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Affordable & Clean Energy for All: The Energy Mix under SDG7



Sustainability Industry Report

The Al-Attiyah Foundation



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Sustainable Development Goal 7 (SDG7), which is among the 17 UN SDGs established in 2015, aims to “ensure access to affordable, reliable, sustainable and modern energy for all by 2030.” Despite reasonable progress between 2015 and 2020, advances seem to have stalled, creating concerns that success by 2030 is out of reach. How will SDG7 impact the energy mix of the future? What sources of energy will ensure sustainability and availability of supply? What is the progress so far on energy access, energy efficiency and renewable energy? How have advances on SDG7 been affected by the Covid-19 pandemic and Russia's war against Ukraine? Where do fossil fuels stand with regards to SDG7?

SUSTAINABILITY REPORT

This research paper is part of a 12-month series published by the Al-Attiyah Foundation every year. Each in-depth research paper focuses on a current sustainability topic that is of interest to the Foundation's members and partners. The 12 technical papers are distributed to members, partners, and universities, as well as made available on the Foundation's website.



- Sustainable Development Goal 7 (SDG7) enjoys a unique position amongst the 17 goals developed by the United Nations General Assembly (UN-GA) in 2015. It is one of the few goals to share interlinkages with almost all other SDGs. This is because energy underpins the successful realisation of wellbeing, economic development, environmental and climate protection, and poverty alleviation.
- Progress on SDG7 has increased significantly over the last half-decade, but remains patchy across its sub-goals (also known as indicators), and is still not nearly enough to be on track to be fully realised by 2030.
- Between 2010 and 2019, 130 million people gained access to electricity annually, but this figure decreased to 109 million between 2018 and 2020, mainly due to logistical complexities as a result of the Covid-19 pandemic that increased the challenges of reaching poor, remote, and underserved populations.
- Intensified policy support and cost reductions will continue to push the share of modern renewables in global final energy, but a higher share of renewables alone will not be sufficient to realise the overall aim of SDG7, particularly if energy consumption continues to overtake growth in renewables.
- International public financial flows need to be scaled up dramatically to ensure the 2030 Agenda's aim of "leaving no one

behind", as well as successfully meet SDG7's targets. Public finance is critical since it can encourage investments in developing countries where real or perceived risks contribute to a high cost of capital or prevent projects from seeing the light of day.

- In currently underserved parts of the world, and/or in LDCs, landlocked countries, energy-vulnerable countries, or countries that do not yet have an established base of clean energy technologies, sustainable, modern energy can take the form of fossil fuels and traditional hydrocarbons, making their energy mix much different from those that are advanced in the deployment of clean energies.





SDG7 is one of the 17 Sustainable Development Goals (SDGs) established by the United Nations General Assembly in 2015 as part of the 2030 Agenda for Sustainable Development which provides a shared blueprint for global peace and prosperityⁱ. SDG7 is the seventh goal of the 2030 Agenda, and aims to “ensure access to affordable, reliable, sustainable, and modern energy for all.”ⁱⁱ

SDG7 enjoys a unique position amongst the 17 goals. It is one of the few goals to share interlinkages with almost all other SDGs (Figure 2). This is because energy underpins the successful realisation of wellbeing, economic development, environmental and climate protection, and poverty alleviation at a regional and global level and across all sectors.

SDG7 has 3 “outcome-oriented” and 2 “process-oriented” targets to be achieved by 2030, making a total of 5 targets (Table 1).

Progress on SDG7 has increased significantly over the last half-decade but remains patchy across its sub-goals (also known as indicators), and is still not nearly enough to be on track to be fully realised by 2030. For example, 26 million people gained access to electricity (indicator 7.1.1.) in 2020, reducing the total number of people worldwide without access to 733 million. This number needs to reach zero by 2030, which means increasing the number of new electricity connections to 100 million a year. At current rates of progress, the world will reach only 92% electrification by 2030^{iv}, equating to 670 million still without access to electricity.

Similarly, the number of people with access to clean cooking (indicator 7.1.2) increased by a remarkable 200 million in 2020, despite increased complexities of reaching more remote and poorer underserved populations as a result of the pandemic. The total number of people

worldwide without access to clean cooking now stands at 2.4 billion, down from 2.6 billion in 2019. However, this progress masks the growth of access deficit in certain geographies, such as Sub-Saharan Africa, where the deficit has nearly doubled since 1990, reaching a total of 923 million people in 2020. Without increased effort to narrow this gap, 2.1 billion people will still lack access to clean cooking in 2030^v.

Advances on SDG7 in the last two years have mainly been impeded due to the Covid-19 pandemic and the energy crisis as a result of Russia's invasion of Ukraine, particularly in energy vulnerable countries and those that were already lagging. Some targets of SDG7 have received more attention than others as a result of these disruptions, particularly the

increased share of renewable energy sources in the energy mix (indicator 7.2.1).

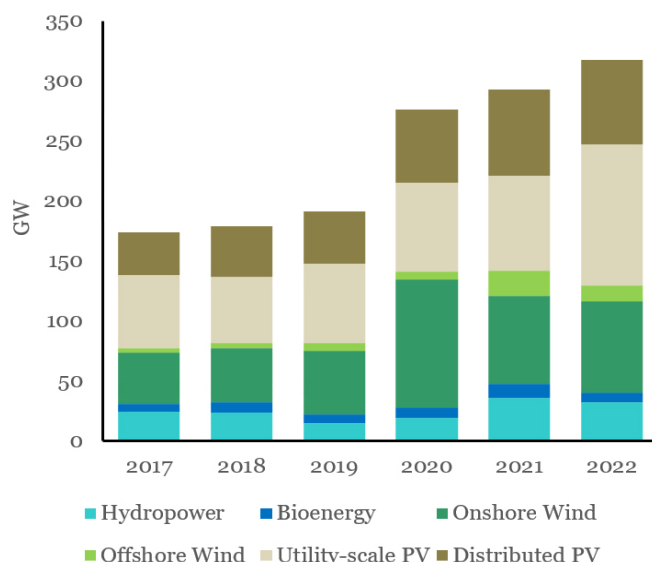
For example, Europe has increased its renewables target in total energy to 45% by 2030 as a result of the war in Ukraine from its earlier target of 40%^{vi}. More worryingly, it has flicked the switch on coal generation to supply affordable electricity to consumers due to the skyrocketing prices of natural gas and sanctions on Russian energy supplies. Investment in the coal supply chain rose 10% in 2021, and is forecast to increase a similar amount in 2022.

