); Energy efficiency: 450 scenario, *WEO* (IEA, 2014); Renewable energy lower bound: *WEO* 450 (IEA, 2014), corresponds to a 29.4 percent renewable energy share in total final energy consumption by 2030; Renewable energy upper bound: REmap 2030 (IRENA, 2014), corresponds to a 36 percent renewable energy share in total final energy consumption by 2030.

Source: Prepared by authors.

in renewable energy. Additional investments for energy efficiency are particularly needed in the transport sector where a high volume of new vehicles is expected to be sold. For renewables, increased adoption of renewable energy targets signals strong interest in scaling up renewable energy, yet new policies in place will need to be combined with emerging financing mechanisms to lower the spectrum and size of financial risks.

In 2013–14, the SE4All Advisory Board convened a Finance Committee that brought together private commercial and development banks to further identify financing gaps and to propose concrete approaches for attracting more capital. The Committee identified four broad investment themes that could help mobilize $120 billion in incremental annual investment by 2020: green-bond market development, structures that use development finance institutions' de-risking instruments to mobilize private capital, insurance products that focus on removing specific risks, and aggregation structures that focus on bundling and pooling approaches for small-scale opportunities.[1]

Also imperative is transferring state-of-the-art knowledge and technologies to countries with less capacity to adopt sustainable energy.

Countries will need to access cutting-edge knowledge and technologies relevant to sustainable energy if they are to contribute to the global achievement of the three SE4All objectives. Trade data for a basket of clean technology products demonstrates that about three-quarters of low- and lower-middle-income countries are participating in trade in clean energy products, particularly solar PV and energy efficient lamps. Trade volumes have grown steeply over the last decade, even if they remain small in absolute terms. Thanks to China's growing role in the solar PV industry, developing countries became net exporters of clean technology products in 2007.



Access to affordable energy services can reduce both time and effort spent in productive labor. John Isaac/© World Bank

Nevertheless, access to clean technologies remains constrained by import taxes and other non-tariff barriers. For instance, 50–70% of low and lower middle income countries apply import taxes to small hydropower turbines, as against 20% of high income countries. Developing countries are also constrained by the technical and commercial capacity of institutions and companies, as well as by a shortage of relevant skills among workers.

Understanding the interactions between energy and such priority areas of development as water, food, health, and gender is fundamental to meeting the objectives of the SE4All.

Analysis of the nexus between energy systems and other key areas of development—water, food, health, and gender—suggests that numerous opportunities can arise from wider cross-sector perspectives and more holistic decision-making in energy.

For example, energy efficiency typically has positive and synergistic feedbacks to other resource systems. Efficient use of energy reduces the need for power generation and thus the need for cooling water. Water efficiency is also energy efficiency: using water more efficiently can cut electricity consumption, as lower water demand reduces the need for pumping and treating water. Exploring the co-benefits of water saving tied to energy efficiency, as well as the potential to save energy through water efficiency, can thus help secure additional benefits.

Renewable energy can be either water-efficient or water-intensive. PV panels and wind turbines require little water and are generally much more water-efficient than conventional sources of electricity. Hydropower depends fundamentally on water, and lower rainfall (perhaps due to greater variability and to climate change) could reduce electricity production from that source.

Access to energy and to other energy-intensive products, services, and facilities can increase farmer incomes and boost agricultural productivity. Agricultural machinery and inputs such as fertilizers and pesticides can raise yields for farmers. Better access to roads and freight services as well as refrigeration and processing facilities can improve

market access while reducing the spoilage of food, thus increasing the productivity of land by reducing field-to-consumer losses and improving farmers' incomes.

Health, too, gains from sustainable energy services in community health clinics, through cost-effective and life-saving interventions. Clinics need reliable access to energy for running medical equipment, for storing supplies such as blood, vaccines, and antiretroviral drugs, for staying open after dark, and for helping retain qualified staff. And street lighting may increase women's and girls' mobility before sunrise and after dark and by improving security reduce the risk of gender-based violence.[2,3]

All these areas have numerous interwoven concerns, including access to services, long-term maintenance and sustainability, environmental impacts, and price volatility. These issues manifest themselves in different ways in each, but the impacts are often closely related. Identifying these linkages early can help in targeting synergies and preempting subsequent potential tensions.

Meeting the SE4All objectives will require the implementation of a transformational strategies and policies.

Attaining the SE4All objectives will require significantly reducing fossil-fuel based activities, supporting technology innovation, introducing new finance and business models, and implementing transformational strategies and policies. This will be critical in high-impact countries—those with large access deficits and high energy consumption—but also in countries that wish to move in the direction of sustainable energy.

Notes

1. SE4All Finance Committee Report 2014.
2. Cecelski and others 2005.
3. Doleac and Sanders 2012.

SUSTAINABLE ENERGY FOR ALL

The SE4All *Global Tracking Framework* full report, summary report, key findings, PowerPoint presentation, and associated datasets can be downloaded from the following website:

http://trackingenergy4all.worldbank.org
#endenergypoverty

The Sustainable Energy for All indicators can also be found at World Development Indicators:
http://data.worldbank.org/wdi

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