CHAPTER 3
RENEWABLES

MAIN MESSAGES

- **Global trend:** In 2019, the global share of renewable energy sources in total final energy consumption (TFEC), inclusive of traditional uses of biomass, was 17.7 percent, just 0.4 percentage points higher than the year before. Despite notable growth in renewable energy consumption over the decade between 2010 and 2019, the share of renewable sources in TFEC, excluding traditional uses of biomass, increased by just 2.7 percentage points and represented only 11.5 percent of TFEC in 2019. This modest pace of growth points to the importance of containing energy consumption through energy efficiency and energy conservation. Trends differ across end uses, with the largest increase in the share of renewables continuing to be in the generation of electricity, while the transport and heat sectors have seen much slower progress.
- **Target for 2030:** Ensuring access to affordable, reliable, sustainable, and modern energy for all implies an accelerated deployment of renewable energy sources in all three conventional categories: electricity, heat, and transport. Target 7.2 of the Sustainable Development Goals (SDG) for 2030 is "increasing substantially the share of renewable energy in the global energy mix." The main indicator used to assess progress toward that target is the share of renewable energy in TFEC. While no quantitative milestone has been set for SDG 7.2, custodian agencies assess that the current trend in the indicator is not in line with the ambition of the target, and much faster renewable energy uptake is needed.
- **Electricity:** Renewable electricity use grew more than 5 percent year-on-year in 2019, bringing the share of renewables in global electricity consumption to 26.2 percent, up from 25.3 percent in 2018, the largest share of renewables among the end-use categories. However, electricity represented only a fifth of global TFEC in 2019. In the face of growing global demand for electricity (+1.6 percent in 2019), consumption of nonrenewable electricity continued to grow as well (+0.4 percent in 2019), a slower pace than for renewables but from a significantly larger base. Hydropower remains by far the largest source of renewable electricity globally, followed by wind and solar PV, the last of which recorded the fastest growth rate among these technologies. Together, wind and solar PV are responsible for 58 percent of the increase in renewable electricity consumption observed over the last 10 years, and their deployment has been accelerating.
- **Heat:** Renewable heat consumption increased by 2.4 percent to 17.8 EJ in 2019, excluding traditional uses of biomass.[1] Traditional uses of biomass remained almost stable globally, accounting for more than 13 percent (23.5 EJ) of global heat consumption in that year. Overall, as global heat demand continued to increase (+0.3 percent year-on-year), representing almost half of TFEC, the share of modern renewables in global heat consumption remained just 10.1 percent in 2019, less than a 2-percentage point improvement over the last 10 years.

1 This calculation for the heat sector does not include renewable electricity used for heating or ambient heat harnessed by heat pumps, due to limited data availability at global scale and the difficulty of quantifying the fraction of electricity consumption used specifically for heating.

- **Transport:** In 2019, renewable energy used in transport grew by 7 percent to 4.4 EJ, the fifth-largest increase recorded since 1990 and the largest since 2012. This brought the total share of renewable energy in the sector to 3.6 percent in 2019, up from 3.4 percent in 2018. Biofuels, primarily crop-based ethanol and biodiesel, supplied 91 percent of the total. Nevertheless, sales of electric vehicles are leading to record increases in renewable electricity use in transport. Use grew by 0.03 EJ in 2019, nearly matching the record single-year increase in 2018.
- **Regional highlights:** The region where renewables constitute the largest share of the energy supply is in Sub-Saharan Africa, but that is because traditional uses of biomass for heating and cooking are so widespread. When only modern forms of renewable energy are counted, Latin America and the Caribbean have the highest share of renewables in TFEC, owing to hydropower generation and to the consumption of bioenergy in industrial processes and biofuels for transport. In 2019, 44 percent of the global year-on-year increase in modern renewable energy consumption took place in Eastern Asia—essentially in China—where hydropower, solar photovoltaics (PV), and wind dominated the growth.
- **Top 20 countries:** The share of renewable energy in TFEC varies widely across countries. Between 2000 and 2019, the share of modern renewables declined in four of the top 20 energy consuming countries despite expanding use in all. Simultaneous increases in nonrenewable energy use explain the drop in renewables' share. In 2019, the largest advance in the share of modern renewables was observed in Turkey (+2.3 percentage point), owing to higher hydropower generation, followed by the United Kingdom (+1.3 percentage point), where wind power developments and the uptake of biofuels for transport played a leading role.
- **Installed renewable energy generating capacity in developing countries:** SDG indicator 7.B.1 tracks installed renewable energy generating capacity in developing countries. In 2020 a record 246 watts per capita of renewable capacity was installed, a year-on-year growth rate of 11.6 percent. In 2020, four countries had more than 1,000 watts per capita: Bhutan (3,026), Paraguay (1,238), Uruguay (1,075), and the Lao People's Democratic Republic (1,022). Although growth is positive and accelerating, developing countries are not on track to meet any of the net-zero scenarios or targets by 2030. The positive global and regional trajectory masks the fact that the countries most in need are being left behind even within the group of developing countries. Renewables capacity per capita grew at a compound annual growth rate of 9.5 percent over 2015–20 for the developing world as a whole. Growth lagged in island developing states (8.3 percent), least developed countries (5.2 percent), and landlocked developing countries (2.4 percent).
- **Recent trends:** Despite continued disruptions in economic activity and supply chains following responses to the COVID-19 pandemic, renewable energy developments have shown resilience in 2020. However, in 2021, annual additions of new renewable electricity capacity fell 5 percent to 257 GW. Rising commodity, energy, and shipping prices, in addition to restrictive trade measures, increased the cost of producing and transporting solar PV modules, wind turbines, and biofuels worldwide, heightening uncertainty about future renewable energy projects. Getting renewable deployment back on track to reach SDG 7.2 and 7.B.1, as well as the ambitions of the Paris Agreement, will require stronger policy support for renewables in all sectors and greater mobilization of private capital behind renewable energy projects.

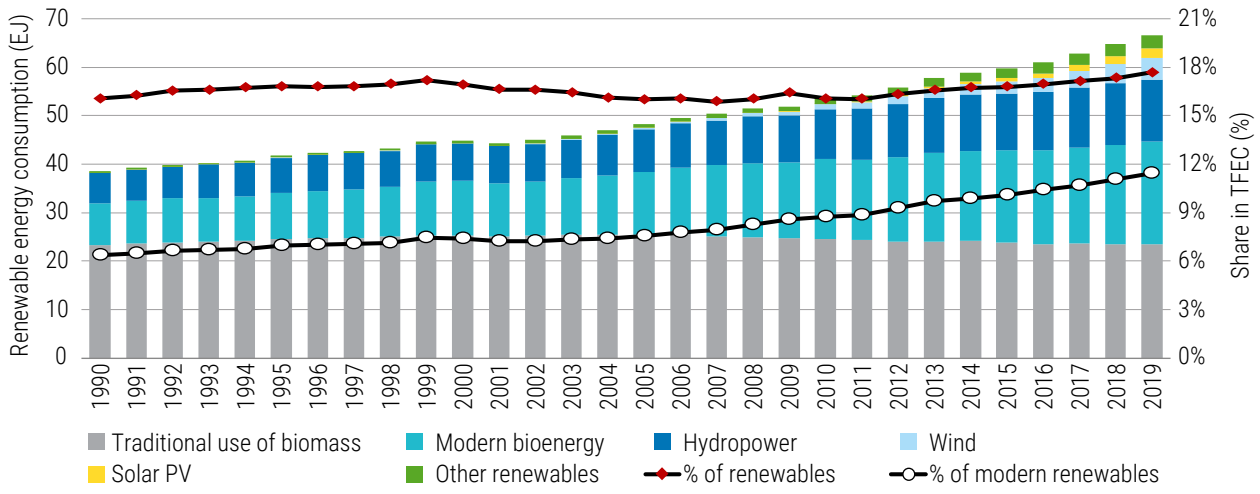
ARE WE MAKING PROGRESS?

In 2019, global consumption of renewable energy, including the traditional uses of biomass, amounted to 66.6 exajoules (EJ), following a 2.7 percent year-on-year increase. During the same period, nonrenewable consumption increased by 0.2 percent. As a result, the share of renewables in total final energy consumption (TFEC) reached 17.7 percent. While being the highest share recorded over the past three decades, it is not even 2 percentage points higher than in 1990. From 2018 to 2019, modern bioenergy, wind and solar PV made the largest contributions to the growth of renewable energy use, followed by hydropower and geothermal energy. [2]

Since 1990, the share of renewable energy in TFEC has held steady despite a 70 percent growth in global consumption of renewable energy. Two simultaneous trends account for this seeming contradiction: traditional uses of biomass have been slowly declining (-5 percent during 2010–19), while the use of modern renewables—that is, excluding the traditional uses of biomass (box 3.1)—has increased almost 50 percent, with its share of TFEC rising from 8.6 percent in 2009 to 11.5 percent in 2019 (figures 3.1 and 3.2). During 2010–19, all renewable energy sources together accounted for less than one-quarter of the global increase in TFEC. To achieve SDG 7 and provide access to affordable, reliable, and sustainable energy for all, a considerable acceleration in the uptake of modern renewables will be required, along with more efficient uses of biomass and substantial progress on energy efficiency and energy conservation.

Over the last decade, modern bioenergy saw the largest absolute increase among renewable sources, accounting for more than a third of the increase in modern renewable energy consumption (figure 3.2). Bioenergy's share was as much as wind and solar PV combined, though the latter two grew the fastest. Overall, bioenergy, including the traditional uses of biomass, remains the largest renewable source of energy, accounting for almost 70 percent of global renewable energy consumption, followed by hydropower, wind and solar PV (figure 3.1).

Figure 3.1 • Renewable energy consumption and share in total final energy consumption, by technology, 1990–2019



Source: International Energy Agency (IEA, 2021a) and United Nations Statistics Division (UNSD, 2021).

2 The data in this report reflect revisions from last year's edition. Traditional uses of biomass for heat were revised downward by 0.6 EJ (-2.5 percent) globally for 2018, with most of the change accounted for by India (-0.7 EJ, -15 percent); Nigeria (-0.14 EJ, -3 percent); China (+0.14 EJ, +5 percent); and Liberia (+0.07 EJ, +626 percent). Global modern uses of biomass was revised upward by 0.97 EJ (+5 percent), with India accounting for largest change (+1.1 EJ, +60 percent). Global geothermal heat consumption was also revised upward, by 0.2 EJ (+29 percent), mainly as a result of changes in China. The regional groupings discussed in this section follow the United Nations' M49 regional classification (https://unstats.un.org/unsd/methodology/m49/).

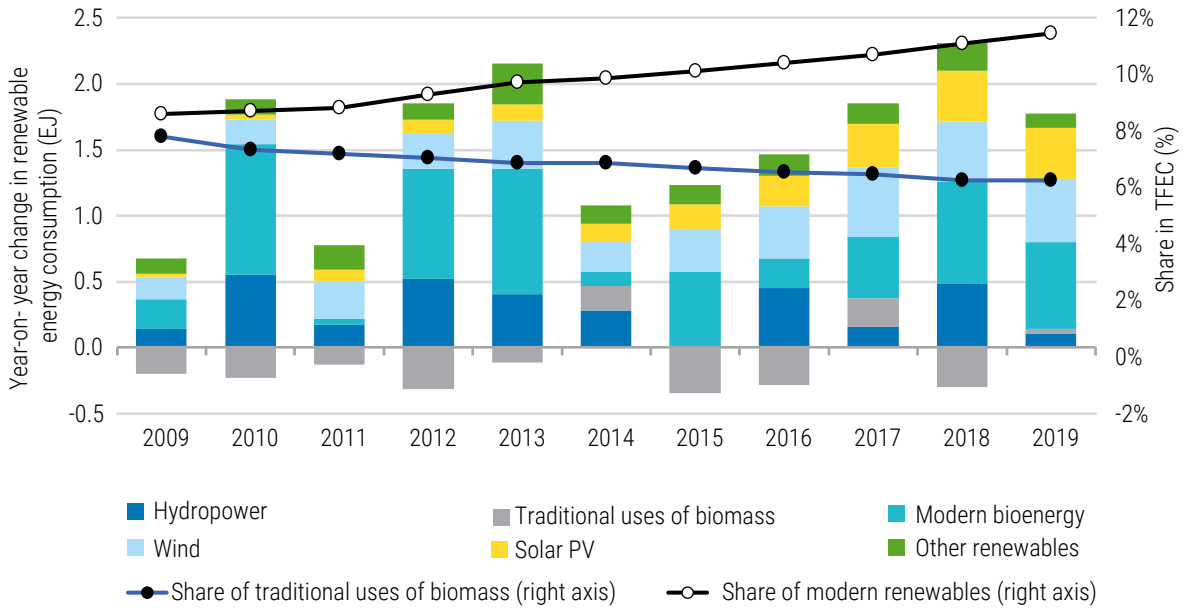
BOX 3.1 • Traditional uses of biomass and modern renewables

The term "traditional uses of biomass" refers to the use of local solid biofuels (wood, charcoal, agricultural residues, and animal dung), burned with basic techniques, such as traditional open cookstoves and fireplaces. Owing to their informal and noncommercial nature, it is difficult to estimate the energy consumed in such practices, which remain widespread in households in parts of the developing world. For purposes of this report, "traditional uses of biomass" refers to the residential consumption of primary solid biofuels and charcoal in non-OECD countries. Although biomass is used with low efficiency in OECD countries, as well—for example, in fireplaces burning split logs—such use is not covered by the traditional uses of biomass cited in this report.