Overall renewable energy consumption also remains strong, with new capacity additions of 295 GW^{vii} in 2021 and forecast to rise to a record 320 GW in 2022 due to stronger-than-expected growth in China and Europe. However, the

Table 1 SDG7 targets / goals and sub-targets / sub-goalsⁱⁱⁱ

Outcome Targets	Sub-targets	Process Targets	Sub-targets
7.1 Ensure universal access to affordable, reliable, and modern energy services	7.1.1 Access to electricity	7.A Enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology	7.A.1 International financial flows to developing countries in support of clean energy R&D and renewable energy
	7.1.2 Clean fuels and technology for cooking		
7.2 Increase substantially the share of renewable energy in the global energy mix	7.2.1 Renewable energy share in total final energy consumption (TFEC)	7.B Expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries (LDCs), small island developing states (SIDs), and land-locked developing countries, in accordance with their respective programmes of support	
7.3 Double the global rate of improvement in energy efficiency	7.3.1 Energy intensity measured as a ratio of primary energy supply per unit of GDP		

Figure 1 Net renewable capacity additions by technology, 2017-2022^{viii}



realisation of these projects is subject to rising commodity, energy, and shipping prices, as well as restrictive trade measures that have increased the cost of producing and transporting solar PV modules, wind turbines, and biofuels worldwide. The cost of solar panels and wind turbines rose between 10-20% since 2020.

The annual average growth rate in clean energy investment in the five years following the Paris Agreement (2015) was just over 2%, according to the International Energy Agency. The rate accelerated to 12% per year after 2020, much faster but still short of required rates.

International public finance flows to developing countries in support of clean energy have also decreased. Latest available data from 2019 indicates a decline of 23% from 2018 levels to US\$ 10.2 billion only, and more than a 50% drop from the peak of US\$ 24.7 billion in 2017.

This figure likely dropped further in 2020, with the pandemic reinforcing nation-first mentalities, inequalities between developed and developing countries, and a weakening multilateral system.

Such developments risk undoing years of work undertaken to pivot the global economy away from traditional, unsustainable forms of energy, while also reducing focus on other sub-goals, such as clean fuels for cooking and reduced energy intensity, which are particularly relevant to developing countries and least developed countries (LDCs).

According to new estimates by the United Nations Conference on Trade and Development (UNCTAD), the current annual gap in financing needed to achieve the SDGs now stands at US\$ 3.6 trillion, more than US\$ 1 trillion wider than before the Covid-19 pandemic, and without factoring in the effects of the war in Ukraine^x.



Figure 2 Interlinkages between SDG 7 targets and other SDGs^{ix}Table 2 Primary indicators of global progress toward the SDG 7 targets C^{xi}

Indicator	2010 ^{xii}	Previous Year	Latest Year	Target (2030)
7.1.1 Access to electricity	1.2 billion people without access	759 million people without access	733 million people without access (2020)	100% global electricity access
7.1.2 Access to clean fuels and technology for cooking	3 billion people without access	2.6 billion people without access	2.4 billion people without access (2020)	100% global clean fuels and technology for cooking access
7.2.1 RE share in TFEC	16.1% share of TFEC from RE	17.3% share of TFEC from RE	17.7% share of TFEC from RE (2019)	32-38% share of modern renewables in TFEC to achieve net-zero energy emissions by 2050
7.3.1 Energy intensity	5.6 MJ/US\$ primary energy intensity	4.8 MJ/US\$ primary energy intensity	4.7 MJ/US\$ primary energy intensity (2019)	2.6% annual reduction in energy intensity
7.A.1 International financial flows to developing countries	11.2 US\$ billion	14 US\$ billion	10.9 US\$ billion (2019)	US\$ 1.3-1.4 trillion annual financial flows to meet SDG7

Target 7.1 / Indicator 7.1.1

Universal access to affordable, reliable and modern energy services / Access to electricity.

The rate of increase in access to electricity has slowed in recent years, although the number of people without access to electricity has reduced by 467 million since 2010 to 733 million in 2020, bringing the share of the world's population with access to electricity to 91%. Between 2010 and 2019, 130 million people gained access to electricity annually, but this figure decreased to 109 million between 2018 and 2020, mainly due to logistical complexities as a result of the Covid-19 pandemic that increased the challenges of reaching poor, remote, and underserved populations, particularly in Sub-Saharan Africa. The pandemic also reduced the affordability of electricity, with 90 million people connected in Africa and developing countries in Asia losing their ability to afford an extended bundle of energy services in 2020^{xiii}.

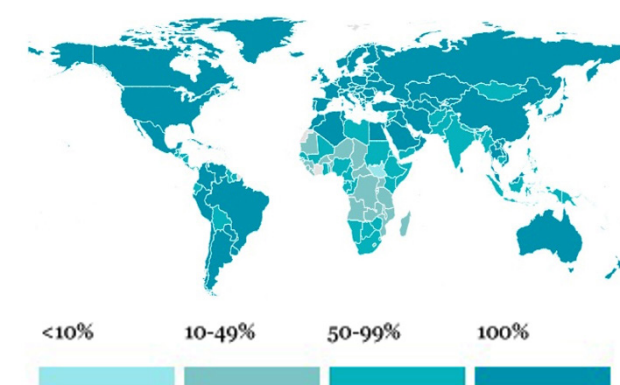
Sixteen of the 20 countries with the largest access deficits are in Africa, with the other 4 including Pakistan, India, Myanmar and the Democratic People's Republic of Korea. Together, these countries are home to 76% of the entire global population living without access to electricity, with 80% of these living in rural areas. Even areas that notionally have access to electricity may suffer from unreliability, lengthy blackouts, or inadequate levels of current to run many appliances.

High access deficits in rural areas also limits opportunities for their populations to access quality public services, such as healthcare, poverty alleviation, and improved livelihoods, having a direct impact on the realisation of other important SDGs, such as SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 3 (Good

Health and Well-being), SDG 6 (Clean Water and Sanitation), SDG 8 (Decent Work and Economic Growth), and SDG 10 (Reduced Inequalities).

LDCs significantly lag the rest of the world in access to electricity, with an average access rate of 55%, which is 36 percentage points lower compared with the global average of 91%. Fragile and conflict-affected countries are at most risk from the continuing socioeconomic impact of the Covid-19 pandemic, while climate-vulnerable countries and small island developing states (SIDs) are at risk from additional dynamics of climate change and weather events.

Figure 3 Global electricity access rate^{xiv}



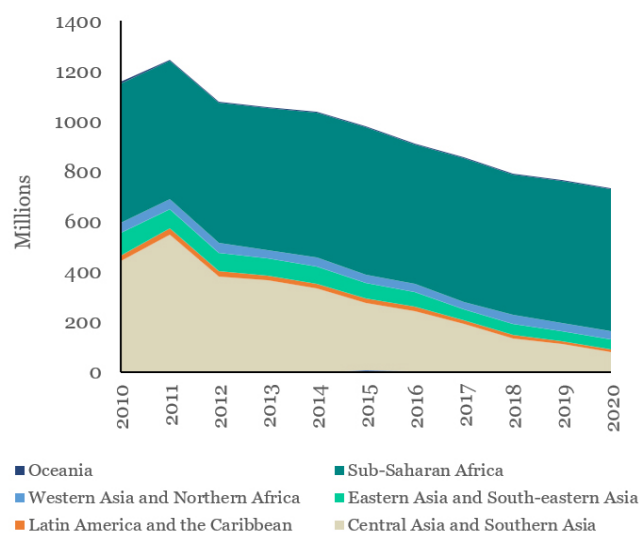
Successfully closing the access gap in these countries is a challenge. Access needs to increase by 0.9% annually to achieve universal access by then, which cannot be achieved at current growth rates of 0.5%.

