Public Financial Support for Renewable Power Generation and Integration in the G20 Countries

IISD REPORT

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September 2024

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Executive Summary

In 2023, the G20 committed to "pursue and encourage efforts to triple renewable energy capacity globally" (G20 Leaders, 2023), a pledge taken up by 198 parties later that year. The world is not on track to achieve the goal despite record capacity additions in 2023. Currently, global renewable power capacity is projected to increase by only 2.5 times by 2030. Achieving the tripling target will require total investments—public and private—in renewable power capacity, grids, and storage to at least double from 2023 levels of around USD 1.1 trillion per year.

Government intervention is needed to bridge the investment gap, including direct investments and policies that crowd in additional private investment and address barriers to deployment. The role of the public sector is particularly critical in emerging market and developing economies (EMDEs), where public sources account for half of all renewable energy spending, compared to 20% in advanced economies. Some interventions will have limited impacts on budgets, but increased public funding is likely to be needed for three reasons. First, a pathway consistent with keeping global warming to 1.5°C requires a rapid energy transition: renewables need to be cheaper than both new and existing fossil fuel electricity generation. Second, governments need to invest in electricity networks to manage increasingly distributed and variable energy sources. Third, the absence of correct pricing of the social costs of fossil fuels (climate and health impacts) means that governments need to channel investment toward cleaner technologies.

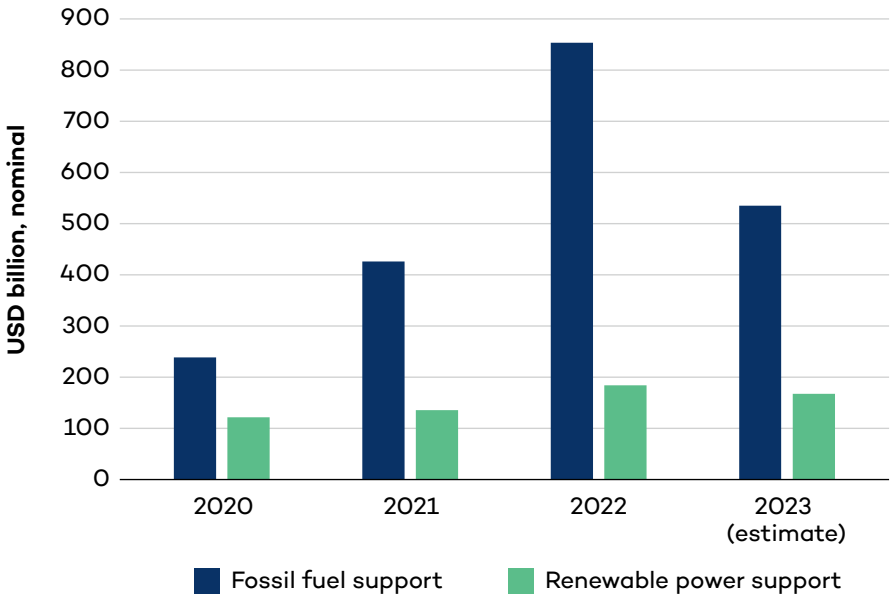
Government spending and other forms of actual support to renewable energy is a blind spot at the international level. The International Renewable Energy Agency (IRENA) calculated the most recent global estimate of renewable energy subsidies using 2017 data. Other organizations track government commitments, public lending, and types of policy measures. To help address the knowledge gap, the International Institute for Sustainable Development has developed an inventory of public financial support for renewable energy generation and integration (grids and storage) by G20 governments. Quantitative data on spending was gathered, where available, for 2020 to 2023 (with the European Union data for 2023 being an estimate). G20 countries are important because they accounted for around 90% of total renewable power capacity installed globally in 2023 and have the resources to assist lower-income countries in increasing deployment.

The inventory reveals that G20 governments provided at least USD 168 billion in public financial support[1] for renewable power in 2023, less than one third (31%) of G20 subsidies for fossil fuels in 2023 (Figure ES1). Advanced (G20) economies and China accounted for 95% of renewable power support, higher than their share of G20 GDP (85%)[2] and population (51%). Many EMDEs, especially outside the G20, risk being left behind in the clean energy transition.

[1] "Public financial support" includes subsidies and other kinds of transfers to the energy sector arising from government policies.

[2] The country grouping is based on the International Monetary Fund classification in its 2023 *World Economic Outlook*.

Figure ES1. Comparison of G20 renewable power support with fossil fuel subsidies, 2020–2023



Most public support identified in the inventory was for generation, with grids and storage accounting for 10% of total allocations (we only included support for grids that was explicitly linked to renewable power). Where disaggregated data was available, support was directed to solar (20%), wind (12%), biogas, biomass, geothermal, and tidal (10%) energy. However, these are underestimates, because 46% of all support targeted multiple renewable power technologies or did not specify.

Assuming current investment and support patterns remain consistent to 2030, investment in G20 countries may need to roughly double to achieve the tripling target, and public support may also need to double to around USD 336 billion per year to facilitate this. This would still be lower than current G20 subsidies for fossil fuels (USD 535 billion in 2023). Learning rates and economies of scale will continue to bring down renewable power costs and reduce the need for public financial support. However, this could be balanced by possible increases in costs, including higher costs of capital, trade protection and domestic content requirements, as well as ongoing expansion and modernization of grids. Wealthy G20 governments could also step up to support the energy transition in lower-income EMDEs, where project costs are typically higher. Some of the required funds can be obtained by shifting public financial flows away from fossil fuels, particularly from new fossil fuel production. A portion of fossil fuels subsidy savings would also be needed to help vulnerable groups cope with price changes or job losses.

In 2023, in G20 countries, every dollar in public support for renewable power and integration leveraged over 6 dollars of investment.[3] Globally, the ratio of subsidies to total investment in

[3] In 2023, global investment in renewable energy generation, storage, and grids was USD 1,151 billion, 90% of which was in G20 countries (USD 1,036 billion).

fossil fuels was around 3:4 in 2023—meaning that every 3 dollars of government subsidies (for production and consumption) only leveraged one additional dollar of investment.

Policies take time to put in place, and renewable power projects take time to build, connect to the grid, and be commissioned. Action is needed now to keep the 2030 target in reach. G20 governments can act by

- aligning their renewable capacity targets with the tripling renewable energy pledge and developing detailed implementation strategies, including for any additional public financial support;
- articulating these plans in their revised nationally determined contributions;
- redirecting public support from fossil fuels to renewable power in a socially responsible way; and
- advanced economies increasing development assistance and international public financing to accelerate deployment of renewable power in EMDEs, including through an ambitious new climate finance goal.

The benefits of increasing support to renewable power extend beyond achieving climate goals. It will also increase access to energy and clean cooking solutions, especially in areas with limited grid infrastructure. It will ensure that economies benefit from a source of energy that is price-stable and less geopolitically risky than fossil fuels, has fewer negative impacts and lower social costs associated with pollution and climate change, and establishes new jobs and industries compatible with sustainable development.