Traditional uses of biomass tend to have very low conversion efficiency (5–15 percent) which can cause local demand to exceed sustainable supply and lead to deforestation and other negative environmental effects. In addition, emissions of particulate matter and other air pollutants are produced. When combined with poor ventilation, the result is indoor air pollution, which is responsible for a range of severe health conditions and is a leading cause of premature death. Even though biomass as it is traditionally used is, in principle, renewable, policy attention should focus on encouraging the adoption of more efficient renewable heating and cooking technologies (see chapter 2 on access to clean fuels and technologies for cooking).

"Modern bioenergy" can be used efficiently for electricity generation, for industrial applications, for cooking in efficient wood and pellet stoves and boilers, and for the production of biofuels for transport. Modern bioenergy—along with solar PV, solar thermal, geothermal, wind, hydropower, and tidal energy—is one of the "modern renewable" sources analyzed in this report.

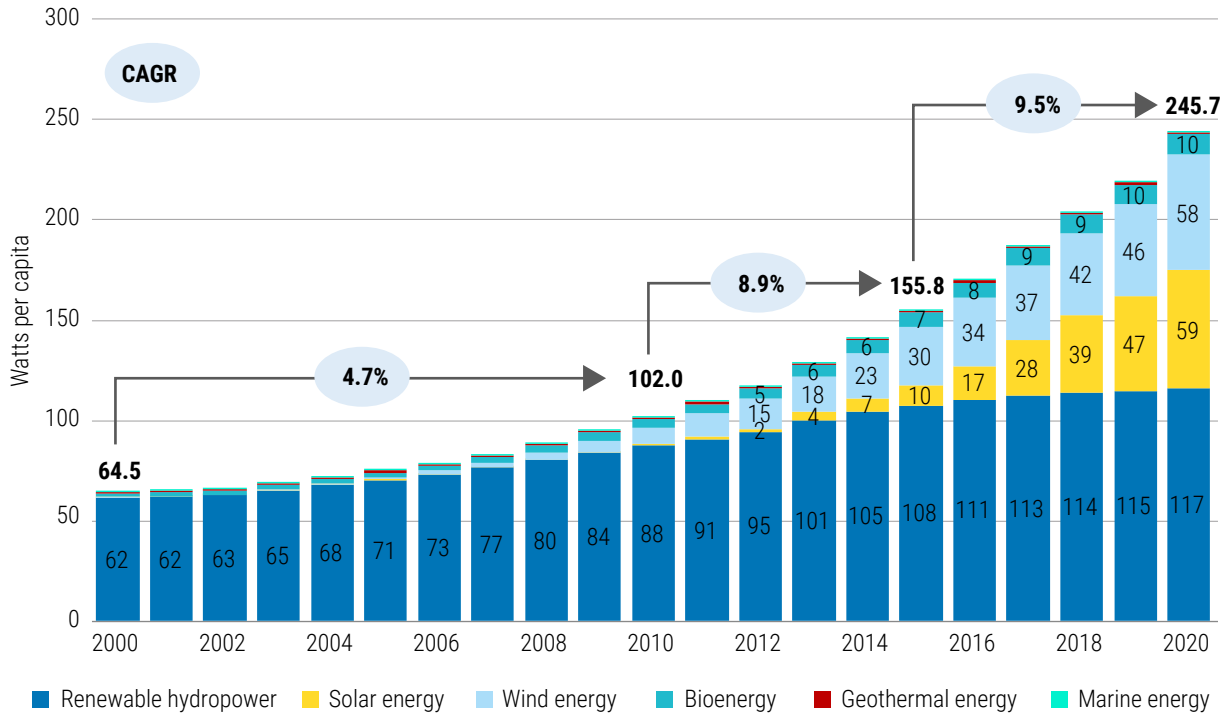
Figure 3.2 • Share of modern renewable energy and traditional uses of biomass in total final energy consumption (left) and increase in renewable energy consumption by technology (right), world, 2009–19



Source: International Energy Agency (IEA, 2021a) and United Nations Statistics Division (UNSD, 2021).

Renewable installed capacity per capita has continued to expand over the past ten years in the developing world. The compound annual growth rate (CAGR) of 8.9 percent for the 2010–15 period increased to 9.5 percent between 2015–20, reaching 11.6 percent in 2020 (figure 3.3). Growth in recent years was driven mainly by solar and wind, which increasingly are less expensive than the cheapest new fossil fuel option.

Figure 3.3 • Renewable installed capacity per capita in developing countries (2000–20) and compound annual growth rate for selected periods



Source: International Renewable Energy Agency (IRENA, 2021b)

LOOKING BEYOND THE MAIN INDICATORS

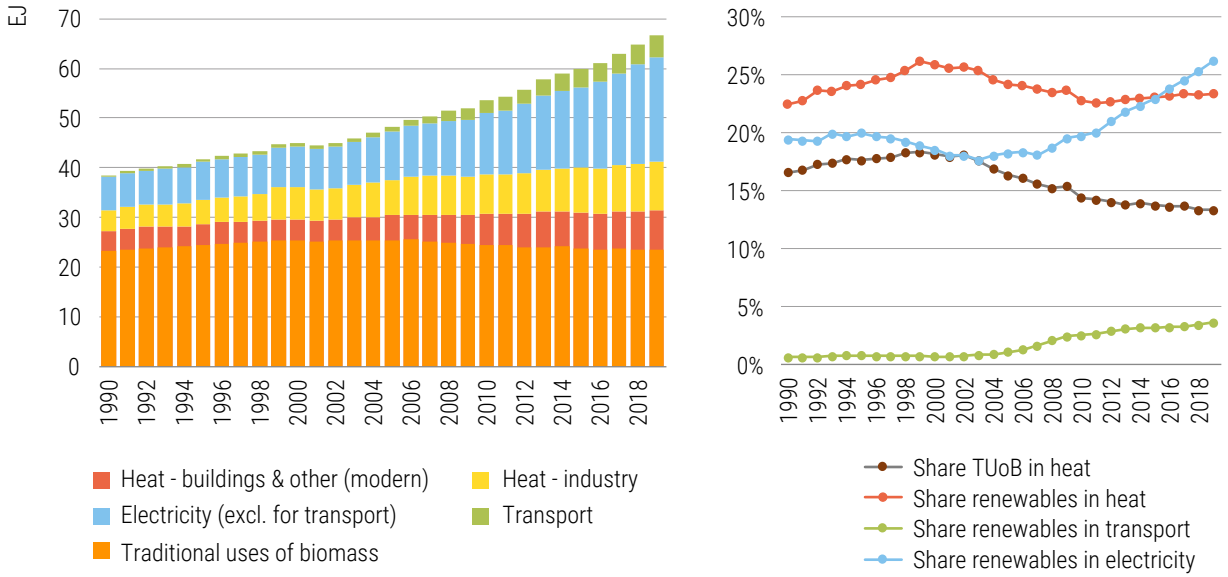
Ensuring access to affordable, reliable, sustainable, and modern energy for all implies a substantial increase in the share of renewable energy in all three main end-use categories: electricity (21 percent of global TFEC in 2019), transport (32 percent), and heat (47 percent).

The share of renewables in TFEC is the greatest for **electricity**, rising from 25.3 percent in 2018 to 26.2 percent in 2019 (figure 3.4). Renewable electricity accounts for almost half of the globe's modern renewable energy consumption and three-fifths of the year-on-year increase. The rapid increase in the penetration of renewables in the electricity sector is driven by the continuous expansion of new capacity additions powered by wind and solar PV.

In the **heat** sector, renewable sources accounted for 23.4 percent of the energy used in 2019, most of which (13.3 percentage points) corresponds to traditional uses of biomass. The consumption of modern renewables for heat (that is, excluding traditional uses of biomass) increased by 2.4 percent year-on-year in 2019, while global heat demand saw a slight increase (+0.3 percent year-on-year). This progress failed to displace nonrenewable energy used for heat, which remained steady in 2019.

The **transport** sector represented only 10 percent of modern renewable energy consumed globally in 2019. It is the end-use sector with the lowest renewable energy penetration, at only 3.6 percent of final energy consumption. Biofuels supply the great majority (91 percent) of renewable consumption in transport, but renewable electricity use is slowly emerging, thanks to the electrification of railways and the uptake of electric vehicles.

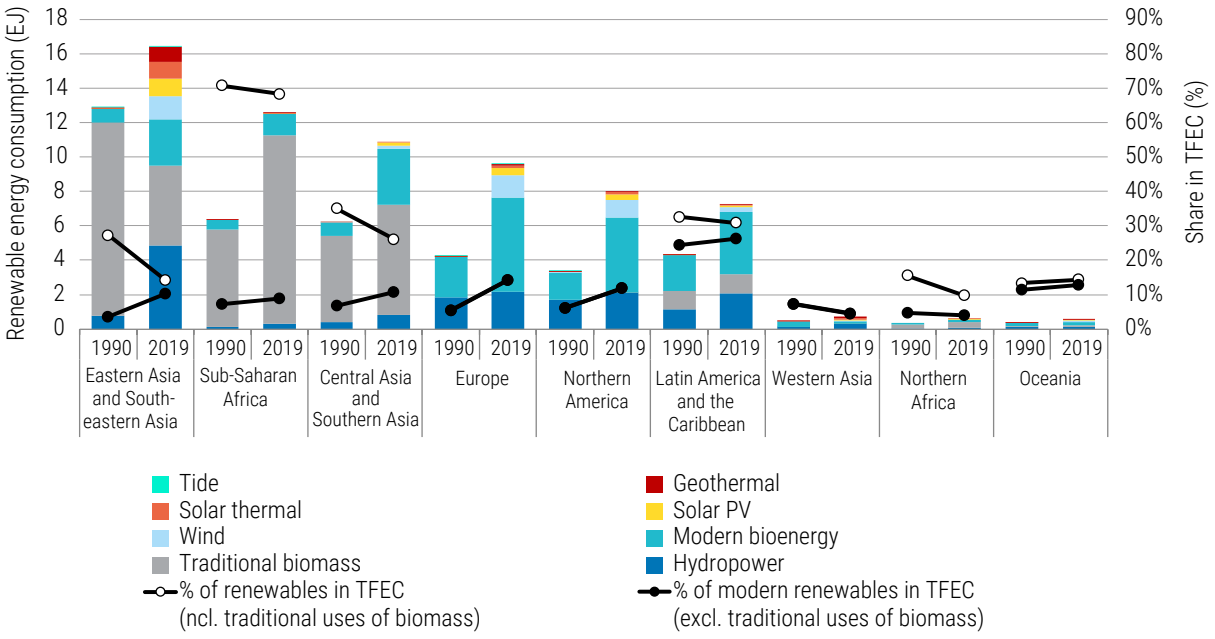
Figure 3.4 • Renewable energy consumption and share by end use, 1990–2019



Source: International Energy Agency (IEA, 2021a) and United Nations Statistics Division (UNSD, 2021).
Note: Electricity used for transport is included under transport; TUoB = traditional uses of biomass.

Behind the global figure lie regional disparities (figure 3.5). Sub-Saharan Africa has the largest share of renewable sources in its energy supply, but traditional uses of biomass represented more than 85 percent of the renewable energy consumed in the region in 2019. Excluding traditional uses of biomass, Latin America and the Caribbean show the highest share of modern renewable energy consumption (26 percent of TFEC in 2019), owing to the significant use of hydropower in electricity generation, and to the consumption of bioenergy for industrial processes (in particular, in the sugar and ethanol industry) and biofuels for transport.