Target 7.1 / Indicator 7.1.2

Universal access to affordable, reliable and modern energy services / Clean fuels and technology for cooking.

Focus on indicator 7.1.2 has historically lagged in comparison to the other SDG7 targets; nevertheless, it remains one of the most important in ensuring the realisation of other SDGs, such as SDG 2, SDG 3, SDG 6, SDG 8, SDG 13 (Climate Action), SDG 14 (Life below Water), and SDG 15 (Life on Land).

Figure 4 Population without access to electricity



Clean fuels, as defined by the WHO, are electricity, LPG, natural gas, biogas, and solar. In 2020, 69% of the global population had access to clean cooking fuels and technologies, but the remaining 31% (or 2.4 billion people), were still cooking with charcoal, coal, crop waste, dung, kerosene, and wood.

Recent rises in the prices of natural gas and LPG may reverse some of the progress in the actual use of clean fuels, with lower-income consumers turning back to cheaper but dirtier options. Consumers in Nigeria and India have reverted to charcoal and firewood since December 2021 due to soaring LPG prices^{xvi}, while countries like Rwanda, Brazil, Vietnam and Kenya have also witnessed fewer people using LPG for cooking in 2022.

Figure 5 Global clean cooking fuels access rate^{xvii}

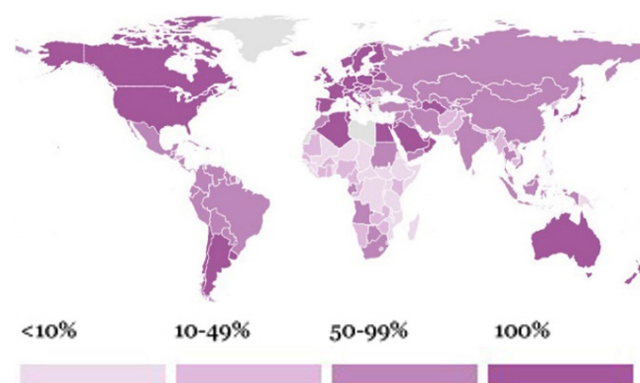


Figure 6 Population with access to clean fuels for cooking by region^{xviii}



Figure 6 shows the rate of access to clean fuels for cooking by region. Nineteen of the 20 countries with the lowest share of the population with access to clean cooking fuels are

LDCs in Africa. At present rates of progress, only 75% of the global population will have access to clean fuels by 2030, with the remainder mainly concentrated in Sub-Saharan African countries.

Access disparity between urban and rural populations is also stark, with 86% of the global urban population having access, compared with only 48% of the global rural population in 2020. Even though access disparity has been declining since 2010 (down by 38 percentage points in 2020 compared to 42 percentage points in 2019), it has ballooned in Sub-Saharan Africa, growing from 23 percentage points in 2010, to 29 percentage points in 2019^{xix}.

Gaseous fuels remain the fastest growing source of clean cooking globally, overtaking unprocessed biomass fuels as the dominant cooking fuel. Use of electricity has also risen yet only makes up 11% of the global population with access to clean cooking fuels. Increases in the use of clean fuels have been accompanied by steep declines in the use of coal, particularly in rural areas, where the use of coal has dropped to 1% in 2020, and kerosene in urban areas, where its use has dropped to 2% in the same year^{xx}.

Figure 7 Renewable energy consumption by end-use^{xxii}

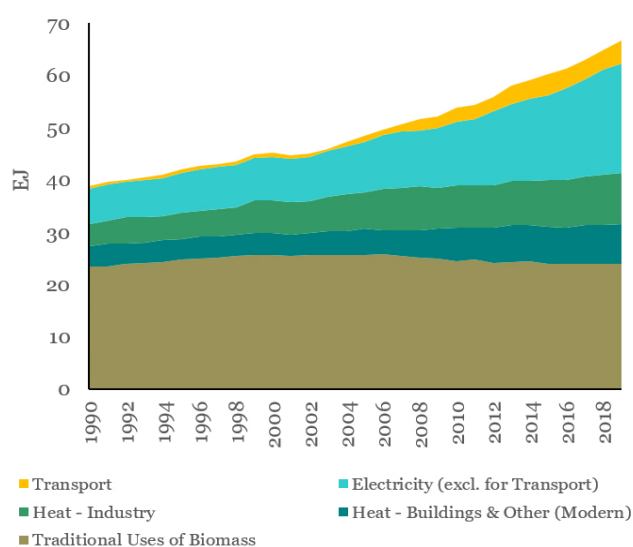


Figure 8 Renewable energy consumption and share in TFEC, by region, 2010 vs 2019^{xxiii}

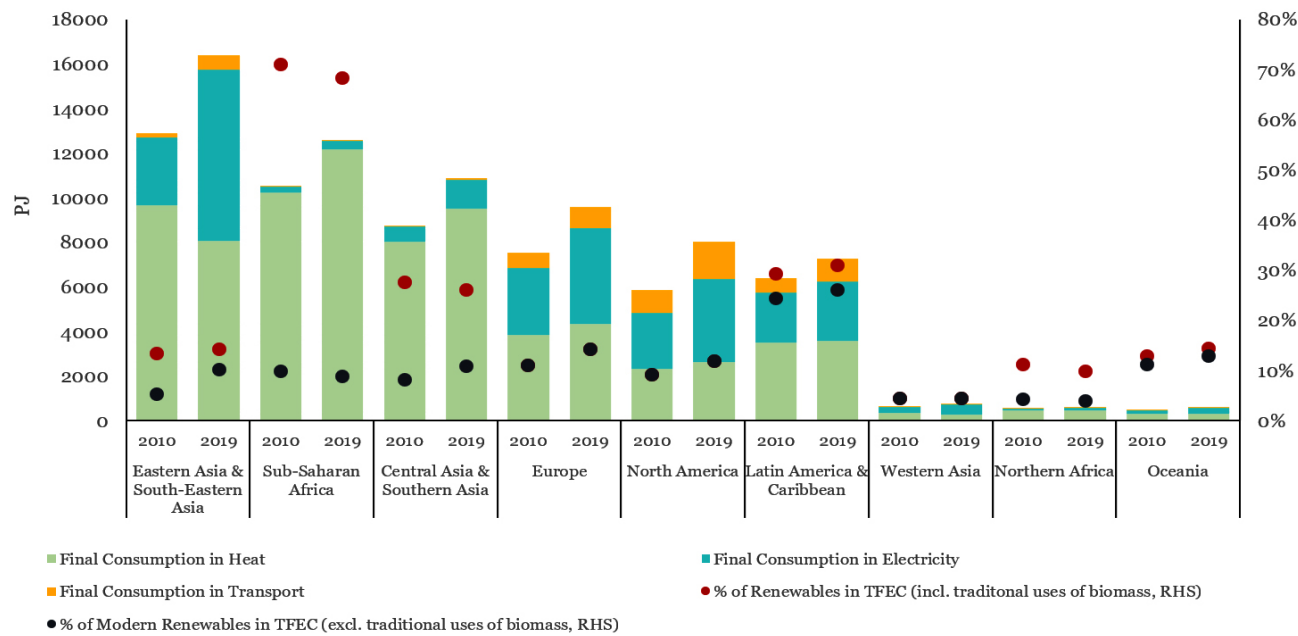
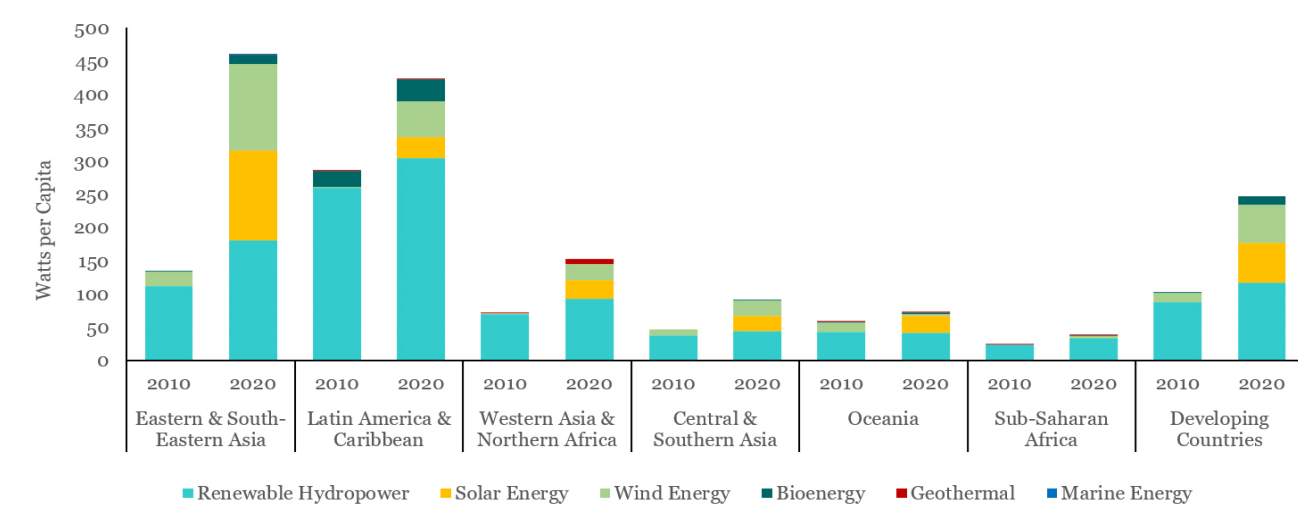