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Abbreviations and Acronyms

CFD	contract for difference
COP	UN Climate Change Conference
CPI	Climate Policy Initiative
EMDE	emerging market and developing economies
EU	European Union
IEA	International Energy Agency
IISD	International Institute for Sustainable Development
IRA	Inflation Reduction Act
IRENA	International Renewable Energy Agency
GEST	Government Energy Spending Tracker
OCI	Oil Change International
PV	photovoltaic
R&D	research and development
RISE	Regulatory Indicators for Sustainable Energy
SOE	state-owned enterprise
WTO	World Trade Organization

1.0 Introduction

Constraining global temperature increases to 1.5°C above the pre-industrial level will require transforming the world's energy systems from depending on fossil fuels to relying on low-carbon sources. The world needs at least 11 terawatts (TW) of installed renewable energy capacity by 2030—roughly triple current levels—to be consistent with modelling scenarios that keep climate change within 1.5°C (International Energy Agency [IEA], 2024a; International Renewable Energy Agency [IRENA] et al., 2023). In 2023, the G20 made a commitment to "pursue and encourage efforts to triple renewable energy capacity globally" (G20 Leaders, 2023), and at the 28th UN Climate Change Conference (COP 28) in 2023, 198 parties pledged to triple global renewable energy capacity and double energy efficiency by 2030 (UN Climate Change, 2023).

The world is not on track to triple renewables despite record new renewable power capacity additions in 2023 (IRENA, 2024a). Based on current policies and market conditions, only solar photovoltaic (PV) is on track to triple renewables; currently, global renewable energy capacity is projected to increase by only 2.5 times by 2030 (IEA, 2024a; IRENA, 2024b). Achieving the tripling target will require total investments—public and private—in renewable energy capacity, grids, and storage to at least double from 2023 levels of around USD 1.1 trillion per year, even assuming the costs of renewable energy fall further (IEA, 2024a). IRENA's estimate of total investments in new renewable energy capacity, grids, and other flexibility solutions required for the tripling goal is even higher at USD 1.9 trillion (IRENA et al., 2023). Most of this investment is expected to occur in G20 countries, which accounted for around 90% of global renewable energy power capacity in 2023 (IEA, 2024b). For emerging market and developing economies (EMDEs) other than China, renewable energy investment needs to quadruple to achieve the target established at the COP 28, given the currently low levels of renewable energy investment in most EMDEs (IEA, 2024b).

On average, globally, most investment in energy is by the private sector (around 65%).[4] The public sector has a larger role in EMDEs, where public sources account for half of all renewable energy spending, compared to 20% in advanced economies (IEA & International Finance Corporation, 2023). Governments can increase renewable power capacity through direct public investment and by putting in place policies that crowd in private investment and remove barriers to deployment, including renewable energy integration, particularly in EMDEs outside China, where investment is lagging (IEA & International Finance Corporation, 2023). IEA modelling found that addressing key challenges to renewable energy deployment through policy action led to an increase in the growth of renewables of 21%, substantially reducing the gap between the current trajectory and that needed to achieve the tripling target (IEA, 2024b).

A range of policy levers is available, some of which have limited impacts on government budgets, including streamlining permitting and approval processes, land zoning, and providing

[4] Currently, around 45% of energy sector investments worldwide are made by private companies, around 35% by governments and state-owned enterprises, and 20% by households (IEA, 2024d).

a stable policy environment (IEA, 2024a). However, many interventions require public financial support, such as grid investments, tax exemptions, and concessional finance.

Government support has been critical to encouraging the innovation, technological improvements, and economies of scale that drove down costs and led to the widespread deployment of many renewable energy technologies, notably solar PV and onshore wind (Nemet, 2019; Roser, 2020). Despite the known relationship between support and deployment, the authors are not aware of any estimates of the scale of additional public support needed to achieve the tripling renewable energy target. In fact, government spending and other forms of actual support to renewable energy is a blind spot at the international level. IRENA made the most recent global estimate of renewable energy subsidies using 2017 data (Taylor, 2020). Other organizations track government commitments (not actual spending), public lending, and types of policy measures (see Appendix A).

To help address the knowledge gap on renewable energy support, the International Institute for Sustainable Development (IISD) has developed an inventory of G20 government support measures for renewable power generation and integration (grids and storage), including quantitative data on spending where available. Accurate data on renewable power support is important to

- understand the relationship between support and deployment,
- assess the amount and form of support needed to achieve the tripling renewable energy target,
- track the changing types of public financial support in response to falling renewable power costs for some technologies and an increasing emphasis on domestic manufacturing, and
- track progress on shifting support from fossil to renewable power.

2.0 Methods

The inventory includes public money allocated for national-level policy measures in the period from 2020 to 2023 in G20 countries (including all European Union [EU] members but excluding EU-wide packages). Data was sourced primarily from national budgets, compilations of data by government or non-government organizations, and reliable media sources. The inventory focuses primarily on subsidies as defined by the World Trade Organization (WTO) (Box 1).

Box 1. Subsidy and public financial support: Definitions

We use the definition of subsidy agreed upon by WTO members: a financial contribution by a government that provides a benefit to a recipient (Agreement on Subsidies and Countervailing Measures, 1994). The WTO's definition includes direct budgetary transfers (e.g., grants), indirect transfers through price and regulatory support (e.g., price setting above or below market rates), government revenue foregone (e.g., tax incentives), underpricing of government goods and services (e.g., free land or water), and transfer of risk (e.g., environmental remediation).

Public financial support has a broader scope, including subsidies, spending by state-owned enterprises (SOEs), and lending by public financial institutions. In this report, the term "support" is used because the extent of the "financial contribution by a government" is unclear for some measures. For example, feed-in tariffs (FITs) generally collect funds from electricity consumers or producers and use these funds to pay renewable power suppliers an above-market price for electricity (a cross-subsidy). However, in some cases, governments top-up the FIT with budget allocations. The policy undeniably confers a benefit to the recipient as price support but also might include budgetary transfers.

Measures and government spending data were collected for

- renewable power generation technologies (biomass, geothermal, hydro, solar, tidal, and wind);
- grids and battery storage when spending was explicitly linked to renewable power integration;
- manufacturing of renewable generation or storage technologies; and
- other programs explicitly dedicated to increasing renewable power integration or manufacturing capacity, such as developing a skilled workforce or improving permitting processes.

The inventory is the product of a collaboration by the authors, consultants, and colleagues in partner organizations. Notably, for the EU, we used Enerdata's extensive database on renewable energy subsidy measures, and for Brazil, we used the Instituto de Estudios Socioeconómicos inventory of energy subsidies. The researchers were able to derive data in the original language for most countries, given that language skills included English, German,

Hindi, Indonesian, Korean, Japanese, Portuguese, Mandarin, Spanish, and Russian. Only Arabic and Turkish were not present.

Data for 2023 for the EU was not available at the time of writing; therefore, the results are preliminary. The average for 2020 to 2022 was used to estimate the 2023 data for these economies. This is reasonable because, for all large support providers in this group (Germany, France, and Italy), the average was within 8% of the 2020, 2021, and 2022 amounts (i.e., the support level has been consistent over these years).