Figure 3.5 • Renewable energy consumption and share in total final energy consumption by region, 1990 and 2019

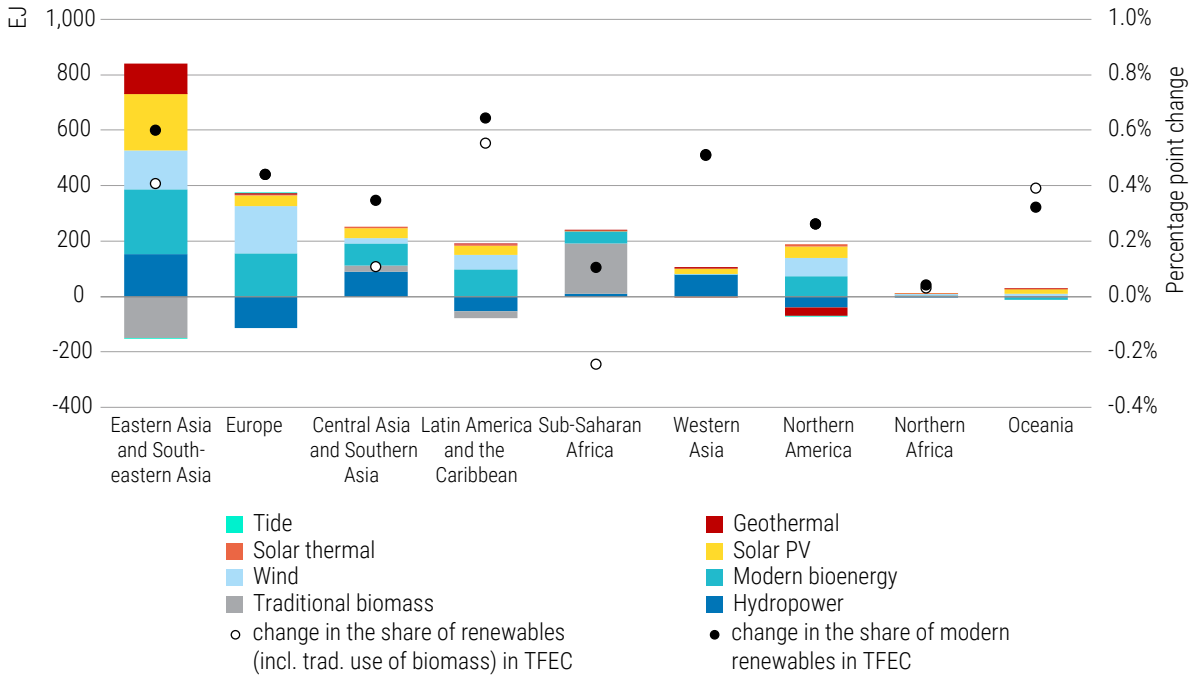


Source: International Energy Agency (IEA, 2021a) and United Nations Statistics Division (UNSD, 2021).

In 2019, 44 percent of the global year-on-year increase in consumption of modern renewable energy occurred in Eastern Asia—essentially China—owing primarily to the deployment of hydropower and solar PV, followed by wind (figure 3.6). With leading contributions from Germany and the United Kingdom, Europe accounted for another 15 percent of the year-on-year growth in modern renewable energy use in 2019, despite less favorable conditions for hydropower, owing to the development of wind power, modern bioenergy for heat and transport, and solar PV.

Latin America and the Caribbean and Eastern Asia saw the most rapid annual advances in the share of renewables in TFEC in 2019: +0.6 and +0.7 percentage points, respectively.

Figure 3.6 • Year-on-year change in renewable energy consumption and in the share of renewables in total final energy consumption, by region, 2019

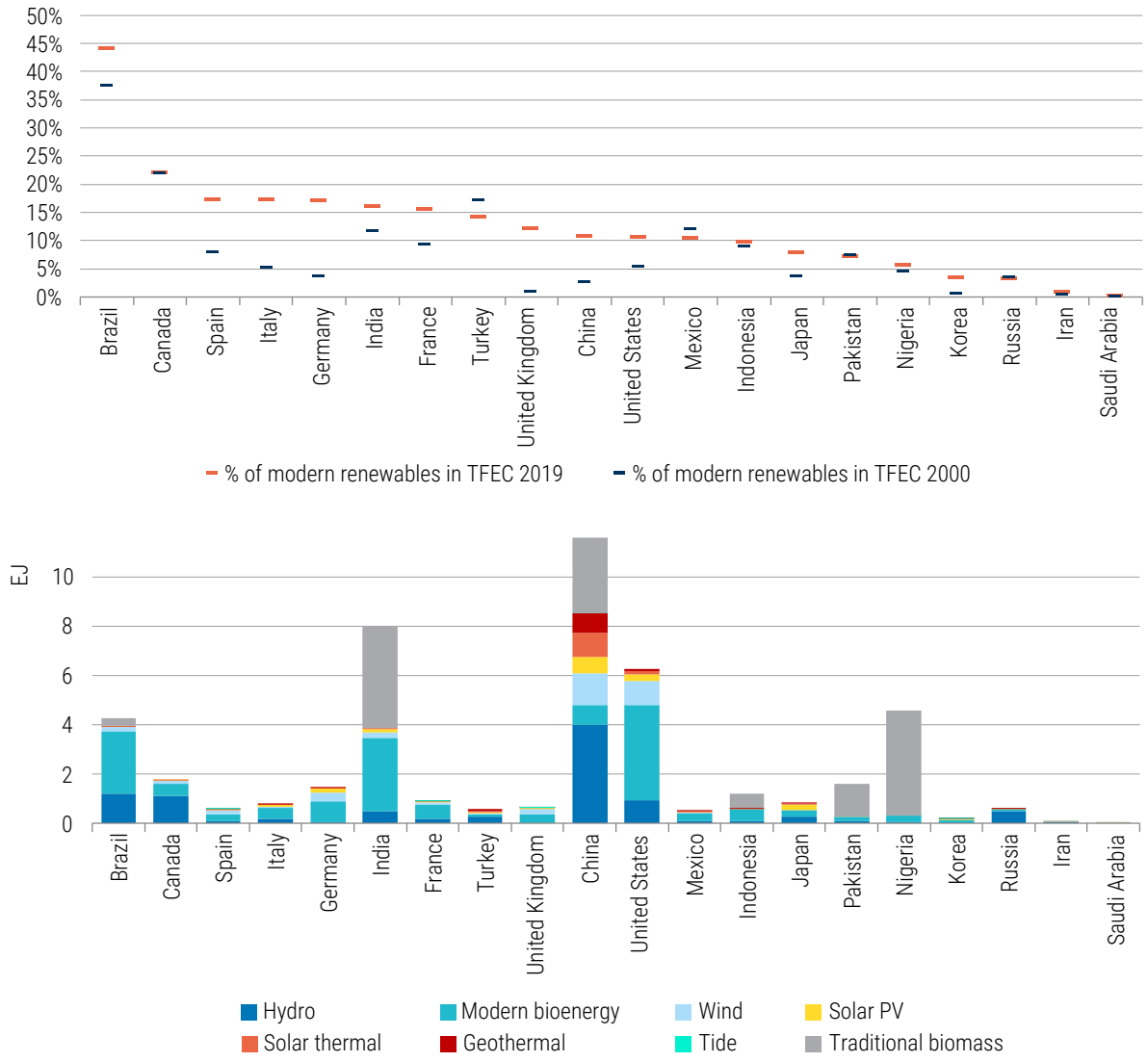


Source: International Energy Agency (IEA, 2021a) and United Nations Statistics Division (UNSD, 2021).

At the national level, the share of renewable sources in energy consumption varies widely depending on resource availability, the consistency and effectiveness of regulatory frameworks, financing mechanisms and policy support, and the impact of energy efficiency and consumption patterns on total energy demand. Among the top 20 energy consuming countries, Brazil and Canada had the highest shares of modern renewables in their energy mix in 2019, owing to heavy reliance on hydro for electricity and bioenergy for heat and transport (figure 3.7). China alone accounted for almost a fifth of global modern renewable energy consumption, yet this represented less than 11 percent of its TFEC. Germany, Italy, and the United Kingdom achieved the largest advances in the share of modern renewables in TFEC between 2000 and 2019, mostly through the deployment of bioenergy (in particular for heat), wind, and solar PV, and thanks to the stabilization or decline of TFEC. In 2019, the largest increase in the share of modern renewables was in Turkey (+2.3 percentage points), owing to higher hydropower generation, followed by the United Kingdom (+1.3 percentage points) and Germany (+1.1 percentage points). Reductions in total energy demand played a key role in the latter two countries, together with the rapid uptake of wind power, bioenergy for heat (Germany), and biofuels (United Kingdom).

Box 3.2 reviews renewable energy deployments in past two years, as the world economy was first disrupted by the COVID-19 pandemic and then began to recover.

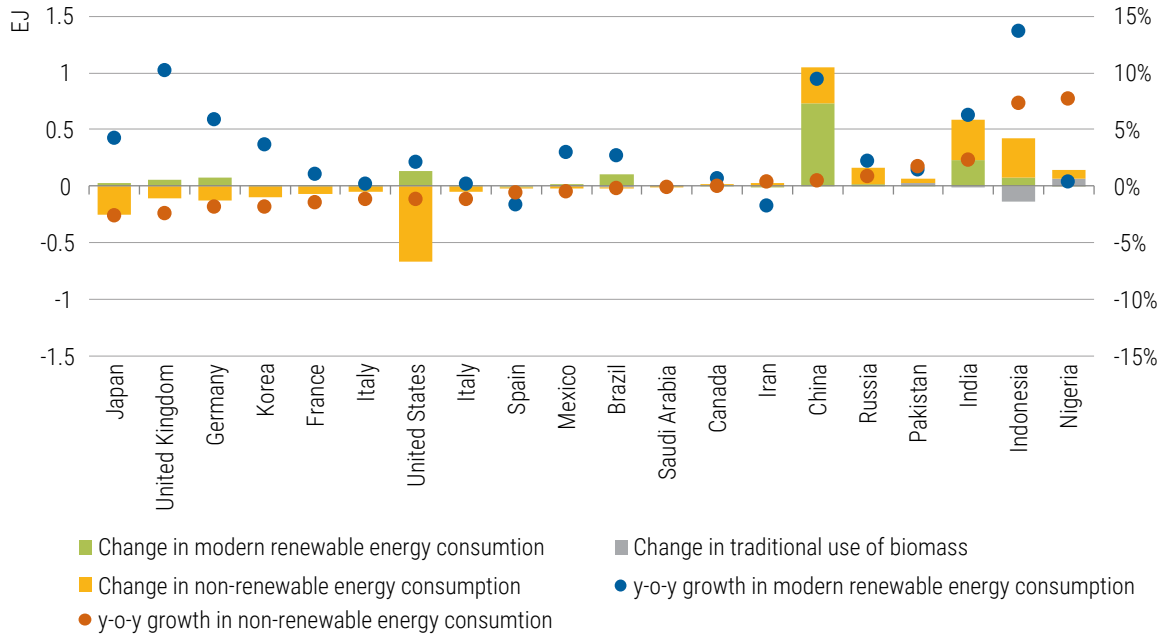
Figure 3.7 • Share of renewables in total final energy consumption, 2000 and 2019, and renewable energy consumption, by source, in the top 20 energy-consuming countries, 2019



Source: International Energy Agency (IEA, 2021a) and United Nations Statistics Division (UNSD, 2021).

Between 2000 and 2019, the share of modern renewables in TFEC declined in four out of the 20 largest energy consuming countries, despite growing consumption of modern renewable energy in all of them. In the same period, the consumption of nonrenewable energy increased in 13 of the 20 (figure 3.7). From 2018 to 2019, eight of the 20 largest energy consuming countries experienced an increase in nonrenewable energy consumption, despite growing modern renewable energy use in seven of them (figure 3.8). This highlights the importance of containing overall consumption through energy efficiency and energy conservation, and phasing out the use of fossil fuels to achieve higher shares of renewables in the energy mix.

Figure 3.8 • Annual change in renewable and nonrenewable energy consumption, top 20 countries with the largest total final energy consumption, 2019



Source: International Energy Agency (IEA, 2021a) and United Nations Statistics Division (UNSD, 2021).