Figure 9 Growth in renewable electricity capacity per capita by technology across regions, 2010 vs 2020 supply, 2010–19^{xxiv}



Target 7.2 / Indicator 7.2.1

Increase substantially the share of renewable energy in the global energy mix / Renewable energy share in total final energy consumption.

Intensified policy support and cost reductions will continue to push the share of modern renewables in the global Total Final Energy Consumption (TFEC), but a higher share of

renewables alone will not be sufficient to realise the overall aim of SDG7, particularly if energy consumption continues to overtake growth in renewables, which has been the trend over the last 5 years.

Global renewables share in TFEC has increased by a mere 0.7 percentage points since 2016 (out of which a 0.4 percentage point growth

was registered in 2019 from 2018 levels) to a 17.7% share in 2019, while renewable energy consumption increased by 2.8% from the year before. This suboptimal performance underlines the importance of reducing energy consumption through energy efficiency and conservation if rapid progress is to be made toward Target 7.2.

The largest increase in the share of renewables in TFEC continues to be for electricity. The share of renewables in global heat consumption reached just 10.1% in 2019, an improvement of less than 2 percentage points in a decade. The transport sector meanwhile saw the total share of renewable energy increase by 0.2 percentage points to 3.6% in 2019, comprising mainly crop-based ethanol and biodiesel, which supplied 91% of the renewable energy used in transport that year. The expansion of renewable electricity and sales of electric vehicles also pushed up the use of renewable electricity in transport, which grew to 0.03 EJ in 2019, the second-largest increase in a single year after 2018^{xxi}.

Figure 8 highlights the regional disparities behind the global improvements in the share of renewable energy in TFEC. Sub-Saharan Africa has the largest share of renewables in its energy supply, but this is because traditional uses of biomass represent nearly 70% of the renewable total. Excluding traditional uses of biomass, Latin America and the Caribbean is the region with the largest share of modern renewables in TFEC, thanks to significant hydropower generation, the consumption of bioenergy in industrial processes, and the use of biofuels for transport.

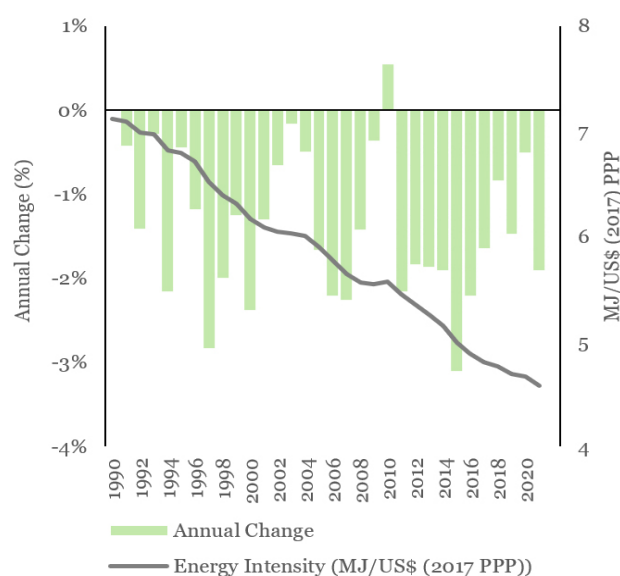
Other regions like Western Asia (Middle East) and Northern Africa have seen limited change in the share of modern renewables in their TFEC, although capacity has grown rapidly in countries such as Morocco, Egypt, Jordan, Saudi Arabia, the United Arab Emirates, and Oman. The use of modern renewables in electricity in both regions has grown by nearly 90% from 2010 levels of 336.2 PJ, and nine times in transport, to 18.3 PJ^{xxv}, although both remain two of the lowest globally.



Indicator 7.B.1 tracks progress in enhancing installed renewables-based generating capacity in developing countries, linking it closely to indicator 7.2.1. 2020 saw a rise in renewable capacity per capita of 11.6%, resulting in a record 246 watts per capita that year (Figure 9). However, the positive growth masks that countries most in need are still being left behind. In developing countries as a whole, capacity per capita has increased only by 9.5% annually over the last five years, with growth much slower in landlocked developing countries (2.4%), LDCs (5.2%), and SIDs (8.3%)

xxvi

Figure 10 Global primary energy intensity and its annual change^{xxvii}



Growth to 2030 could be further hindered with current rising commodity, energy, and shipping prices, in addition to logistical bottlenecks exacerbated by a rise in Covid-19 outbreaks in China, the key manufacturing country. This will result in increased costs for producing and transporting solar PV modules, wind turbines, and other renewable infrastructure, putting a question mark over future renewable energy projects.

Target 7.3 / Indicator 7.3.1

Double the global rate of improvement in energy efficiency | Energy intensity measured as a ratio of primary energy supply per unit of GDP.