The inventory may underestimate total support for the following reasons:

1. Budget reporting on renewable power support was poor in some countries.
2. We did not disaggregate financial support under general policies that targeted both fossil fuels and clean power (such as electricity consumption subsidies).
3. The study did not attempt to quantify measures where data was not available.
4. Subnational programs and other forms of public financial support, including capital spending by SOEs and public financing, were excluded due to resource constraints.[5]

Despite these limitations, the inventory substantially adds to the knowledge on renewable power support by providing a detailed list of policies and a recent detailed estimate of actual government spending on renewable power. The inventory provides the data to draw broad conclusions about renewable power support trends in recent years. Further analysis would be helpful to disaggregate support measures by deployment and manufacturing, which would require a more detailed assessment of each policy's objectives (particularly tax exemptions).

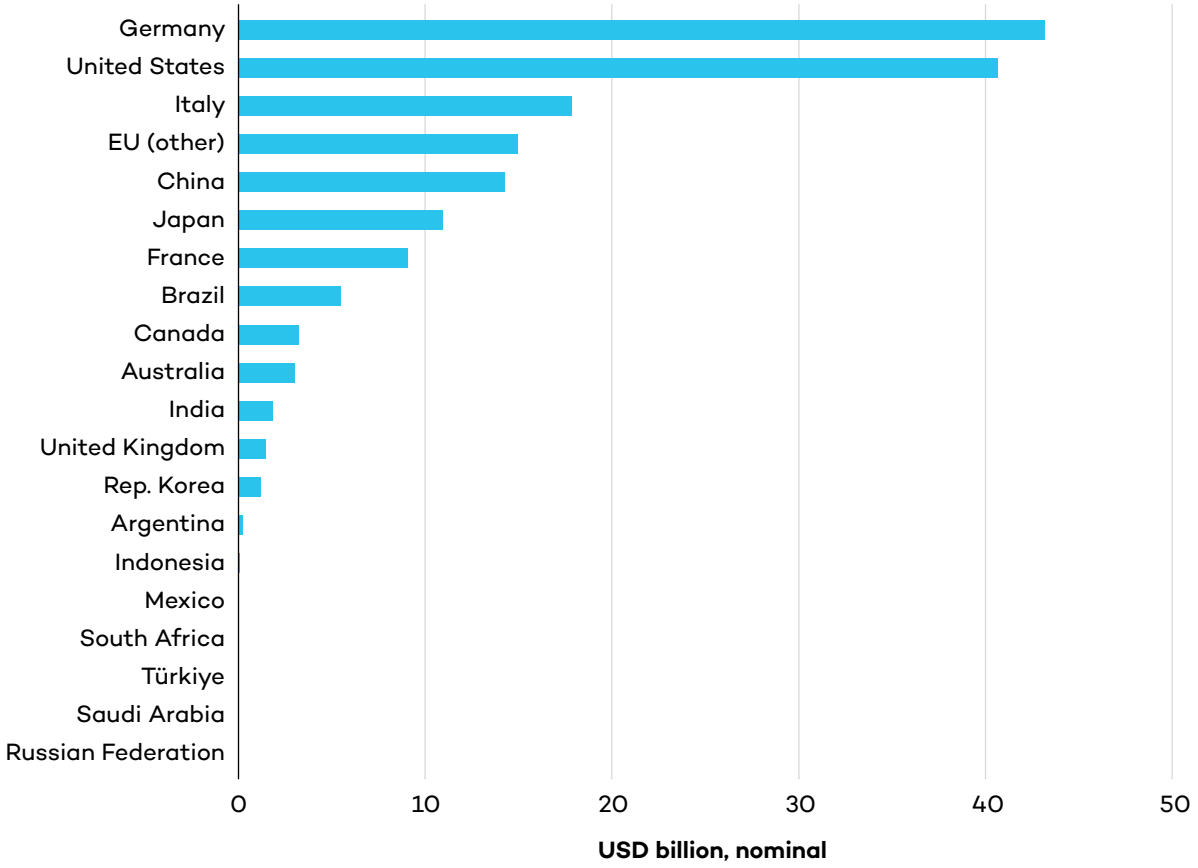
[5] International public finance data on clean energy is available in the Energy Finance Database (OCI, 2024).

3.0 Results

The inventory of renewable power public financial support identified 491 measures in the G20 economies (including all EU members) that were in force at some point in the period from 2020 to 2023. Of these, 69% (339 measures) had quantified data from government budgets. Around a third of all identified measures (152 measures) were not quantified.

In 2023, G20 support for renewable power totalled at least an estimated USD 168 billion,[6] close to the 2020 to 2023 average of USD 152 billion per year. Germany and the United States provided around half of the public support to renewable energy in 2023 (Figure 1). Other EU countries and China were the next largest supporters of renewable energy. Brazil, China, and India provided the largests amount of support to renewable power in G20 EMDEs. The low level of support in other EMDEs is undoubtedly the cause of the inequitable distribution of new renewable capacity deployment.

Figure 1. Estimated support for renewable energy in G20 economies, 2023



Note: Support for renewable energy in 2023 in EU countries was estimated from previous years. Regarding the use of nominal values: We did not convert to real (inflation-adjusted) values because (i) government national accounts tend to use nominal values on an annual basis and (ii) it was complex to account for inflation properly across the 16 currencies.

Source: Authors.

[6] Estimate for EU countries.

Between 2020 and 2023, total support provided by G20 countries was at least an estimated USD 610 billion. The EU provided over half of this cumulative support (USD 340 billion), with Germany and Italy among the biggest supporters (USD 172 billion and USD 71 billion, respectively). In the same period, China provided USD 118 billion, and the United States provided USD 74 billion for renewable power.

Table 1. Support for renewable power generation and integration in G20 countries by economy, 2020–2023 (USD billion, nominal)

Economy	2020	2021	2022	2023 (estimate)
Germany	46,456	42,634	40,479	43,190
United States	10,896	10,766	12,128	40,651
Italy	17,762	18,813	16,892	17,822
EU (other)	16,818	16,792	11,321	14,977
China	13,383	25,689	65,299	14,263
Japan	-	2,964	22,332	10,939
France	8,815	9,841	8,557	9,071
Brazil	1,880	1,896	1,262	5,500
Canada	17	1,042	896	3,272
Australia	2,422	146	175	3,011
India	1,321	1,334	2,124	1,859
United Kingdom	-	-	47	1,442
Rep. Korea	1,240	1,367	1,474	1,240
Argentina	740	204	565	225
Indonesia	137	-	-	94
Mexico	36	930	25	15
Türkiye	-	2,000	1,400	-
Russian Federation	-	-	-	-
Saudi Arabia	-	-	-	-
South Africa	-	-	-	-