BOX 3.2 • Accelerating renewable energy deployment in turbulent times: trends in the pandemic recovery context

Despite continued disruptions in economic activity and supply chains following responses to the COVID-19 pandemic across the world, renewable energy developments have shown resilience. However, progress varies across end-use sectors.

Additions of renewable electricity capacity did not set a new record in 2021. Instead, they fell from almost 270 GW in 2020 to 257 GW in 2021. Solar PV accounted for over half of all new additions (IRENA 2022a). Solar PV and onshore wind are becoming the leading choices for renewable power additions. Renewables as a whole have been growing, but their compound annual growth rate of just 8.7 percent since 2016 is significantly below the 12–15 percent increases through 2030 required by the net-zero scenarios and the qualitative SDG targets.

In the transport sector, following a historic decline in 2020 amid a global disruption of transport, demand for biofuels returned to pre-pandemic levels in 2021. Expanding demand for renewable diesel in the United States and biodiesel in Asia offset the lower ethanol demand resulting from high ethanol prices in Brazil and lower gasoline demand in the United States.

Global modern renewable heat consumption saw an estimated 5 percent growth year-on-year in 2021, while traditional uses of biomass increased by 1 percent. As total heat demand expanded by an estimated 3 percent over the same period, the share of modern renewable sources in heat supply rose by only 0.2 percentage points in 2021.

In 2021, rising commodity, energy, and shipping prices raised the cost of producing and transporting solar PV modules, wind turbines, and biofuels, creating uncertainties for future renewable energy projects. Compared with commodity prices in 2019, investment costs for utility-scale solar PV and onshore wind were 25 percent higher by the end of 2021 (IEA 2021b). In addition, restrictive trade measures have caused additional increases in prices of solar PV modules and wind turbines in key markets such as the United States, India, and the European Union. These higher prices pose challenges for small companies with limited finances, as well as for developers who won competitive auctions anticipating continuous reductions in equipment prices. However, higher natural gas and coal prices also contributed to improved competitiveness for wind and solar PV.

In the transport sector, some governments—including Argentina, Colombia, Indonesia, and Brazil—have lowered blending mandates in response to strong increases in biofuel prices, slowing development of biofuels.

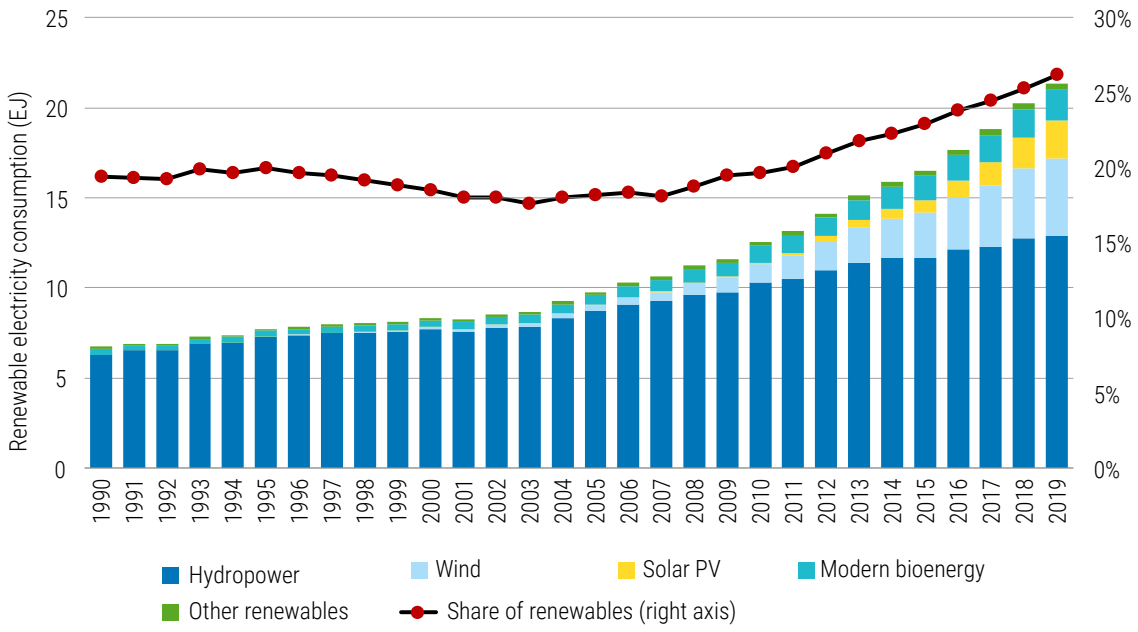
Recent renewable energy deployment trends still fall short of meeting Paris Agreement climate ambitions, as discussed in more detail in chapter 6. Getting renewable deployment on track with SDG 7.2 and 7.B.1, as well as with the ambitions of the Paris Agreement, will require strengthened policy support in all sectors. For instance, as renewables—including electricity, heat, biofuels, and biogas—accounted for just 11 percent of governments' economic recovery spending on clean energy as of October 2021, governments could consider targeting more recovery spending on renewable energy deployment and implementing additional measures to leverage private investments.

ELECTRICITY

Electricity accounted for 21 percent of the globe's TFEC in 2019. It is the fastest-growing energy end use, as electricity consumption has doubled over the last 23 years, with a 37 percent increase in the last decade.[3]

In 2019, global consumption of renewable electricity grew by more than 5 percent (+1.1 EJ) year-on-year, while consumption of nonrenewable electricity grew 0.4 percent (+0.2 EJ). As a result, the share of renewables in electricity generation increased by 0.9 percentage point to 26.2 percent in 2019 (figure 3.9)—currently the highest share of all end-use categories.

Figure 3.9 • Global renewable electricity consumption by technology, 1990-2019



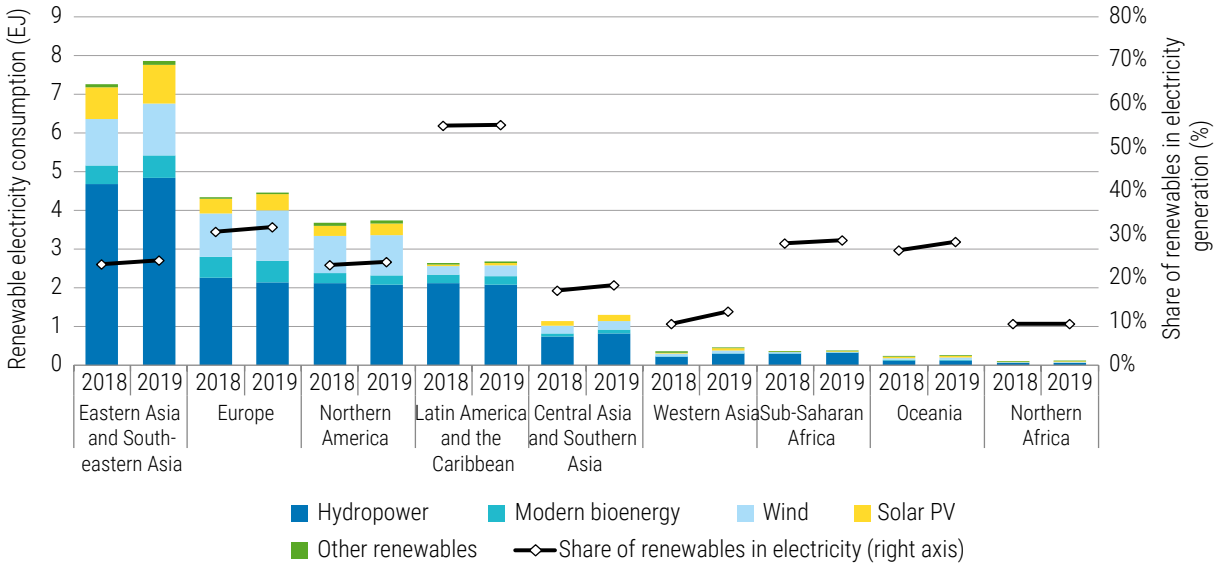
Source: International Energy Agency (IEA, 2021a) and United Nations Statistics Division (UNSD, 2021).

3 Among the largest factors driving this trend is the rapidly growing use of electricity for space cooling, with air conditioners and electric cooling fans accounting for nearly 16 percent of global electricity consumption in buildings in 2020 (IEA 2021b).

In 2019, wind and solar PV contributed almost 45 percent and 35 percent, respectively, of the annual increase in renewable power generation, with most of the remaining growth from bioenergy and hydro. Accounting for 61 percent of renewable power generation and 16 percent of total electricity generation, hydropower remained the largest renewable source of electricity globally and in each region.

Latin America and Caribbean has the largest share of renewable sources in power generation (figure 3.10), with hydropower alone representing 44 percent of regional electricity generation in 2019. That year, the share of renewables in power generation grew fastest in Western Asia, where it rose by almost 3 percentage points year-on-year to 9.5 percent of total generation. The increase was driven chiefly by hydropower development and favorable hydrological conditions, and by the rapid growth of new solar PV capacity and the relative stability of electricity demand. Thanks to rapidly declining costs and policy support, wind and solar PV together accounted for almost 60 percent of the global increase in renewable electricity consumption over the last decade. The share exceeds 80 percent in Europe and Oceania and approaches 90 percent in Northern America.

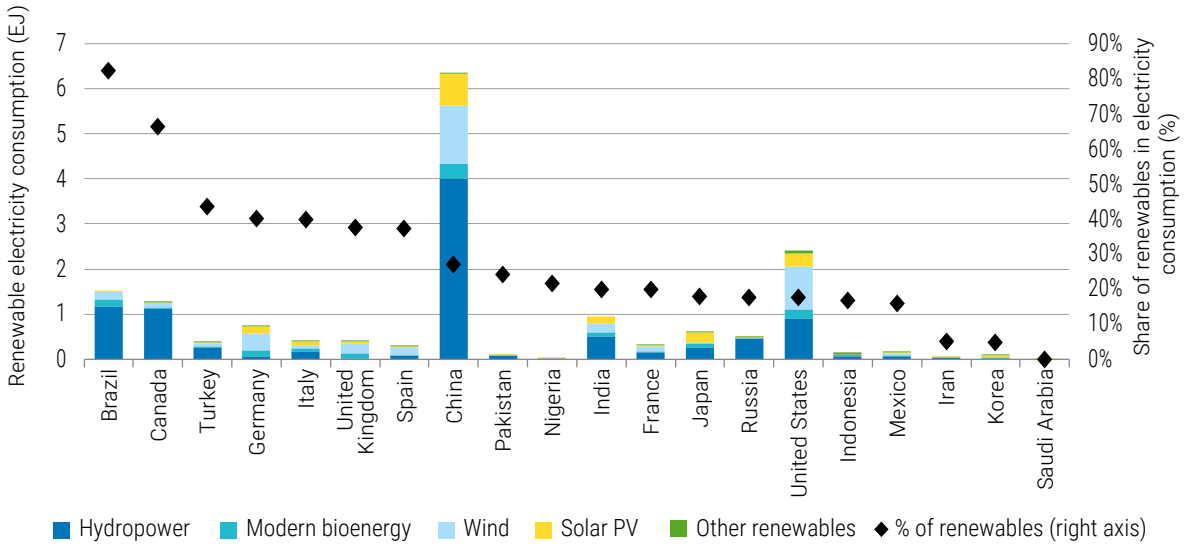
Figure 3.10 • Renewable electricity consumption and share of renewables in electricity generation by region, 1990 and 2019



Source: International Energy Agency (IEA, 2021a) and United Nations Statistics Division (UNSD, 2021).

The top 20 energy consuming countries show contrasting trends, with the share of renewables in electricity generation varying from near 0 (e.g., Saudi Arabia) to more than 80 percent (Brazil) (figure 3.11). Brazil and Canada have by far the highest shares owing to their large hydropower capacities. Wind and solar PV together—i.e., nondispatchable renewables—are the largest sources of renewable electricity in Germany, the United Kingdom, Spain, the United States, Mexico, and Korea. Their combined share in renewable power generation ranged from 44 to 73 percent in those countries. Among the top 20 energy consuming countries, Turkey, Germany, and the United Kingdom saw the largest growth in the share of renewables in electricity generation, with increases of 11, 5, and 4 percentage points, respectively.