Improvement in global energy intensity has slowed in recent years, mainly due to the completion of China's replacement programme of inefficient industrial facilities, and the pandemic-induced economic downturn that cut household and business spending on energy efficiency. Target 7.3 intends to double the global rate of energy intensity improvement by 2030.

Fact Box 1 Energy Intensity as defined by Target 7.3

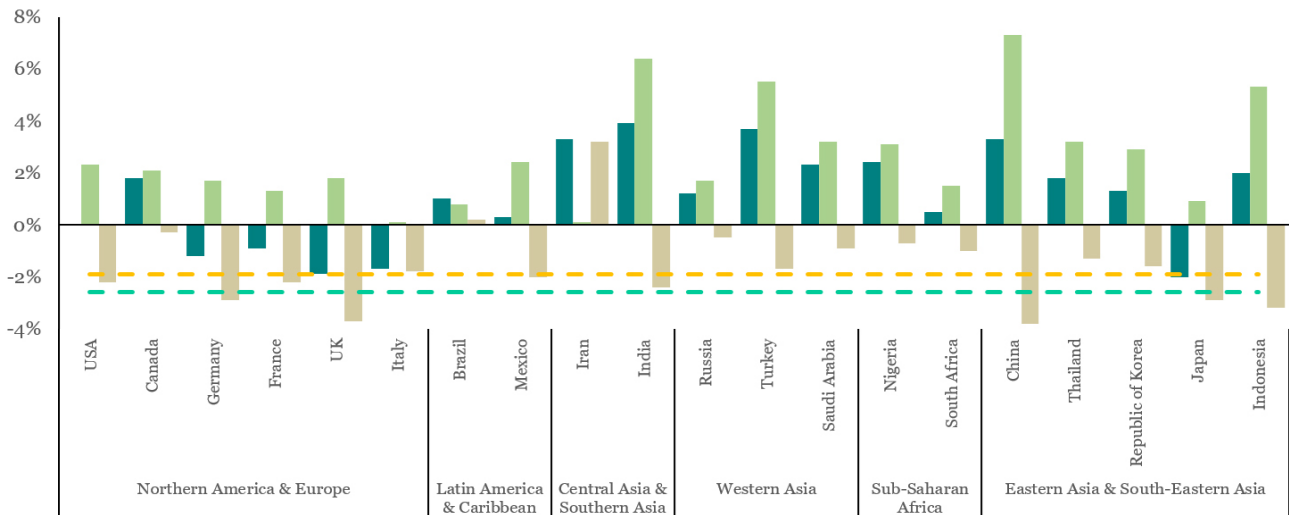
How does Target 7.3 define Energy Intensity?

Indicator 7.3.1 measures energy intensity as a ratio of primary energy supply per unit of GDP. However, the definition of energy intensity differs by sector.

Energy intensity definitions by sector:

- Freight transport: EI is defined as final energy use per metric ton-kilometre
- Passenger transport: EI is defined as final energy use per passenger-kilometre
- Residential: EI is defined as final energy use per square metre of floor area
- Services, industry, agriculture: EI is defined as final energy use per unit of gross value added (in 2017 US\$ PPP)

Figure 11 Growth rate of total energy supply, GDP, and primary energy intensity in the 20 countries with the largest total energy supply, 2010–19^{xxviii}



The UN recommends an annual improvement rate in energy intensity of 2.6% to achieve Target 7.3.

However, annual energy intensity improvements have only averaged 1.9% since 2010, with 2018 recorded as the year with the lowest, and 2019 as the second lowest improvement since the start of the decade. Estimates for 2020 and 2021 show that 2020 is likely to become the year with the lowest improvement rate, although 2021 will witness a rebound, due to the return of economic growth. Figure 10 highlights the global improvement in overall primary energy intensity but presents a distorted picture as it masks stark differences across different regions.

Eastern Asia and South-Eastern Asia was the only region to have overachieved on SDG 7.3 between 2010 and 2019, with energy intensity improving by 2.7% annually, mainly due to strong economic growth coupled with increasing progress on energy efficiency. Regions like Oceania, Northern America and Europe, and Central Asia and Southern Asia also recorded annual improvement rates above

the global average, at 2.2%, 2%, and 2% respectively, but others like Latin America and the Caribbean, Western Asia and North Africa, and Sub-Saharan Africa, recorded some of the lowest rates of improvement.



Latin America and the Caribbean recorded an annual improvement rate of only 0.6%, but the region also has one of the lowest energy intensities in the whole world. Sub-Saharan Africa, whose energy intensity level is almost double that of Latin America and the Caribbean, has an annual improvement rate of 1.3%.

Eastern Asia and South-Eastern Asia's above average performance was led by China, who continued to improve its primary energy intensity at the fastest rate (3.8%) between 2010 and 2019. Apart from China, Indonesia is the only other emerging economy with an average intensity rate exceeding the SDG 7.3 target. Among OECD countries, the UK had the highest annual average rate of improvement in energy intensity, at 3.7%, followed by Japan and Germany, thanks to decades of work on energy efficiency and a shift in their economies toward producing high-value, low-energy goods, and services.

On a sectoral basis, rate of improvement of energy intensity accelerated across all sectors between 2010 and 2019, except for residential buildings that still lack enforcement of building energy codes, especially in emerging economies, where a large share of new housing is built. The freight transport sector experienced the highest rate of improvement (-2.2%), followed by industry (-2%), passenger transport (-1.9%), services (-1.6%), agriculture (-1.3%), and lastly residential (-1.2%)^{xxix}.

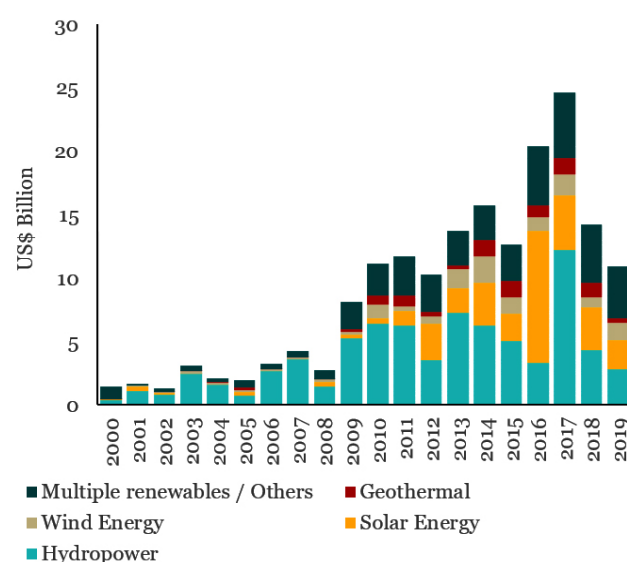
Target 7.A / Indicator 7.A.1

Enhance international cooperation to facilitate access to clean energy / International financial flows to developing countries in support of clean energy R&D and renewable energy.

The public sector remains a critical source of finance for developing countries and LDCs,

in contrast to developed markets, where the private sector typically finances most renewable energy investments. Current levels of international public financing available for energy projects in developing countries (including LDCs, climate-vulnerable countries, landlocked developing countries, conflict-prone countries, and SIDs) is still insufficient to mobilise the larger volumes of investment needed to reach Target 7.A.