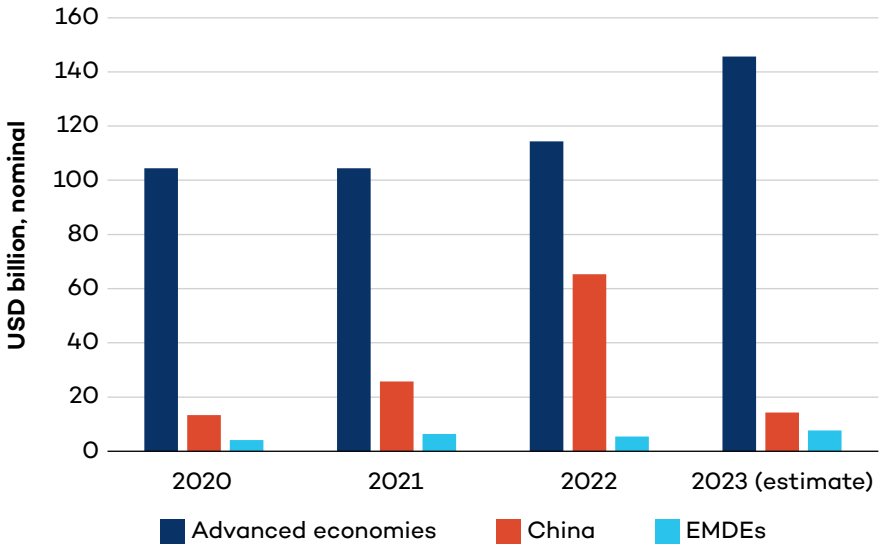
1,000–19,999 USD billion 20,000–39,999 USD billion > 40,000 USD billion

Note: China's support levels in 2022 were unusually high due to a lump sum transfer to pay down debt to renewable power producers from previous years. Regarding the use of nominal values: We did not convert to real (inflation-adjusted) values because (i) government national accounts tend to use nominal values on an annual basis and (ii) it was complex to account for inflation properly across the 16 currencies.

Source: Authors.

Advanced economies and China accounted for 95% of support (Figure 2). Among other EMDEs, Brazil and India were the most significant contributors during this period; they provided around USD 10.5 billion and USD 6.6 billion, respectively, between 2020 and 2023. Brazil and India's rapid deployment of renewable power in recent years appears to have occurred with relatively low public financial support compared to advanced economies and China, although capacity additions are still lower.

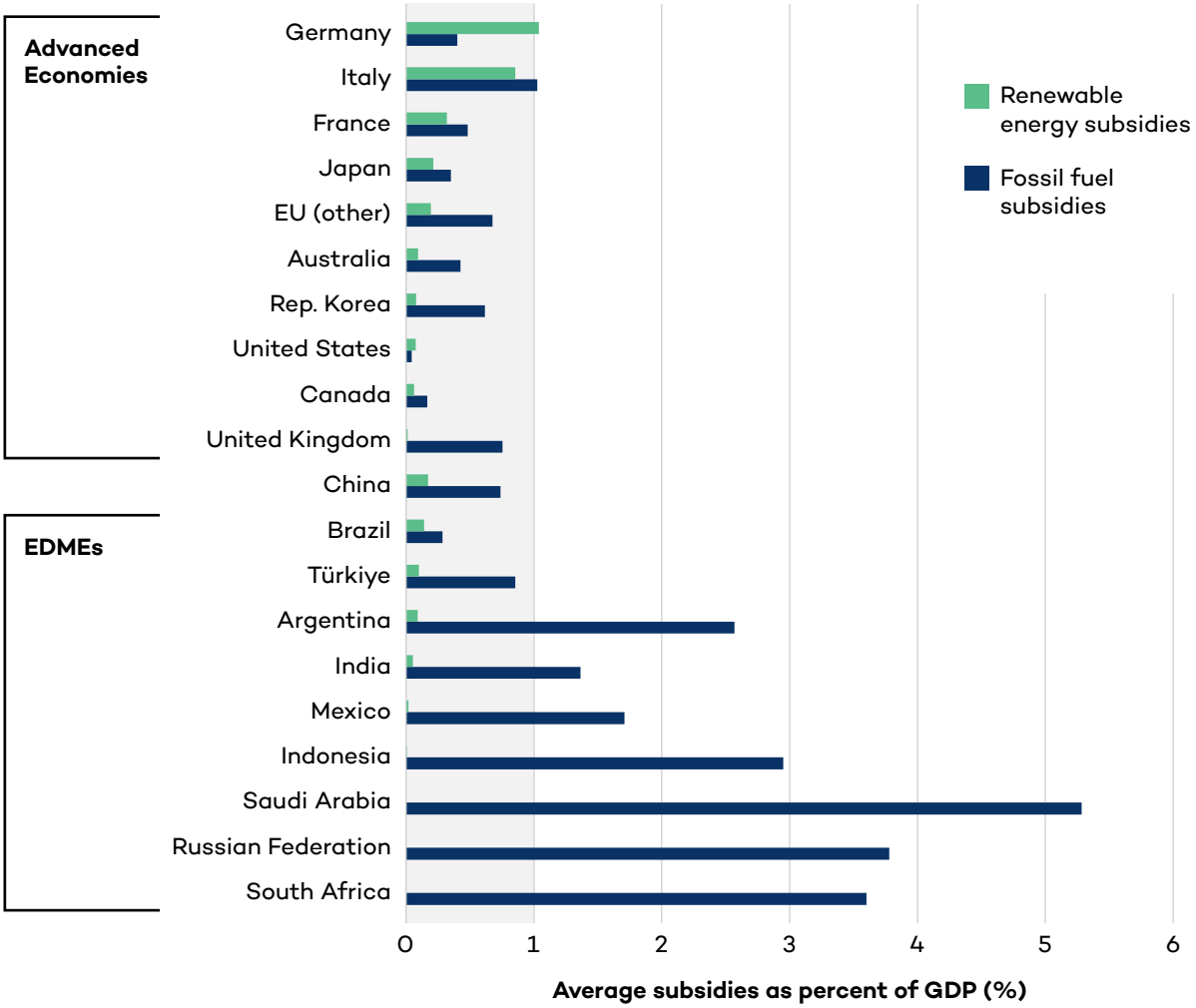
Figure 2. A comparison of support for renewable power generation and integration between advanced economies, China, and EMDEs, 2020–2023



Source: Authors.

For all G20 countries, between 2020 and 2023, government support for renewable power was, on average, less than 1% of their domestic GDP, except for Germany (Figure 3). Germany was the largest supporter of renewable power in 2023 in terms of both absolute value (USD 43 billion) and percentage of GDP, and the only G20 economy with higher support for renewable power than fossil fuel subsidies as a percentage of GDP. Among EMDEs, Brazil had the highest spending as a percent of GDP (even excluding biofuels for transport), exceeding China and several advanced economies, including Australia and Canada. Values of zero (Russia, Saudi Arabia, and South Africa) should be interpreted carefully: support may have occurred but not identified or quantified in the inventory.

Figure 3. Estimated support for renewable power generation and integration compared with estimated fossil fuel subsidies in G20 economies in 2023 as a percentage of GDP



Source: Authors; World Bank, 2024.