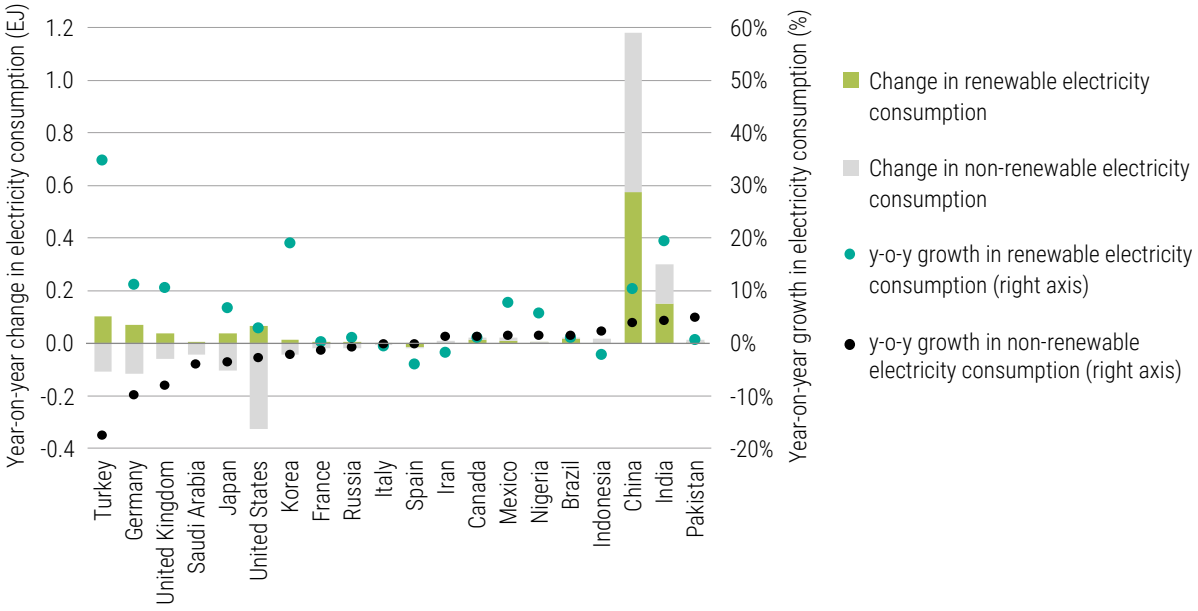
Figure 3.11 • Renewable electricity consumption by source and country, top 20 countries with the largest total final energy consumption, 2019



Source: International Energy Agency (IEA, 2021a) and United Nations Statistics Division (UNSD, 2021).

In 2019, China alone contributed more than 54 percent of the global annual increase in renewable electricity generation (figure 3.12). Half of China's growth came from wind and solar PV, while more than 40 percent came from hydropower. India, Turkey, Germany, and the United States were the next largest contributors to this growth, together contributing more than a third of it. During the same period, China was also responsible for the largest increase in nonrenewable electricity consumption, followed by India. Together, these two countries largely offset declines in nonrenewable electricity consumption observed elsewhere in the world.

Figure 3.12 • Year-on-year change in renewable and nonrenewable electricity consumption by country, top 20 countries with the largest total final energy consumption, 2019



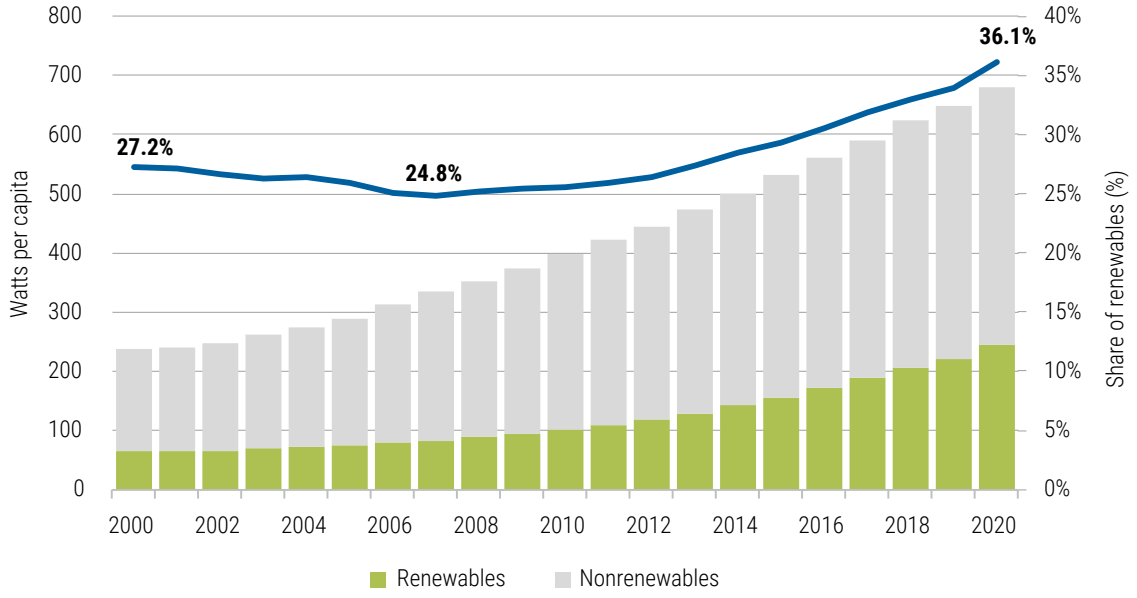
Source: International Energy Agency (IEA, 2021a) and United Nations Statistics Division (UNSD, 2021).

INSTALLED RENEWABLE ELECTRICITY CAPACITY IN DEVELOPING COUNTRIES

As population growth, development patterns, and evolving lifestyles drive up electricity demand in developing countries, the phase-out of fossil fuels will require increases in renewable power generation. For the second year, this chapter tracks progress toward SDG indicator 7.B.1, which focuses on increasing renewables-fueled generating capacity in developing countries (in watts per capita).

Developing countries have seen a rising share of renewables in the power sector since the low point of 24.8 percent in 2007 (figure 3.13). [4] The highest share of renewables to date, 36 percent, was recorded in 2020, with 246 watts per capita of renewable capacity installed. This is close to the world average of 36.5 percent and the 37 percent of developed countries. The 184 GW of renewable power added in developing countries during 2020 is 65 percent larger than the 111 GW additions of 2019 and an all-time record in renewable power additions. These dynamics reflect the economic attractiveness and plummeting costs of renewables, among other factors. Over 60 percent of the total renewable power generation added last year had lower costs than the cheapest new fossil fuel option in 2020 (IRENA 2021a).

Figure 3.13 • Annual installations of power capacity in developing countries, and share of renewables, 2000–20



Source: International Renewable Energy Agency (IRENA, 2021b)

Installation of renewables-powered capacity has been accelerating over the past two decades and outpacing population growth. The first decade of the century saw a CAGR of 4.7 percent, which was surpassed by an 8.9 percent CAGR during 2010–15. Most recently, in the 2015–20 period, the CAGR of renewable capacity per capita stood at 9.5 percent; in 2020, the growth rate jumped to 11.6 percent (figure 3.14). Nonrenewable additions decreased by 23 percent between 2019 and 2020—from 99.4 GW to 76.4 GW. It is not clear whether that decrease represents an emerging trend.

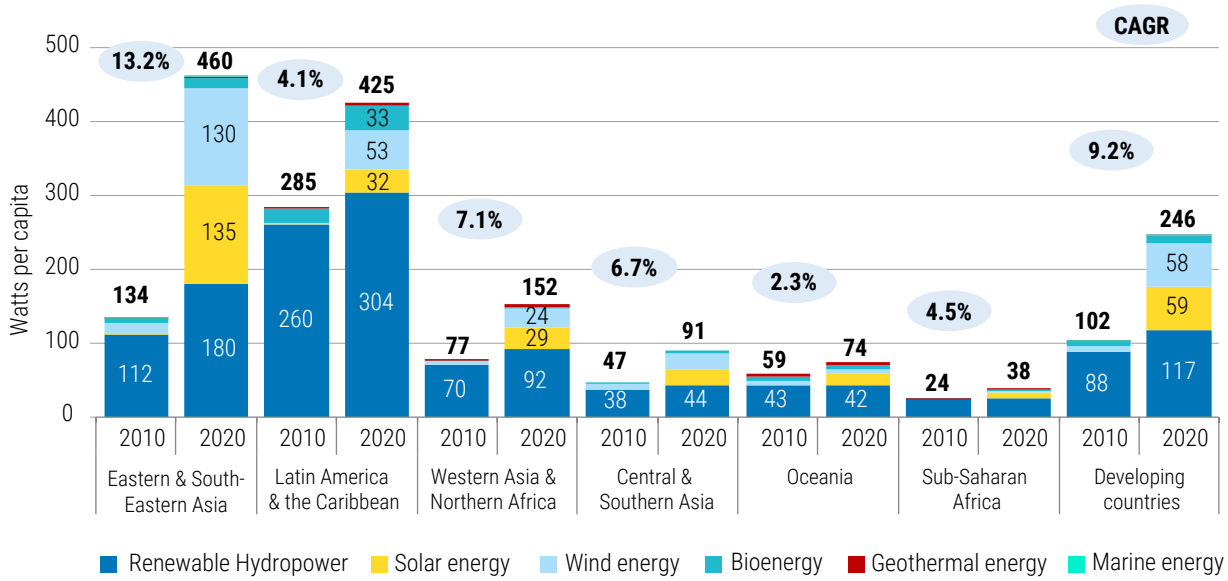
4 The classification of countries included in each group follows the United Nations' M49 regional classification (https://unstats.un.org/unsd/methodology/m49/).

Across regions, growth in renewables-fueled capacity varied over the past ten years. In Eastern and South-Eastern Asia, capacity grew from 134 to 460 watts per capita from 2010 to 2020. Much of this staggering growth was due to additions of wind and solar power. The three countries in the region showing the most growth are Lao PDR, China, and the Republic of Korea.

In Latin America and the Caribbean capacity increased 49 percent, from 285 to 425 watts per capita, the chief components being wind energy (35 percent), hydropower (32 percent), and solar energy (22 percent). Renewables-fueled capacity increased the most in Paraguay, Uruguay, and the Falkland Islands.

Western Asia and North Africa and Central and Southern Asia almost doubled their per capita capacity during 2010–20, mostly because of solar and wind power (at 7.1 percent and 6.7 percent CAGR respectively). Countries in Oceania and Sub-Saharan Africa are lagging, with per capita capacity having grown 25 percent and 56 percent, respectively, over the period.

Figure 3.14 • Growth in renewable electricity capacity per capita by technology across regions, 2010–20



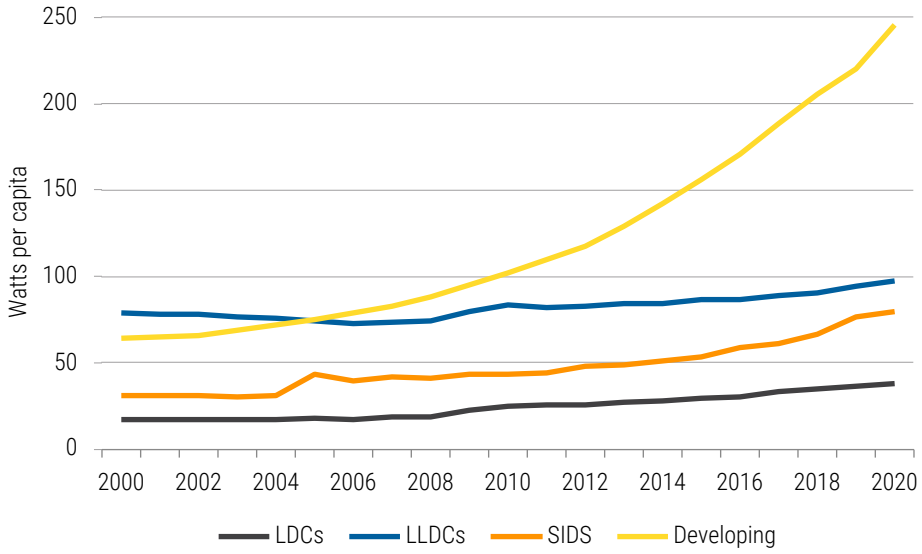
Source: International Renewable Energy Agency (IRENA, 2021b)

Global and regional numbers mask worrying disparities across country groups, with those most in need lagging behind, even in comparison with other developing countries. While developing countries as a whole expanded renewable capacity by 9.5 percent annually in the last five years, Small Island Developing States (SIDS); Least Developed Countries (LDCs); Landlocked developing countries (LLDCs) had lower growth (8.3 percent, 5.2 percent and 2.4 percent, respectively) (figure 3.15). At current annual growth rates, it would take LDCs and LLDCs almost 40 years and SIDS almost 15 years to reach a level of deployment similar to the average 2020 level of developing countries.