Figure 12 Annual international public financial flows toward renewables in developing countries, by technology^{xxx}



According to the IEA, the overall financing requirement to meet SDG7 (across renewable energy, energy efficiency and universal access) is US\$ 1.3-1.4 trillion annually to 2030^{xxxi}. Latest available data of financing flows in support of clean energy show that only US\$ 514 billion has been mobilised annually since 2018^{xxxi}, of which only ~US\$ 14.2 billion^{xxxiii} was accounted as public finance to developing countries, and less than half of the peak of US\$ 24.7 billion in 2017. This figure fell to US\$ 10.9 billion in 2019, a 23% drop, and likely further in 2020, as the Covid-19 pandemic reinforced nation-first mentalities, inequalities between developed and developing countries, and a weakening multilateral system.

International public funding for energy between 2010 and 2019 highlights a 45% share to non-renewables, with non-renewables overtaking financing for renewables by hefty margins in 2010, 2011, 2013, 2014, and 2016. On average, non-renewables received US\$ 14.9 billion per year, slightly more than the US\$ 14.5 billion for renewables.

Some US\$ 19.7 billion of international public financing was directed to energy in 2019, out of which US\$ 8.8 billion was towards non-renewables. This figure has likely increased in 2021 and 2022 (although it might still be lower than for renewables) due to the effects of the ongoing energy crisis that has seen a return to coal-fired generation in Europe and elsewhere due to the skyrocketing prices of other energy sources.

Figure 13 Annual commitments to least-developed countries and non-LDCs in support of clean energy^{xxxiv}

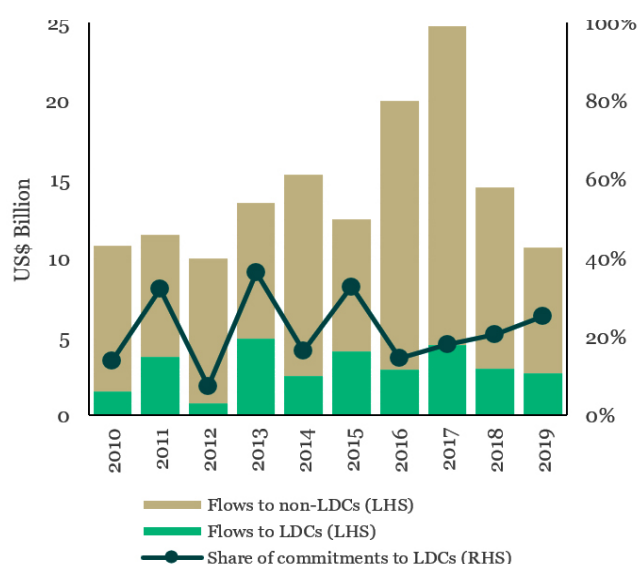


Figure 13 highlights the difference in flows directed to emerging markets in developing countries and those farthest behind (LDCs). The LDCs received 25.2% of commitments in 2019, an increase from the 21% in 2018, continuing an upward trend since 2016, but masking a 9%

decrease from US\$ 3 billion to US\$ 2.7 billion in absolute amounts^{xxxv}.

Public finance is critical since it can encourage investments in developing countries where real or perceived risks contribute to a high cost of financing or prevent projects from seeing the light of day. It can help leverage the necessary amounts of private capital, especially in the midst of the Covid-19 pandemic which has dramatically increased investors' risk perception and shifted public funding priorities in developing countries.



17 WHAT ARE THE GAPS AND HOW CAN THEY BE ADDRESSED?

Table 3 highlights the gap that SDG7 must meet across its indicators to be on track to achieve its 2030 targets.

Some of the necessary steps that can be taken for each SDG7 indicator to narrow the gap to 2030 quickly and effectively include:

Target 7.1 / Indicator 7.1.1

Universal access to affordable, reliable and modern energy services / Access to electricity.

- Further accelerating the development of decentralised energy systems for rural areas in developing countries, LDCs, SIDs, and others, including solar home systems and mini grids
- Directing a portion of economic relief funding (to assist with the impacts of the pandemic and energy crisis) to the off-grid renewables market, as it is typically more resilient to externalities and disruptions
- Tailoring business models to new disruptive technologies in electrification, including IoT and energy storage, to make power grids more accessible, transparent, and cost-effective
- Utilising innovative financing tools with targeted interventions for public financiers to extend solutions to high-risk and/or remote populations.
- Fully exploiting synergies with other related SDGs, including SDGs 1, 2, 3, 6, 8, and 10 for inclusive, sustainable, and resilient growth to "build back better", and keep SDG7 on track with net-zero ambitions

Target 7.1 / Indicator 7.1.2

Universal access to affordable, reliable and modern energy services / Clean fuels and technology for cooking.

- Sound government policy to encourage switching from polluting fuels to clean fuels, such as the Indonesia Kerosene to LPG Conversion Programme that saw 56 million households and micro-businesses switching from kerosene to LPG between 2007 and 2014
- Customised initiatives according to each developing countries', LDCs' and others' income levels through international cooperation with low-income countries with high access rates, such as the Maldives
- Developing expanded data metrics to include robust and detailed data on the types of cooking technology being utilised, to identify access, modification, or replacement solutions
- Redirecting subsidies towards cleaner fuels from polluting fuels, such as from charcoal to LPG, natural gas, or electricity
- Improving distribution infrastructure for LPG and natural gas in rural areas, which are characterised by high levels of firewood and agricultural residues
- Improving user-friendliness of cooking technologies and devices, and ease of access to repair services
- Disseminating cookstoves and other cooking technology that strictly meets the WHO's emission criteria.

Table 3 Gap between SDG7 indicators and their 2030 targetssupply, 2010–19

Indicator		Target (2030)	Current Progress	Gap	Action Needed
7.1.1	Electricity Access	100% global electricity access	91% of global population with access to electricity	670 million people without access to electricity in 2030 at current rates of progress	100 million new electricity connections per year to 2030
7.1.2	Clean fuels and technology for cooking	100% global clean fuels and technology for cooking access	69% of global population with access to clean fuels and technology for cooking	2.1 billion people without access to clean fuels and technology for cooking at current rates of progress	Upscaling supply and logistical support to provide clean fuels and technology for cooking to 2.1 billion
7.2.1	Renewable energy share in TFEC	32-38% share of modern renewables in TFEC to be able to achieve net-zero energy emissions by 2050	17.7% of TFEC from renewables	32-38% share of modern renewables in TFEC, and 60-65% of all generation from renewables	Stronger policies, effective mobilisation of private capital and strategic use of public financing, particularly in developing countries
7.3.1	Energy Intensity	2.6% annual reduction in energy intensity	1.9% annual reduction in energy intensity	Now 3.2% annual reduction to meet 2030 target and over 4% annual reduction to be able to achieve net-zero energy emissions by 2050	Improving energy efficiency at scale and stronger and stringent government policies
7.A.1	International financial flows	US\$ 1.3-1.4 trillion annual financial flows to meet SDG7	US\$ 514 billion annually, of which only US\$ 10.9 billion is international public finance for developing countries	~ Not quantified ~	Increased international public financial flows to developing countries

Target 7.2 / Indicator 7.2.1

Increase substantially the share of renewable energy in the global energy mix / Renewable energy share in total final energy consumption.