3.1 Support for Renewable Power by Type

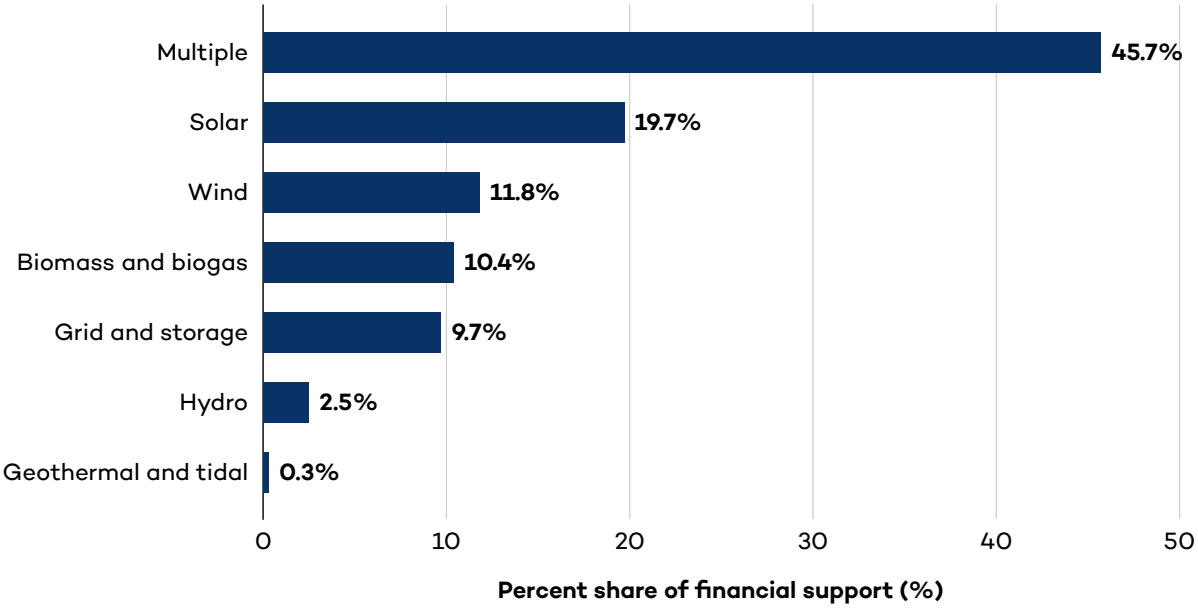
In terms of distribution across recipient technologies, G20 governments directed 104 of the 491 identified measures specifically toward supporting solar energy. Biomass and biogas were the second most supported, with 76 measures. Seventy support measures specified wind energy, both onshore and offshore, as the target technology, while hydropower was targeted by 32 measures. Geothermal, tidal energy, and grid and storage technologies were each specified in 16 measures.

In terms of absolute support values, solar and wind energy benefited the most in G20 countries (where disaggregated data was available). Solar received around USD 103 billion, accounting for 20% of total 2020–2023 support, while wind received around USD 62 billion or nearly 12% of the total renewable power support during this period. Biomass and biogas

received about USD 54 billion from G20 countries. Additionally, over USD 50 billion (10%) was allocated to grid development, upgrades, and storage.

The allocation to individual renewable power technologies is likely underestimated due to a lack of disaggregated data. Over the 2020–2023 period, 177 of 491 measures, amounting to around USD 240 billion (46% by value), did not provide disaggregated data on the technology or type of support provided. Therefore, these policies were assumed to support multiple renewable power technologies or the renewable power sector more broadly (including research and development [R&D] and manufacturing). Data disaggregated by technology was not available for the EU for 2023 (which was an estimate of the 2020-2022 support). In addition, many subsidy types were not quantified and therefore were not included in this analysis.

Figure 4. Distribution of financial support for renewable power generation and integration in G20 countries in the 2020–2023 period (% based on the value of support measures)



Note: "Multiple" refers to policies that were not disaggregated by technology type. Wind includes both onshore and offshore.

Source: Authors.

3.2 Support for Renewable Power by Beneficiaries

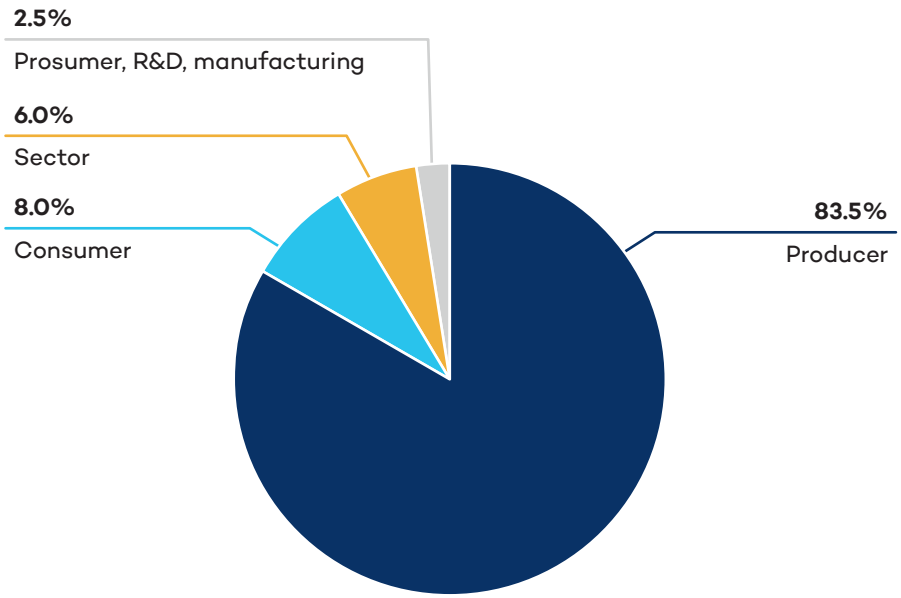
Support for renewable power mainly targeted production. Of all 491 support measures, 348 targeted renewable producers and developers, for a total of USD 439 billion (83% of 2020–2023 support). Consumers received around USD 42 billion (8% of 2020–2023 support), mostly through tax incentives for heavy industries or surcharge reductions for industrial consumers. Sector-wide support, including infrastructure like grid, storage, and R&D, received around USD 31 billion, or 6% of total support.

A unique beneficiary of renewable power support is prosumers—those who produce and consume their own energy, including households, energy communities, and industrial parks.

The inventory found that this segment received about USD 9 billion in the past 3 years in the forms of direct subsidies for rooftop solar installation, grants for micro-grid and off-grid communities, and tax exemptions for household electricity sellers, with expectations for increased support in the future. However, this is likely to be an underestimate, given that many support policies are not disaggregated by technology or end user.

Where information was readily available, the inventory did disaggregate manufacturing as a subset of producer support. However, we are not confident that all manufacturing measures have been identified and appropriately tagged in the inventory. The objectives of some tax expenditures and grants were not clearly articulated: further analysis of the data is needed to assess the extent of manufacturing support and how this has changed over time.

Figure 5. Support for renewable power in G20 countries by beneficiary type as a percentage of total support in the 2020–2023 period



Note: "Sector" includes support measures that benefit both consumers and producers such as grids and storage.

Source: Authors.

3.3 The Ratio of Public Support for Renewable Power to Investment

In this section, we aim to assess the relationship between public financial support and investment by comparing the quantity of support estimated in the inventory with annual investment estimates from other organizations. An important caveat is that annual support typically includes a larger amount for investments in renewable power made in previous years from measures such as FITs, contracts for difference (CFDs), and power purchase agreements (i.e., renewable power generators are reimbursed for electricity supplied due to investments that might have been made a decade ago). This is particularly true for China and Europe, where most of the renewable power subsidies are concentrated. Thus, even if investment in renewable power dropped to

zero next year, many subsidies would continue for the project life. However, the relationship remains indicative of the amount of support being provided by governments for a given level of renewable power capacity and investment in their energy system.