Since 2015, SIDS have grown more dynamically than the other country groups, but even their rate of growth is not enough to cover an ever-increasing gap between them and the rest of developing countries, which stood at 168 watts per capita in 2020.

Much attention is needed to raise the ambition of renewable capacity deployment across regions so as not to lock in unsustainable and polluting energy choices and create stranded assets. Closing geographic gaps in the deployment of renewables-based capacity will require tailored policies and investment measures to ensure a fair, just, inclusive, and comprehensive energy transition in the long-term.

Figure 3.15 • Renewable capacity per capita by special groups, 2000–20



Source: International Renewable Energy Agency (IRENA, 2021b)

Following the United Nations' High-Level Dialogue on Energy in 2021, the UN secretary-general advanced a global roadmap of milestones toward achievement of SDG 7, including the decarbonized energy made possible by renewable capacity (box 3.3).

BOX 3.3 • A global roadmap of milestones toward renewables-powered capacity

Following the High-Level Dialogue on Energy in September 2021 (see box 1.1), UN Secretary General António Guterres laid out a global roadmap of milestones to a radical transformation of energy access and transition by 2030, while also contributing to net zero emissions by 2050 (UN 2021a; UN 2021b).

The roadmap emphasizes the importance of rapidly transitioning to decarbonized energy systems, noting that deployment of renewable energy is lagging, particularly in transport, industry, and heating and cooling.

Building on a set of thematic reports, the document sets out two milestones specific to energy capacity powered by modern renewables. The two milestones are to double capacity globally by 2025 and to triple it by 2030.

In addition, a number of compacts were announced in October 2021 on the sidelines of the dialogue. They included private sector investment commitments amounting to 719 GW of renewables-fueled capacity as well as aspirations for another 4,534 GW through catalytic partnerships.

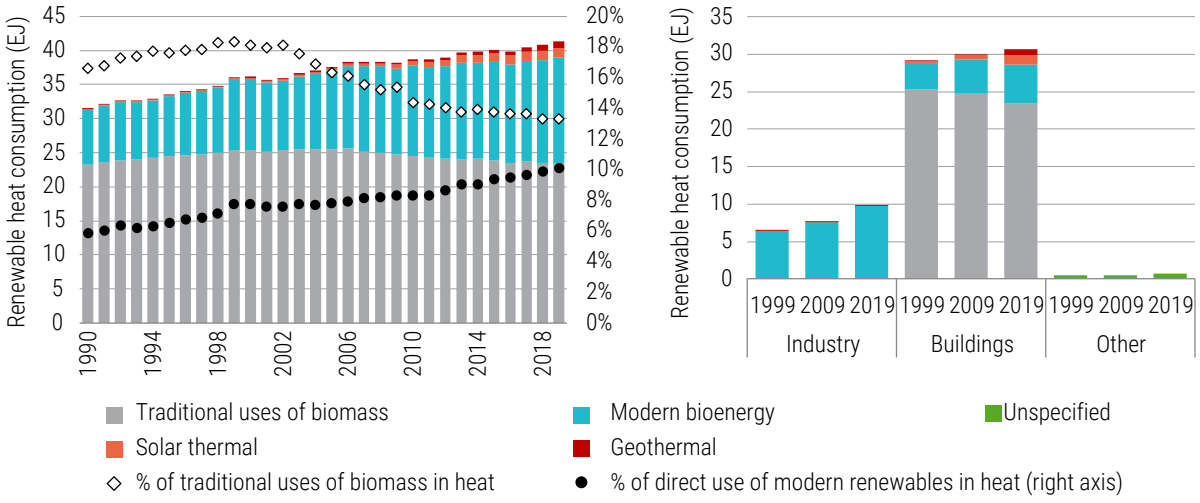
HEAT

Heat is the largest energy end use worldwide, accounting for half of global final energy consumption (176 EJ). Industrial processes are responsible for about half of the total, followed by space and water heating in buildings. Uses in agriculture, mostly for greenhouse heating, round out the total.

With coal, gas, and oil meeting more than three-quarters of global heat demand, the sector remains heavily fossil-fuel dependent. The traditional uses of biomass still account for more than 13 percent (23 EJ) of global heat consumption and even grew by 0.2 percent from 2018 to 2019 (figure 3.16), in line with growth in total heat consumption (+0.3 percent). Excluding these traditional uses of biomass and ambient heat harnessed by heat pumps,[5] on which limited data is available, direct renewables-based heat consumption increased by 2.4 percent from 2018 to 17.8 EJ in 2019. This represented only 10.1 percent of total heat consumption, however, less than two percentage points higher than ten years earlier.

Despite its dominant share in final energy consumption, heating receives limited policy attention and support. Greater ambition and much stronger policy action are needed to progress toward the targets of SDG 7.1 and SDG 7.2. Transitioning away from fossil fuels and inefficient and unsustainable uses of biomass will require combining substantial improvements in energy efficiency, energy conservation, and materials efficiency with rapid deployment of renewable heat technologies.

Figure 3.16 • Renewable heat consumption by source and sector, 1990-2019



Source: International Energy Agency (IEA, 2021a) and United Nations Statistics Division (UNSD, 2021).
Note: Indirect consumption of renewable heat through renewable electricity is not represented on this figure.

Bioenergy accounts for about 87 percent (15.4 EJ) of direct modern uses of renewables for heat,[6] following a 2.1 percent increase between 2018 and 2019, spread equally across industry and the buildings sector. Industry is responsible for a little less than two-thirds of modern bioenergy use, most of which is concentrated in subsectors producing biomass residues on-site such as wood, pulp and paper, and sugar and ethanol.

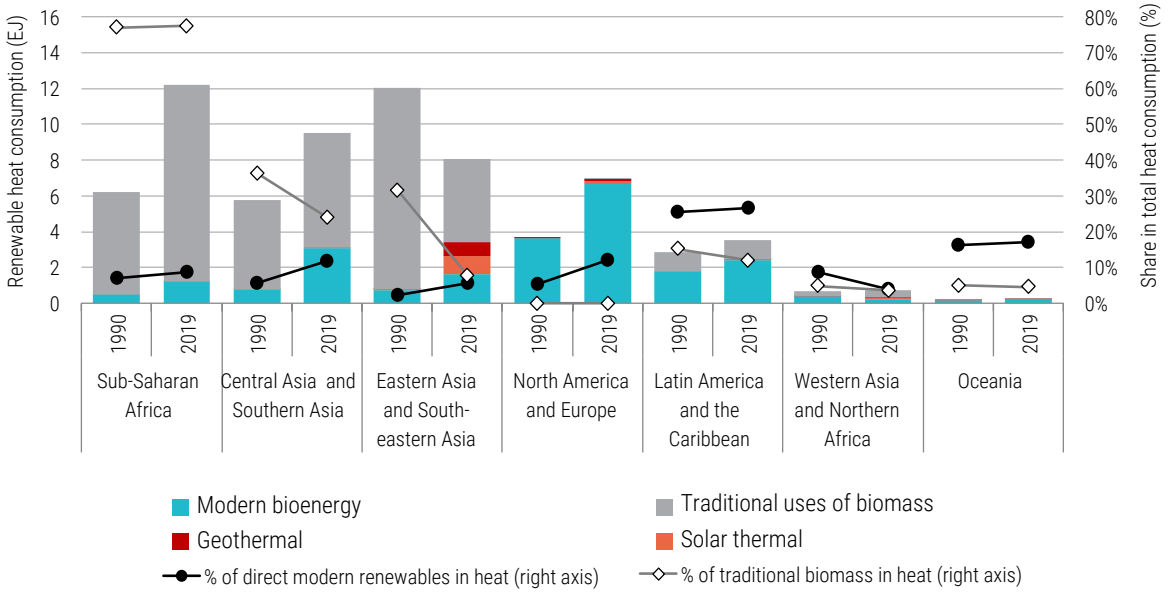
5 The rapid spread of heat pumps over the last decade is making ambient heat an increasingly important heat source, although its importance globally is difficult to estimate because data are unavailable for some markets. For lack of sufficient data, this report does not account for it, although ambient heat can be credited as a renewable source.

6 Renewables also contribute to heat supply indirectly through renewable electricity used for heating and district heat networks. Accounting for these indirect uses, and excluding ambient heat harnessed by air-source heat pumps, renewable electricity is actually the second-largest modern renewable heat source after bioenergy—and the fastest-growing one. It accounted for almost half of the increase in total (direct and indirect) modern renewable heat consumption in 2018, owing to the combination of increasing penetration of renewables in the power sector and electrification of heat in the form of electric heat pumps and boilers. The buildings sector is the locus of most electricity consumption for heat.

Global **solar thermal** consumption increased by 1.2 percent in 2019, accounting for 7.8 percent (1.4 EJ) of modern uses of renewables for heat; yet it still met less than 1 percent of total final heat demand. The large majority of solar thermal consumption corresponds to small domestic solar water heaters, although significant untapped potential remains for large-scale systems for district heating and industrial applications, which continue to develop as a niche market. China continued its marked lead in solar thermal development, accounting for 72 percent of global solar thermal capacity in operation and 71 percent of newly installed capacity in 2019 (IEA-SHC, 2020). However, China's market for solar thermal has dropped steadily since 2014 owing to reduced construction activities, phaseouts of incentives, and market competition with other technologies, such as heat pumps and rooftop solar PV. In this context, the emerging hybrid photovoltaic-thermal technologies could play an important role. Solar thermal cooling offers great potential to decarbonize space cooling, especially since the greatest demand coincides with the highest solar irradiance, reducing the load of electric air conditioners at peak times during summer months (IEA 2021c). However, solar thermal cooling remains a niche technology.

Geothermal heat consumption grew by more than 9 percent in 2019, representing 5.4 percent (1 EJ) of modern uses of renewables for heat. About 60 percent of geothermal heat worldwide is harnessed by ground-source heat pumps (Lund and Toth 2020). The large majority of applications are in the building sector, with bathing, swimming, and space heating (primarily via district heating) being the most prevalent end uses. China is responsible for four-fifths of global geothermal heat consumption, followed by Turkey and the United States, which together account for another 10 percent. China's growth in geothermal heat consumption in 2019 represented more than 130 percent of the global increase in geothermal heat use, more than making up for the 7 percent year-on-year decline recorded in the United States.

Figure 3.17 • Renewable heat consumption by region, 1990 and 2019



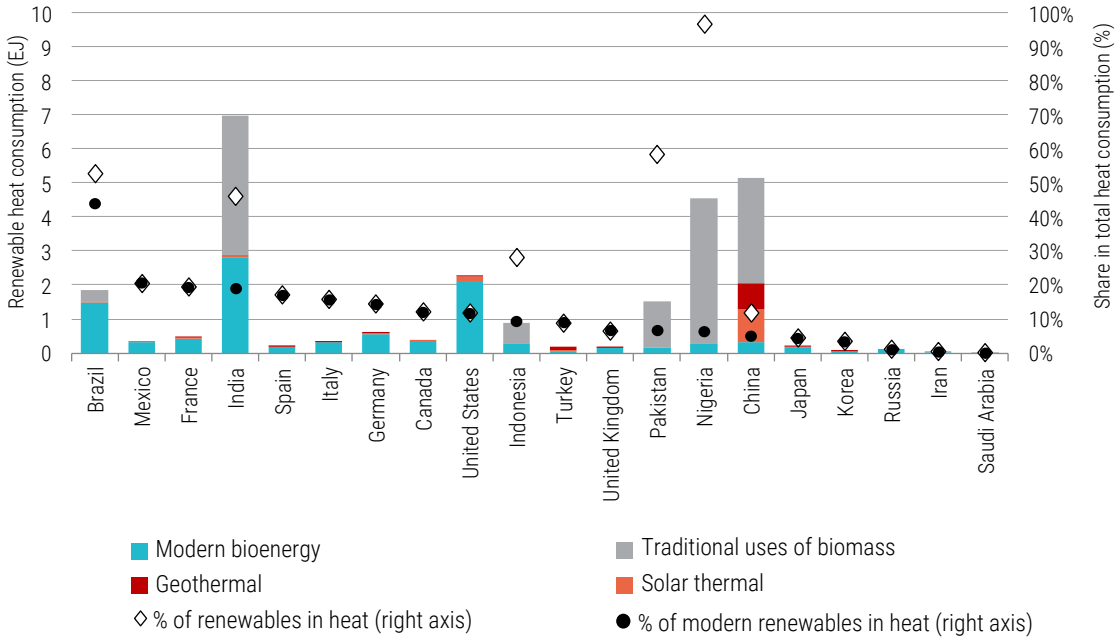
Source: International Energy Agency (IEA, 2021a) and United Nations Statistics Division (UNSD, 2021).
Note: Indirect consumption of renewable energy through electricity for heat is not included in this figure.