- Continue furthering decarbonisation of the power sector through renewable sources, mostly through growth in renewables with the lowest LCOEs based on geography.
- Encourage new approaches to power system planning, system and market operations, and regulation and public policy that support uptake of modern renewables in lieu of traditional uses of biomass, and/or hydropower where possible
- Pursue low-carbon electricity as the main energy carrier for end-use sectors that have been difficult to integrate with renewables, such as heat and transport

- Divert policy mechanisms from biogas and biofuels for the heat and transport sectors towards electrification, such as EVs and their possible role as an enabler for better integration of variable renewable energy sources.
- Develop and pursue transition pathways tailored to the socioeconomic landscape of developing countries to encourage ambition, access to finance, efficient supply chains, and deployment.

Target 7.3 / Indicator 7.3.1

Double the global rate of improvement in energy efficiency / Energy intensity measured as a ratio of primary energy supply per unit of GDP.

- Implementation of mandatory performance standards and/or labels in relation to the energy efficiency of key end uses such as air conditioners, refrigeration, lighting, industrial motors and passenger cars.
- Particular focus on energy efficiency policies in markets undergoing rapid growth (such as in Asia), by encouraging cooperation with developed markets in the development of policy for appliances, industrial equipment, and vehicles.
- Enhance international cooperation to help governments of developing countries introduce new standards, learn from others' experience, and adopt best practices.
- Accurately adjust ambition levels to reflect technological progress so that performance standards and labels can achieve substantial reductions in energy consumption.
- Encourage government actions to reduce the cost of energy-efficient equipment or retrofits include economic incentives such as grants, loans, and tax breaks.
- More actively pursue carbon pricing, the phasing out of fossil fuel subsidies, and cost-reflective energy pricing, coupled with safety net schemes for vulnerable consumers.
- Leverage digital technologies to scale up efficiency.



Target 7.A / Indicator 7.A.1

Enhance international cooperation to facilitate access to clean energy / International financial flows to developing countries in support of clean energy R&D and renewable energy.

- Align policies and funds of public finance providers to create an enabling environment for private investments, developing needed infrastructure, and addressing perceived risks and barriers to attract capital to bring new markets to maturity.
- Encourage deployment of public funding that can help implement policies that ensure a just and inclusive energy transition.
- Strengthen international collaboration between advanced economies that are best positioned to mobilise public funding and the rest of the world, to support clean energy deployment.
- Act on commitments to support renewable energy financing in developing countries made during COP26 through development finance institutions (DFIs).
- Design policies to develop fiscal flexibility in developing countries to mobilise and borrow money to finance clean energy-led economic recovery programmes from the impacts of the pandemic and energy crisis.
- Enhance the availability of risk-mitigation instruments to investors, such as guarantees, letters of comfort or intent, hedges against currency risks, letters of credit, and insurance products.
- Encourage the participation of DFIs in blended finance structures to lower perceived risks of third-party investors, as well as overall costs of capital.



HOW DOES SDG7 SUPPORT THE REALISATION OF THE OTHER SDGS?

Table 4 highlights the interlinkages that SDG7 indicators share with other SDGs, and how they contribute to socioeconomic welfare across three categories: energy security, climate change, and inflation.

Table 4 Interlinkages between SDG7 indicators and other SDGs, and their impact on key areas of socioeconomic welfare

Interlinkages with other SDGs		Improves Energy Security	Accelerate Climate Action	Reduces Impact of Inflation
7.1.1 Electricity Access	<ul style="list-style-type: none"> Electricity access can improve livelihoods (SDG 1), particularly for women, for whom the chance to work from home can create an independent source of income (SDG 5, SDG 8) 	✓✓	✓	✓✓
	<ul style="list-style-type: none"> Deployment of decentralised energy can create employment (SDG 8) in the electricity value chain, and support rural economies by developing their economic sectors to create income-generating opportunities (SDG 9) 	✓✓		✓✓✓
	<ul style="list-style-type: none"> Electricity for irrigation pumps can double the yield of cropland (SDG 2), while energy for processing can vastly improve the efficiency of food production, increase the value of products, and generate economic and employment gains 	✓✓	✓	✓✓
	<ul style="list-style-type: none"> Installing and operating water extraction, transport and treatment systems can improve access to clean water and sanitation (SDG 6) 	✓✓	✓✓✓	✓✓
	<ul style="list-style-type: none"> Providing access to modern energy (including modern cooking facilities) for all can lower the premature death toll by around 1.8 million people per year in 2030 (SDG 3) 	✓✓	✓	✓
	<ul style="list-style-type: none"> Ensuring electricity access can reinforce education goals (SDG 4), while information and communication technologies can further modern education practices 	✓✓		
	<ul style="list-style-type: none"> Reliable electricity can improve the resilience of households and communities to a changing climate (SDG 13) 	✓✓	✓✓✓	✓
7.1.2 Clean fuels and technology for cooking	<ul style="list-style-type: none"> Universal access to clean and modern cooking is integral to reducing poverty and advancing human dignity (SDG 1, SDG 5). The co-benefits of clean cooking can help achieve 10 of the 17 global goals 	✓✓	✓	✓✓
	<ul style="list-style-type: none"> Clean cooking is particularly relevant to fulfilling the SDG commitment to “leave no one behind” 	✓✓✓	✓✓	✓
	<ul style="list-style-type: none"> Access to indicator 7.1.2 can increase the health and well-being (SDG 3) of women, children, and infants, who are disproportionately compromised by household air pollution (HAP) 	✓✓	✓✓✓	✓
	<ul style="list-style-type: none"> Indicator 7.1.2 can also address “time poverty” that women and girls face, which can help in achieving SDG 5 	✓✓	✓	✓✓
	<ul style="list-style-type: none"> More efficient fuels and cookstoves can increase progress on environmental and climate-related goals, such as SDGs 12, 13, and 15, and the Paris Agreement 	✓✓	✓✓✓	✓