In 2023, global investment in renewable power generation, storage, and grids amounted to USD 1,151 billion, 90% of which was in G20 countries (IEA, 2024d). Therefore, the G20 share was around USD 1,036 billion. In the same year, our inventory found that G20 governments spent USD 168 billion supporting renewable power, grids, and storage. Therefore, the G20 ratio of support to investment was around 1:6.

The ratio would change slightly if other forms of public financial support were included, such as public financing and investments by SOEs. International public financing for renewable power in G20 countries totalled, on average, USD 33 billion per year in the period from 2020 to 2022 (Oil Change International [OCI], 2024). At the time of writing, there was no international dataset on domestic public financing (OCI is developing one) or capital investments by SOEs for renewable power, grids, and storage. Some government allocations to large renewable power SOEs—like China's FIT top-up payments—are included in the inventory but not necessarily capital investment. A separate project assessing capital expenditure by SOEs on renewable power, grids, and storage would be valuable.

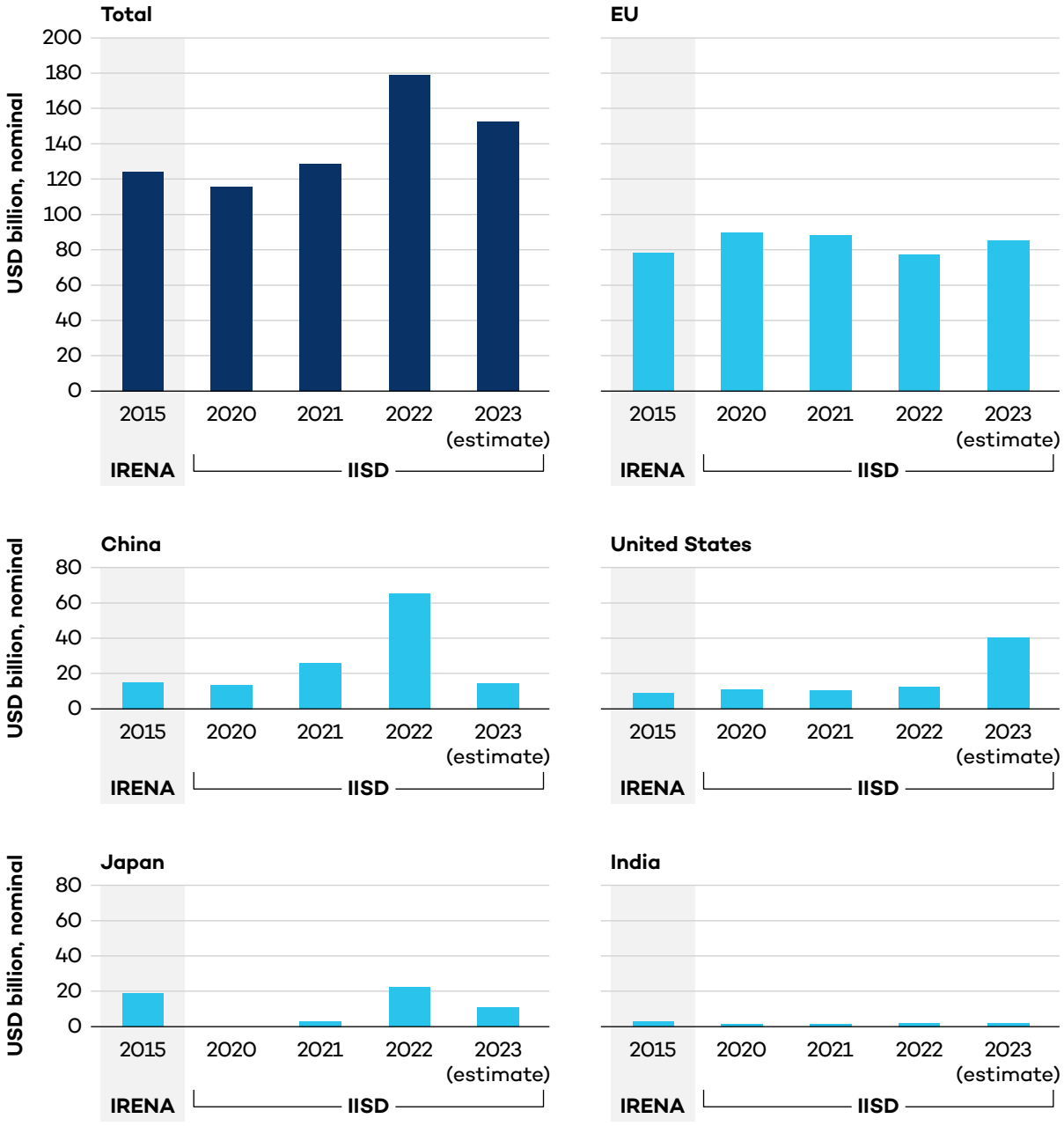
3.4 Comparison With the Results From Other Sources

In 2020, IRENA estimated that global subsidies for renewable power generation were around USD 128 billion in 2015. The EU provided USD 78.4 billion, China provided USD 15.2 billion, Japan provided USD 18.8 billion, the United States provided USD 8.9 billion, India provided USD 2.8 billion, and the rest of the world provided USD 3.7 billion (Taylor, 2020).

IRENA's global estimate for 2015 is similar to this report's estimate for 2020–2023 in G20 countries, despite dramatic increases in renewable power deployment since the IRENA study. There are several reasons for such continuity—most importantly, as renewable power technologies outcompete fossil fuel power on costs, public support needed for installing new renewable capacity has dropped on a per-MW basis. Furthermore, IRENA used a different approach. They used a combination of an inventory approach, where data was available, and a price gap method for estimating the value of FITs and tradable certificates. Also, IRENA did not include grids and storage. The IISD study did not estimate any subsidies, which likely means that the results are a significant underestimate.

The IRENA study projected that total subsidies for renewables could fall to around USD 53 billion by 2030, despite rapid growth in renewable power deployment. This decline in renewable power generation subsidies is attributed to cost-competitiveness being reached in many countries. While we agree that renewable power is becoming more cost-competitive, other factors—such as higher capital costs, concerns about the bankability of renewable power projects due to thin profit margins (Christophers, 2024), and integration costs—will likely make public support necessary going forward, including for grids, storage, system flexibility, and ancillary services. We are not seeing support declining as predicted, but this could be due to different methodologies and scope. See Section 4 for further discussion of the cost influences on renewable power to 2030.