Traditional uses of biomass are primarily concentrated in Sub-Saharan Africa and Asia (figure 3.17), with—in descending order—Nigeria, India, China, Ethiopia, Pakistan, Democratic Republic of Congo and Indonesia together accounting for two-thirds of global consumption (figure 3.18). Despite a slightly declining trend since 2006, traditional uses of biomass in 2019 remain, globally, at a level similar to that of 1990. Trends differed across regions and countries over the last decade, with significant declines in Eastern Asia, especially

in China, as well as in Indonesia and Vietnam. That improvement was partly erased on the global scale by population-driven increases in Sub-Saharan Africa—especially in Nigeria, Ethiopia, Uganda and Democratic Republic of the Congo, as well as in Pakistan.

The United States, China, and India together represented more than three-quarters of the global increase in modern renewable heat consumption from 2010 to 2019. Together with Brazil, they were responsible for 46 percent of global heat demand and accounted for almost half of modern renewable heat consumption globally in 2019. This result is shaped by the sizable consumption of bioenergy in the pulp and paper industry and for residential heating in the United States; extensive use of bagasse in the sugar and ethanol industry in Brazil and India; and notable deployment of solar thermal water heaters and geothermal heat in China. Europe is responsible for another quarter of global modern renewable heat consumption, owing to the deployment of residential wood and pellet stoves and boilers (e.g., in France, Germany, Italy) and the use of biomass in district heating (e.g., the Nordic and Baltic countries, Germany, France, Austria). In addition, although not quantified in this report, the growing consumption of renewable electricity through electric heaters and heat pumps in China, the United States, and the European Union contributed indirectly to renewable heat consumption (IEA 2019).

Figure 3.18 • Renewables in heat consumption in top 20 countries with the largest total final energy consumption, 2019



Source: International Energy Agency (IEA, 2021a) and United Nations Statistics Division (UNSD, 2021).
Note: Indirect consumption of renewable energy through electricity for heat is not included in this figure.

TRANSPORT

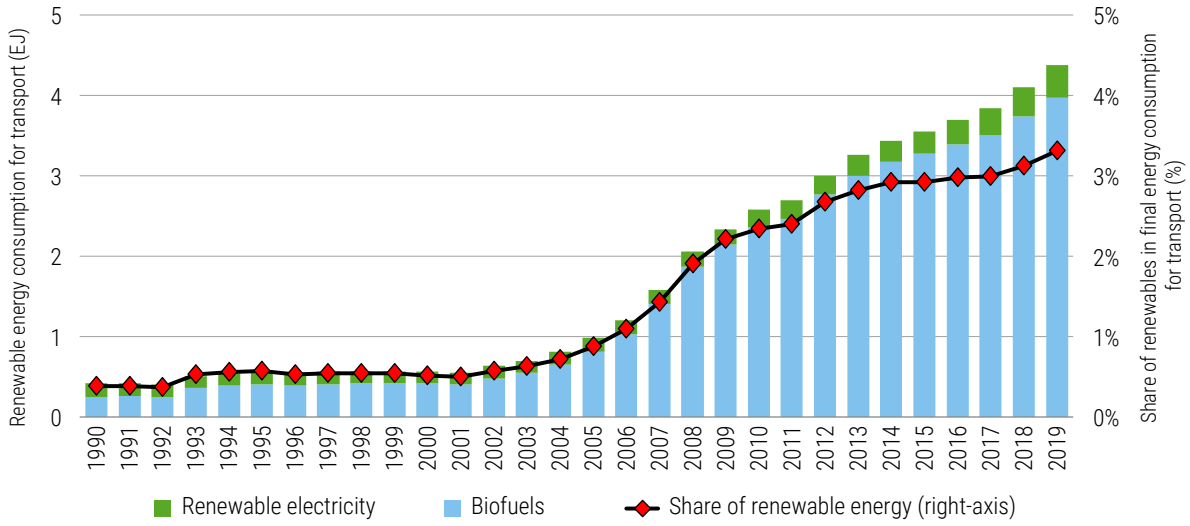
Renewable energy in transport grew by 0.27 EJ in 2019 (+7 percent), the fifth-largest annual growth in absolute terms since 1990 and the largest since 2012 (figure 3.19). Renewable electricity expanded by 0.03 EJ, the second-largest expansion since 1990; biofuels expanded by 0.24 EJ. These advances translated into a slight increase in the share of renewable energy in transport, which reached 3.6 percent in 2019 from 3.4 percent in 2018. However, this increase in share was not enough to contain nonrenewable energy consumption in transport, which grew by 0.35 EJ from 2018 to 2019.

Most of the renewable energy consumed for transport in 2019 came in the form of liquid biofuels (91 percent), mainly crop-based ethanol and biodiesel blended with fossil transport fuels. Most of the remainder was from renewable electricity.

The expansion of biofuels in 2019, driven primarily by country-level policies, was the largest annual increase since 2009. Biodiesel represented about half of the increase, while biogasoline (ethanol) contributed 20 percent. More than half of the growth occurred in Brazil and Europe together—primarily ethanol growth in the former and biodiesel growth in the latter. In Brazil, bioethanol demand grew by 10 percent from 2018 levels to a record 32 billion litres a year. Three main factors contributed to this growth. First, domestic transport fuel demand was 6 percent greater in 2019 than in 2018. Since Brazil's government requires ethanol blending, any increase in gasoline demand also increases ethanol demand. Second, low international sugar prices drove sugar mills to maximize higher-value ethanol production. Third, relatively low ethanol prices compared with gasoline also increased domestic demand for ethanol beyond required blending levels. Because Brazil has a large flex-fuel vehicle fleet, owners can decide whether to fill up with ethanol or a gasoline-ethanol blend, depending on prices. In Europe, country-level policies to meet the Renewable Energy Directive pushed up demand by 6 percent, primarily from biodiesel growth.

Renewable electricity used in vehicles and trains grew 0.03 EJ in 2019 but still accounted for just 9 percent of renewable energy use in transport. A good part of the growth is traceable to an expanding electric vehicle fleet. The number of electric vehicles on the road grew from 5.1 million in 2018 to 7.1 million in 2019 (IEA 2021d). In addition, the electricity powering these vehicles is increasingly coming from renewable sources: the renewable share of total electricity use in transport climbed from 20 percent in 2010 to 26 percent in 2019.

Figure 3.19 • Biofuels and renewable electricity consumed for transport and share of renewables in total final energy consumption for transport, world, 1990-2019



Source: International Energy Agency (IEA, 2021a) and United Nations Statistics Division (UNSD, 2021).

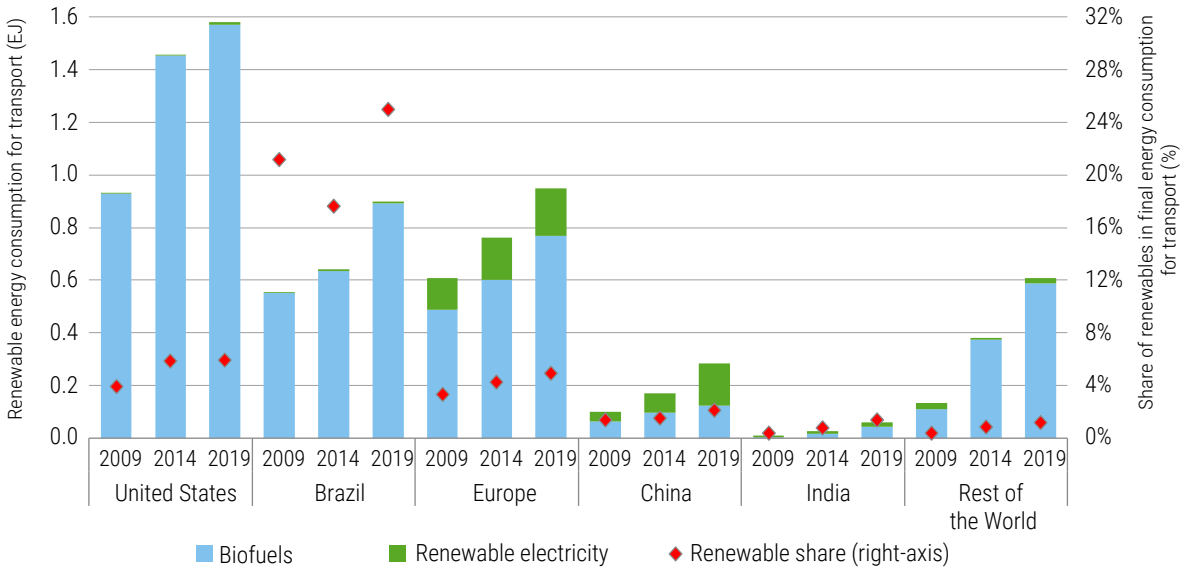
Over the last decade, the amount of renewable energy used in transport has nearly doubled, but its share has increased by only 1.2 percentage points. The growth is thanks to country-level policies to expand biofuels use, electrify transport, and increase the share of renewable sources in electricity generation. Biofuel policies have driven the largest growth in renewable energy, while renewable electricity has played a smaller, but growing, role. Despite many successes at the country level, these policies have just barely kept pace with rising fossil fuel demand, which explains the small share increase. This situation highlights the need for more holistic policy approaches that complement renewable energy uptake in transport with energy efficiency and conservation strategies, in particular through a major modal shift toward more sustainable transport modes, such as public transport systems and active mobility (e.g., biking, walking).

From a regional and country perspective, the United States, Brazil, and Europe account for almost 80 percent of renewable energy used in transport, but shares are growing in other regions as well (figure 3.20). In the United States and Brazil, biofuels—primarily crop-based ethanol and biodiesel—make up 99 percent of the renewable energy used in transport. In Europe, by contrast, renewable electricity represents 19 percent of the renewable energy consumed in transport. Between 2009 and 2019, policies have raised renewable shares in transport from 3.9 percent to 5.9 percent in the United States, and from 3.3 percent to 4.9 percent in Europe.

In China, renewable energy in transport grew by nearly 70 percent between 2014 and 2019 with renewable electricity accounting for three-quarters of the expansion. In that country, renewable electricity represented more than half of all renewable energy used in transport in 2019, owing to electrification of transport efforts in parallel with increasing shares of renewables in power generation, while policy support for biofuels remained modest. In 2019, 47 percent of the global light-duty electric vehicle fleet was in China, as well as more than a half-million electric buses. In India, biofuel support policies have more than doubled renewable energy use in transport since 2014.

Expanding the share of renewable sources in the energy used for transport will require a combination of policies that support biofuels (while ensuring that all feedstock supplies meet the most stringent sustainability criteria), nonbiogenic renewable fuels, transport electrification, and renewable electricity generation, as well as active mobility, transit efficiency (efficiency by design) and phaseouts of fossil fuels. These policies must be steadily but rapidly increased in countries that already have them and rapidly spread to those countries where they are not yet found.