7.2.1 Renewable energy share in TFEC	<ul style="list-style-type: none"> With a holistic approach to policymaking, an increased share of renewables in the TFEC will fuel economic growth, create employment opportunities, enhance welfare benefits, and help achieve a number of other SDGs 	✓✓✓	✓✓✓	✓✓	
7.3.1 Energy Intensity	<ul style="list-style-type: none"> Renewables and increased energy efficiency can also improve welfare through reduced health impacts from fossil fuel combustion 	✓✓	✓✓✓	✓✓	
	<ul style="list-style-type: none"> Increased energy access (through renewables and higher efficiency) will enable additional gains, including sustainable livelihoods, social inclusion, gender equality, and better quality of life 	✓✓✓	✓✓✓	✓✓✓	
	<ul style="list-style-type: none"> The transformation to a sustainable energy system with a high share of renewables will help meet climate goals, and significantly reduce local air and water pollution 	✓✓✓	✓✓✓	✓✓	
	<ul style="list-style-type: none"> It can also stimulate economic activity along the agri-food supply chain, reduce losses and enhance food productivity, and provide energy needed for water pumping and distribution, food storage and processing 	✓✓	✓✓	✓✓✓	
7.A.1 International financial flows	<ul style="list-style-type: none"> Financial innovation for low-carbon energy, such as green bonds and impact investment, can accelerate action on climate change endeavours (SDG 13) and other international climate change agreements, such as the Paris Agreement 	✓✓✓	✓✓✓	✓✓	
	<ul style="list-style-type: none"> Collaboration between the private and public sectors in and between developed and developing markets can also support SDG 16 on partnerships 	✓✓✓	✓✓✓	✓	
	<ul style="list-style-type: none"> Novel business models and value propositions can offer new economic opportunities for employment, including for marginalised groups (SDG 5, 8, 9) 	✓✓	✓	✓✓✓	

- Access to sustainable and modern energy can look different for different regions. In currently underserved parts of the world, and in LDCs, landlocked countries, and energy-vulnerable countries, fossil fuels and traditional hydrocarbons may be their only sources of sustainable energy, making their energy mix much different from those that are advanced in the deployment of clean energies, at least in the medium-term to 2030. The downstream monetisation of gas will play a key role in these markets, by bridging access gaps in electricity and clean fuels, if coupled with relevant energy efficiency and modernisation measures.
- In countries where the inertia of retrofitting or replacing fossil fuel-based, decades'-old energy infrastructure is significant, this is particularly advantageous. In LDCs, quick, practical and affordable access to LNG can be enabled through short-term floating storage and regasification units (FSRUs). Gas infrastructure can also support the uptake of renewables and other clean energies, like hydrogen. Many African countries in particular have local gas resources that have not been developed as they were too small for export projects, and the domestic market. However, there has been some progress, in recent years in the development of local gas resources, in countries such as Senegal, Ghana, Cameroon and Tanzania. It is essential to minimise methane leakage along the natural gas value chain to maintain its credentials as a relatively clean energy source.
- LDCs have articulated their seriousness by committing to the goal of achieving 100% access to electricity by 2030 through 100% renewable energy by 2050^{xxxvi}. This makes LDCs best suited to take advantage of their untapped hydro and solar potential, as well as off-grid solutions.
- Gains in energy efficiency and an increased share of renewables in the TFEC can enable lower energy prices by reducing the need to add expensive new power generation or transmission capacity and by reducing pressure on energy resources. Decreased demand for energy services across several markets can prompt a reduction in energy prices.
- Contrary to popular belief, fossil-fuel based clean energy technologies, such as carbon capture, use and storage (CCUS), bio-energy with carbon capture and storage (BECCS), and blue hydrogen can enable accelerated action towards meeting SDG 7 targets in the medium-term.
- CCUS has been widely discussed as an opportunity for industrial transformation towards sustainability, and it is also mentioned in current IPCC reports as a means of reducing emissions to meet net-zero ambitions. However, it requires support in order to become a key point of reference in policymaking processes and the design of funding mechanisms at a national and global level.

- Additional carbon sequestration and greenhouse gas reduction opportunities are available in combination with the development of clean fuels. These include biogas / biomethane production from landfills and bio-waste, and the production of biochar from crop residues, that can be used to sequester carbon in soil and improve its fertility. Such opportunities also create carbon offsets that can be sold, providing funds for other green initiatives and for supporting local livelihoods.
- Leading oil and gas producers that lack access to modern energy, such as Nigeria, Angola, Venezuela, Indonesia, Iraq, can stand to gain considerably from the realisation of SDG7, through the implementation of important global initiatives related to climate change, such as the phase-out of fossil fuel subsidies, which can encourage energy efficient practices in transport and electricity requirements. All of these countries also have significant renewable potential, which can be harnessed through international collaboration, and the mobilisation of international public finance to support clean projects.



The pandemic and ongoing energy crisis as a result of Russia's invasion of Ukraine has revealed the stark worldwide inequalities in access to reliable energy, especially in developing countries, and rural and peri-urban areas. There is an urgent need to expand energy access to help populations mitigate the effects of both crises. Policymakers should not lose sight of the need for continued action on affordable, reliable, sustainable and modern energy for all, and to maintain a strategic focus on the vulnerable countries needing the most support.

Closing current access gaps to energy will be increasingly challenging, since finding the balance between affordability and financial viability required to "leave no one behind" won't be easy. Reaching the last-mile households (who are mostly poor, vulnerable, and remote) while accelerating electrification in low-income countries is a formidable challenge that governments and the international community must collaborate to overcome.

Among all the SDG7 targets, clean cooking presents the greatest cause for concern owing to its slow progress. All household energy needs, including cooking energy and electricity access, should be integrated into national energy plans.

In the post-pandemic transition phase, aligning public financial flows toward low-carbon and climate-resilient development will be critical to help accelerate progress toward SDG7, thereby securing broader economic development and boosting employment.

Given the capital-intensive nature of many clean energy technologies, low base lending rates could translate into lower deployment costs. Recovery plans designed to kickstart economic growth, protect workers, and create jobs could provide a substantial boost to the deployment of renewable energy technologies.

Meeting the SDG7 targets by 2030 requires a massive augmentation of current efforts. In the run-up to 2030, the custodian agencies would do well to revise the targets of the SDG7 indicators to more ambitious ones, including a more prominent role for technologies like nuclear, hydrogen, and CCUS as crucial low-carbon energy forms in the TFEC, particularly for sectors that are hard-to-abate.

The 2021 UN High-Level Dialogue on Energy was the first global gathering on energy under the auspices of the General Assembly since 1981, with an aim to promote the implementation of the energy-related goals and targets of the SDGs. This needs to be an annual affair, with considerations for newer, more ambitious targets, newer timelines, and stratagem for how the SDGs will meet not only 2030 targets, but more crucially, 2050 ones in hope to keep the Paris Agreement's 1.5°C warming limit within reach.

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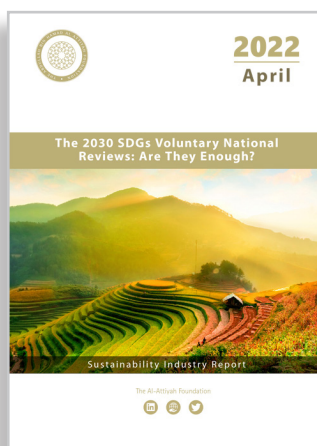
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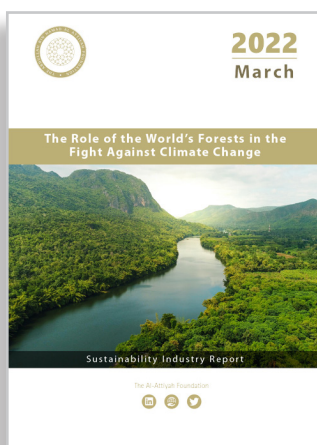
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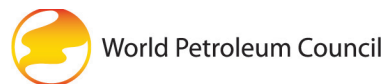
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