Figure 6. Comparing IRENA's 2015 estimates with IISD inventory data (2020–2023) for renewable energy generation in select G20 countries



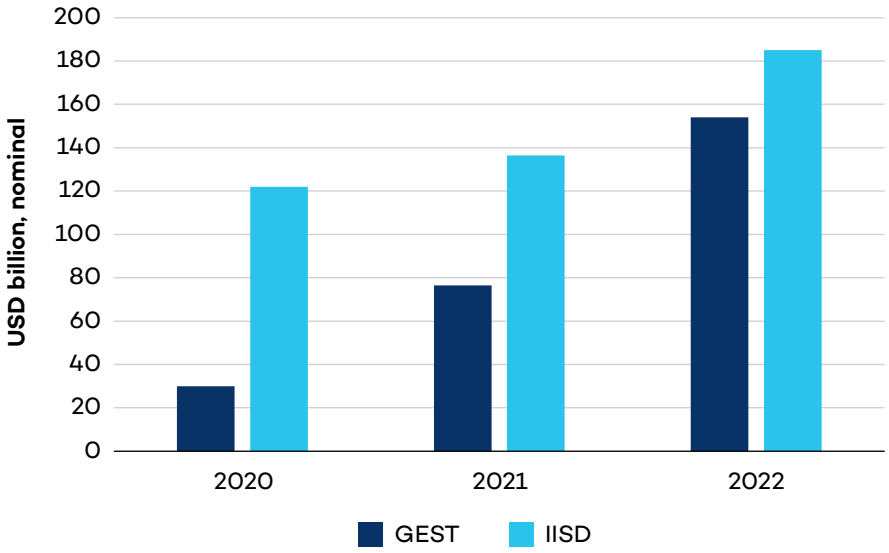
Note: Support for renewable power generation in 2023 in the EU was estimated based on the 2020–2022 average. The 2022 total shows a large jump because China allocated a large budgetary subsidy to clear an earlier debt to renewable power suppliers for unpaid subsidies.

Source: IRENA data: Taylor, 2020; authors.

The IEA also tracks government commitments to renewable energy through its Government Energy Spending Tracker (GEST). The GEST estimated that G20 governments committed around USD 305 billion to renewable power generation, grids, and storage between Q2 2020 and Q2 2023. This estimate is lower than IISD's inventory, which totalled USD 437 billion for the period 2020 to 2022 (only partial GEST data was available for 2023, so we did not

compare data for that year; see Figure 7). The reason for this difference is unclear. The GEST includes all government commitments for renewables and related power infrastructure (i.e., total funding that might be allocated over many years), which is likely to be larger than actual spending each year. However, GEST only tracks new announcements. Therefore, policies that were announced before 2020 may not be included. In addition, some policies are not costed when they are announced, such as some tax exemptions, FITs, or auction tariffs. The costs of these programs are only known in retrospect and therefore may not be included in GEST, but—where available—they are included in the IISD inventory.

Figure 7. A comparison of renewable power commitments in the GEST and IISD's renewable power tracker



Source: IEA, 2023a; authors.

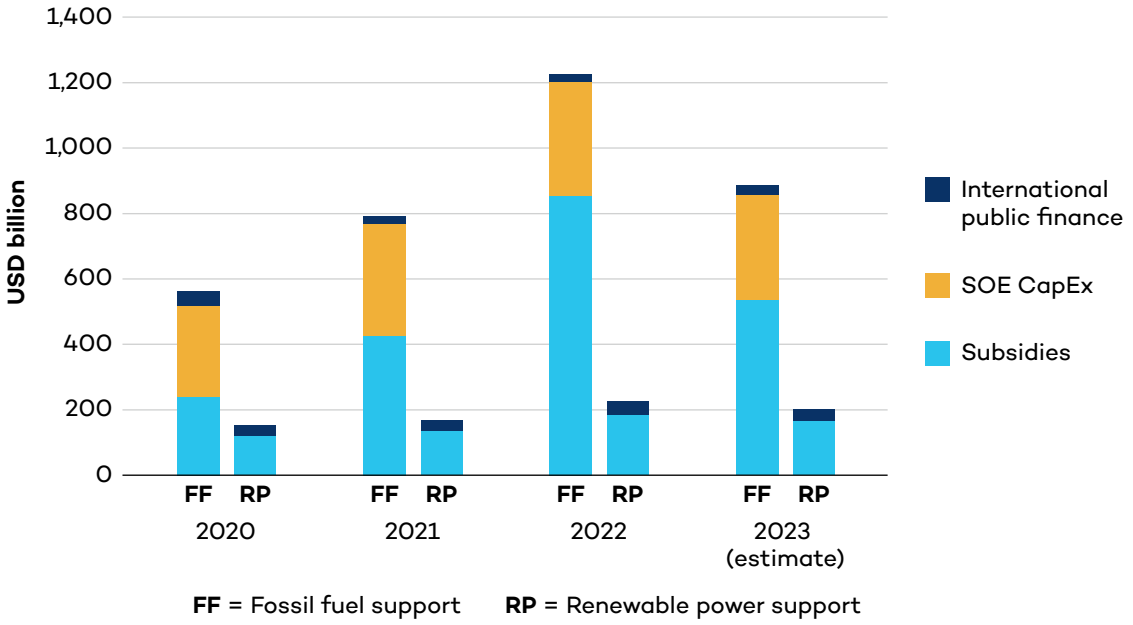
3.5 Comparing Fossil Fuel Subsidies

Additional public financial support to renewable power needs to be considered in the context of the current energy system. In 2023, fossil fuel subsidies were estimated to be USD 535 billion in G20 economies, with the majority (USD 482 billion)[7] being consumption subsidies (e.g., for transport fuels and electricity). Subsidies for fossil fuels were therefore more than three times larger than subsidies for renewable power generation and integration. In addition, around USD 300 billion per year[8] (Laan et al., 2023) in support is provided to fossil fuels through capital investment by SOEs, while international lending contributes USD 43 billion per year in support (OCI, 2024). Total public financial support for fossil fuels in 2023 therefore reached USD 1,125 billion (Figure 8).

[7] The International Monetary Fund's estimates are based on 2022 data (Black et al., 2023).

[8] The 2020–2022 average was USD 306 billion.

Figure 8. Fossil fuel support vs. renewable power support, 2020–2023



Notes: Subsidies for renewables include some support measures where the subsidy component is unclear, such as FITs. Data was not available for capital expenditure by SOEs on renewable power.
Source: Black et al., 2023; Fossil Fuel Subsidy Tracker, 2024; authors.

Figure 8 is not a perfect comparison. International data is not available on capital expenditures by SOEs on renewable power, although it is likely to be much lower than for fossil fuels: power investments by SOEs come mainly from national oil companies (IEA, 2024d). In addition, fossil fuel subsidies include transport (gasoline and diesel), but the IISD inventory did not include biofuels due to a lack of global data on these subsidies. However, the comparison does show that governments are continuing to provide significant support for fossil fuels. Another data gap for both fossil and renewable energy is domestic public financing.

Support for fossil fuels exacerbates climate change and toxic air pollution, with social costs reaching around USD 5 trillion per year (Black et al., 2023). Deployment of renewable energy reduces these social costs while providing price-stable domestic sources of energy that can increase energy security and reduce energy price volatility while delivering sustainable investment and jobs (Birol, 2022; IRENA & International Labour Organization, 2023).

3.6 The Ratio of Fossil Fuel Support to Investment

World investment in fossil fuels totalled USD 1090 billion in 2023 (IEA, 2024d). In the same year, global subsidies for fossil fuels were USD 782 billion, resulting in a ratio of around 3:4. The ratio would be 1:1 if subsidies, SOE investments, and public finance were included (USD 1,125 billion in 2023), meaning that for each dollar of public support, only one dollar was invested in fossil fuels.