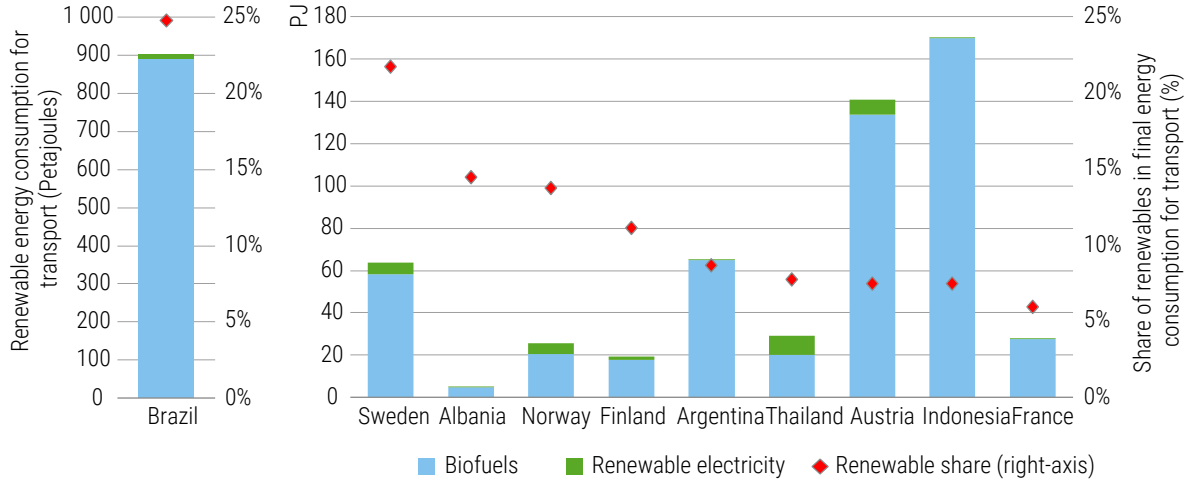
Figure 3.20 • Renewable energy consumption for transport, by source, and renewables' share of total energy consumed for transport, selected countries, 2009, 2014, and 2019



Source: International Energy Agency (IEA, 2021a) and United Nations Statistics Division (UNSD, 2021).

In 2019, Brazil, Sweden, Albania, Norway, and Finland, all achieved renewable energy shares above 10 percent (figure 3.21).

Figure 3.21 • Top ten countries by renewable energy share in transportation, 2019



Source: International Energy Agency (IEA, 2021a) and United Nations Statistics Division (UNSD, 2021).

POLICY INSIGHTS: THE ENERGY TRANSITION AND THE HYDROGEN FACTOR

Switching to renewables-based energy systems is one of the key conditions to address climate and energy challenges. Yet not all sectors or industries can easily switch from fossil fuels to direct uses of renewables or renewables-based electricity. Hard-to-electrify and therefore hard-to-abate sectors include steel, cement, chemicals, long-haul road transport, maritime shipping, and aviation. The petrochemical industry is the major consumer of hydrogen, most of which is produced from fossil gas and coal (IRENA 2022b).

Renewables-based hydrogen, so-called "green hydrogen", has been receiving significant attention recently as a solution to decarbonise these sectors. This momentum is also reflected in its increasingly prominent role in energy scenarios (IEA 2021e; IRENA 2022c), as well as in the growing number of over 30 countries that have adopted or are elaborating hydrogen strategies (IRENA 2022d).

Given the potential role of green hydrogen in the energy transition and its relation to SDG 7, ensuring an integrated policy approach is essential to inform its use, avoid unnecessary dispersion in electrifiable sectors, guarantee the "green" nature of the molecules involved, and create an enabling environment. The rest of this section sketches a policy framework for harnessing the potential of green hydrogen.

Green hydrogen policy making can be broken down into four pillars (IRENA 2020a).

PILLAR 1: DEVELOPING A STRATEGY

Recently announced hydrogen strategies are the results of a long process and mark the beginning of new waves of policies. The drafting process clarifies "why hydrogen," "why here," and "why now." It then defines how the strategy will guide research, industry efforts, and early demonstration programmes. An early outcome of the process is an integrated plan setting forth the activities needed to assess the potential for hydrogen, identify the short-term actions needed to advance deployment, articulate the research areas with the highest priority, and identify the applications where demonstration projects are most needed. The government must set targets, present concrete policies, and evaluate their coherence with existing energy policies.

PILLAR 2: SETTING PRIORITIES

Green hydrogen is no silver bullet for all end uses, and policy makers must set clear priorities for its use. Despite its great promise, it is just one of several possible decarbonization alternatives that must be weighed when setting priorities.

The production, transport, and conversion of hydrogen all require energy, resources, and significant investment (ESMAP 2020; IRENA 2020b; IRENA 2021c). As a result, its extensive use may not be in line with the requirements of sustainable development and a decarbonized world, in which energy consumption and capacity deployment will have to be carefully managed. In particular, the production of green hydrogen requires dedicated renewable energy that could be used for other end uses. Indiscriminate use of hydrogen therefore carries the danger of missed opportunities for the energy transition. In many cases, direct electrification using renewable energy, along with energy efficiency, will be a faster and more cost-effective solution to decarbonizing the energy system than green hydrogen.

A central role for green hydrogen is in industrial applications where hydrogen is already used, such the production of ammonia and methanol. The demand from these facilities is large enough to enable economies of scale in production and infrastructure, making the shift to green hydrogen even more cost-effective compared with distributed applications, for which distribution infrastructure can be very costly.

In the transport sector, the rapidly declining cost and technological improvement of batteries have made electric vehicles an attractive solution. However, for international aviation and shipping, two transport subsectors where fewer viable decarbonization alternatives exist, green hydrogen could play an important role.

While it is possible to identify global priority-setting metrics (IRENA 2022b), energy and industrial sector conditions differ greatly between countries and must be taken into account when setting national and regional priorities.

PILLAR 3: BUILDING A TRACKING SYSTEM

Molecules of green and grey hydrogen are identical. For this reason, once hydrogen has been produced, a tracking system is needed to provide consumers and governments with the origin and quality of the hydrogen. Tracking systems are not only necessary to track the origin and attributes of the energy used across the value chain, they are also key for the development of a national, regional, and international green hydrogen market. Setting up these tracking systems will require compliance with technical considerations and regulations to ensure that they provide accurate, reliable, and transparent information about the hydrogen produced and consumed.

From a technical standpoint, green hydrogen tracking systems should provide transparent information on the origin of the electricity used in the production of the hydrogen, as well as on the greenhouse gas content involved in each unit of green hydrogen produced.

From a regulatory perspective, green hydrogen tracking systems should comply with temporal and geographical correlations and additionality requirements to ensure that the hydrogen certified has been produced from renewable energy.

PILLAR 4: PUTTING PLACE A GOVERNANCE SYSTEM AND ENABLING POLICIES

As production of green hydrogen accelerates, the policies that drive the transition must not only cover the deployment, but also its integration into the broader energy system and its wider interactions with economic and social systems. Against this background, concrete actions for policy makers to consider include:

- *Seeking advice from civil society and industry.* Civil society and industry can provide advice to policy makers on proposals, actions, and amendments to the strategy, depending on progress.
- *Implementing measures to maintain industrial competitiveness and create local opportunities.* For example, the Border Carbon Adjustment Mechanism proposed in the European Union and the EU/US agreement on low-carbon steel and aluminium are example of policies to protect industries that are coping with high carbon prices as they transition toward greener solutions (IRENA 2022b).
- *Identifying local economic activity and job-creation opportunities.* Analyses of the employment impact of green hydrogen within an economy have been done in all first-mover countries, where they are used to inform national strategies. This was the case, for example, in the Netherlands (CE Delft 2018; Government of the Netherlands 2020).

- *Introducing hydrogen as a component of energy security.* Not all countries enjoy the presence of large reserves of fossil fuels, meaning that the continuity of supply is governed by ever-changing international political and economic factors. The production of green hydrogen, on the contrary, can occur in any part of the world where renewable energy is available. Hydrogen is also hard to cartelize, lowering the risk to potential importing countries (IRENA 2022d).
- *Ensuring access to financing.* Policy makers can provide direct dedicated funding from state budgets or assist access to private capital by creating guidelines or new facilitating mechanisms. In jurisdictions where the push for the energy transition is strong, there is the possibility that green hydrogen investors may find themselves with multiple possible financing streams and public funds. Applying for them may create a bureaucratic barrier. Creating a one-stop shop for finance can be a solution to reduce the burden, connecting stakeholders with funding sources for green hydrogen projects, while allocating funds more efficiently (WEF and IRENA 2021).
- *Collecting statistics.* Hydrogen currently is not specifically included in national energy balances. Including it as a separate product in national commodity and energy balances, along with specific transformation processes for electricity-powered synthesis plants, would enable greater depth of analysis and insight on renewable energy end uses and efficiency evaluations. In this respect, UNSD is leading a revision of the Standard International Energy Product Classification (UNSD 2018, chapter 3). One goal of that revision is to improve the handling of hydrogen as an energy product.

APPENDIX: METHODOLOGY

Table 3A.1 • Definitions

Renewable energy sources	Total renewable energy from hydropower, wind, solar photovoltaic, solar thermal, geothermal, tide/wave/ocean, renewable municipal waste, solid biofuels, liquid biofuels, and biogases.
Renewable energy consumption	Final consumption of direct renewables plus the amount of electricity and heat consumption estimated from renewable energy sources.
Direct renewables	Bioenergy, solar thermal, and geothermal energy.
Total final energy consumption	The sum of final energy consumption in the transport, industry, and other sectors (equivalent to total final consumption minus nonenergy use).
Traditional uses of biomass	Biomass uses are considered traditional when biomass is consumed in the residential sector in countries outside the Organisation for Economic Co-operation and Development. International Energy Agency statistics divide traditional uses of biomass into primary solid biomass, charcoal and unspecified primary biomass, and waste. Traditional consumption/use of biomass is a "conventional proxy" because it is estimated rather than measured directly.
Modern renewable energy consumption	Total renewable energy consumption minus traditional consumption/use of biomass.

METHODOLOGY FOR MAIN INDICATOR

The indicator used in this report to track SDG 7.2 is the share of renewable energy in total final energy consumption (TFEC). Data from the International Energy Agency (IEA) and United Nations Statistics Division (UNSD) energy balances are used to calculate the indicator according to the formula:

$$\%TFEC_{RES} = \frac{TFEC_{RES} + \left(TFEC_{ELE} \times \frac{ELE_{RES}}{ELE_{TOTAL}}\right) + \left(TFEC_{HEAT} \times \frac{HEAT_{RES}}{HEAT_{TOTAL}}\right)}{TFEC_{TOTAL}}$$

The variables are derived from the energy balance flows: TFEC = total final energy consumption as defined in table 3A.1; ELE = gross electricity production; HEAT = gross heat production. Their subscripts correspond to the energy balance products.

The denominator is the TFEC of all energy products (as defined in table 3A.1). The numerator, renewable energy consumption, is a series of calculations defined as the direct consumption of renewable energy sources plus the final consumption of gross electricity and heat estimated to have come from renewable sources. In order to perform the calculation at the final energy level, this estimation allocates the amount of electricity and heat consumption deemed to come from renewable sources based on the share of renewables in gross production.

METHODOLOGY FOR ADDITIONAL METRICS BEYOND THE MAIN INDICATOR

The amount of renewable energy consumption can be divided into three end uses based on the energy service for which the energy is consumed: electricity, heat, and transport. These are calculated from the energy balance and are defined as follows:

Electricity refers to the amounts of electricity consumed in the production of electric and heat services. Electricity used in the transport sector is excluded from this aggregation. Electricity used to produce heat is not included because official data at the final energy service level is unavailable.

Heat refers to the amount of energy consumed for heat-raising purposes in industry and other sectors. Because official data at the final energy service level are unavailable, electricity used for heat is not included in this aggregate. Therefore, the heat category here is not equivalent to the final energy end use service. It is also important to note that in this chapter, in the context of an "end use," heat does not refer to the same quantity as the energy product, "Heat," in the energy balance used in the formula above.

Transport refers to the amounts of energy consumed in the transport sectors. Most of the electricity used in the transport sector is consumed in the rail and road sectors, and, in some cases, pipeline transport. The amount of renewable electricity consumed in the transport sector is estimated as the product of the annual shares of renewable sources in gross national electricity production and the amount of electricity used nationally in the transport sector.

METHODOLOGY FOR INDICATOR SDG 7.B.1

Indicator 7.B.1 measures the installed renewable energy-generating capacity in developing countries (in watts per capita) by dividing the maximum installed capacity at year-end of power plants that generate electricity from renewable energy sources by the country's population in mid-year. Data from IRENA are used to calculate the indicator.

IRENA's electricity capacity database contains information on installed electricity generating capacity, measured in MW. The dataset covers all countries and areas from the year 2000, records whether the capacity is on-grid or off-grid, and is divided into 36 renewable energy types that together make up the six main sources of renewable energy. For the population part of this indicator, IRENA uses population data from the United Nations World Population Prospects (UN 2021c).

More detail on the methodology used in this chapter can be found in the SDG indicators metadata repository (https://unstats.un.org/sdgs/metadata/files/Metadata-07-0b-01.pdf).

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