4.0 Public Financial Support Needed to Achieve the Tripling Target

This section attempts to broadly estimate additional public financial support that would likely be needed to triple renewable energy capacity by 2030 based on the ratio of support to investment outlined in the earlier section.

The current global investment gap to triple renewable energy is around USD 1 trillion per year to 2030 (Grant et al., 2023). Assuming current investment and support patterns remain consistent for the next 5 years (i.e., most investment and support being in G20 countries), investment in G20 countries will need to roughly double to achieve the tripling target, and public support will need to double to around USD 336 billion per year to facilitate this goal. This would still be less than G20 subsidies for fossil fuels in 2023 (USD 535 billion) (Black et al., 2023).

The estimate does not consider many factors. Factors that might lower support costs in the G20 include

- a larger share of investment occurring in non-G20 countries;
- falling costs of solar and wind power and battery storage as learning curves and economies of scale continue to bring down component costs; and
- significant volumes of renewable power capacity (notably, solar PV) that were contracted at support high costs since 2010 will come to an end by 2030, reducing subsidy needs.

On the other hand, several factors could lead to cost increases in the G20, including

- that part of the investment in low-income economies will need to come from wealthy G20 countries as donor support and international public financing;
- higher costs of capital and the need to upgrade grid infrastructure in lower-income EMDEs;
- higher project costs associated with high levels of renewable energy penetration as some countries move beyond "low hanging fruit" to more challenging installations (such as more expensive or remote locations, including offshore), increased need for grid flexibility and auxiliary services, and R&D for new solutions, such as long duration storage; and
- higher costs arising from policies encouraging domestic manufacturing (local content requirements and trade restrictions).

Detailed modelling would be required to accurately estimate the level of support needed to achieve the tripling energy target. Ideally, the global estimate would be built up from the national level, given the wide variations in costs and targets. A current study by IISD used economic modelling to assess the likely costs and macroeconomic implications of achieving India's national targets for battery storage, electric vehicles, solar PV, offshore wind, and green hydrogen. The study is expected to be published in late 2024. There are no plans at present to extend the modelling to the global scale.

5.0 The Changing Nature of Public Financial Support

Governments are changing the types of support provided. FITs were instrumental in accelerating the deployment of solar PV and wind in China and Germany, resulting in rapid cost reductions through economies of scale and technological advancement (Roser, 2020).

Table 2. Overview of national-level public financial support measures for renewable power in the top 12 countries providing support in G20 countries

◐ Previously present ● Present

	FIT*	FIP, CFD, or similar	Auction/ tendering	Tax incentives	Net metering	Renewable Energy Portfolio Standard/ Generation mandate/ Capacity purchase obligation	Note
Argentina			●				
Australia		●		●			
Brazil	◐		●	●			FIT removed
China	◐			●		●	Wind and solar FIT removed
France	●		●	●			FIT revised
Germany	◐		●	●			
Indonesia	●						
Italy	●			●			
Japan	◐	●		●			FIT removed
South Africa							
United Kingdom		●					
United States				●			

Notes: * China, Germany, and Japan have transitioned away from FIT policies for new projects but are continuing to honour existing FIT commitments

Source: REN21, 2024; authors.

Since 2020, China, Germany, and Japan have shifted away from their FIT policies (but will continue to fund existing projects; regarding China, see Box 1). Japan has transitioned to a feed-in premium (FIP), while Germany has moved to an auctioning scheme. India has also moved toward auctions and provides support through tax incentives, net metering, and renewable purchase obligations (Raizada et al., 2024).

Box 2. China's FIT policy

China's primary renewable energy support policy has been its FIT scheme, which collects a surcharge from electricity consumers and uses these funds to pay higher prices to renewable energy generators relative to conventional sources. The government also supplements the funds generated by the surcharge with budgetary resources. China's FIT system thus combines aspects of a subsidy with a consumer-funded levy.

China initiated its Renewable Energy Electricity Pricing Surcharge program in 2006. Initially, the collection and allocation were conducted by subnational entities, notably provincial grid companies. However, there was a disparity between provinces that collected large amounts of the surcharge (populous and industrialized regions) and those with high renewable energy capacity (less populous northern regions). The collection of surcharges and allocation of FIT were taken over by the central government in 2011 and 2012 through the Renewable Energy Development Fund (Government of China, 2011, 2012). In addition to income from the surcharge, the fund receives funding from the national public budget.

Generous incentives in the form of a guaranteed price for solar and wind energy attracted a lot of developers. Installed capacity soon surged, and the number of projects qualifying for FIT support surpassed the accumulated funding pool. The result was over-investment and over-capacity relative to the FIT funds available, leading to a massive shortage of subsidies and delayed payments. By the end of 2021, there was a gap of CNY 400 billion (USD 59 billion) in subsidy payments (China Environment Network, 2022).

The subsidy burden, combined with the increasing cost-competitiveness of solar and onshore wind projects, led the government to adjust its support policies. In 2020, the government announced that the approval of subsidies for new projects would be based on the expected revenue from the renewable energy surcharge in that year, effectively capping annual subsidy provisions. FITs were no longer granted for new solar or onshore wind projects from 2021 and 2022, respectively (National Development and Reform Commission, 2021). The scheme continues to pay the FIT for existing projects. Government media sources report that the central government provided CNY 400 billion (USD 59 billion) under the "Other" category in its expenditure to address the subsidy payment gap for existing projects (China Environment Network, 2022).

Since 2023, the Government of China has promoted market-based mechanisms, such as "green certificates" and loans, to encourage existing renewable energy projects to seek alternative funding sources and voluntarily withdraw from the FIT program.

Countries such as Australia, the EU, India, and the United States are also ramping up support for domestic manufacturing of renewable energy equipment. The EU set a 2030 target of producing 40% of the products it needs to reduce greenhouse gas emissions and is funding the strategy through repurposing and supplementing existing funding sources (Norton Rose Fulbright, 2024). In the United States, the USD 370 billion Inflation Reduction Act (IRA) includes tax incentives, as well as grant and loan programs for renewable energy technology manufacturing, deployment, and innovation (CleanEnergy.gov, 2022). The EU and U.S. policies take different approaches. The U.S. IRA provides tax credits to a range of projects and investors, allowing those actors to direct the flow of funds; however, there is less flexibility in the EU policy because its frameworks and incentives are more specific for each investment type (see Table 3) (D'Olier-Lees et al., 2023). India, the EU, and the United States have also imposed trade and non-trade barriers (domestic content requirements) to support their domestic manufacturing sector. This has two major effects: it pushes up local renewable energy installment prices, at least temporarily, due to restricted access to cheaper imports, and it diversifies the supply chain, as more countries manufacture renewable energy components.

Table 3. Policy frameworks and incentives in China, the EU, and the United States

Economy	Policy	Incentive type	Energy sector beneficiaries
China	14th Five-Year Plan	Targets, soft incentives (e.g., concessional financing, land)	Utility-scale renewable energy, grid expansion, storage
EU	REPowerEU	Targets, state-backed loans	Renewable energy
	Fit for 55	Targets, state-backed loans	Renewable energy, hydrogen, efficiency
United States	Inflation Reduction Act 2022	Tax credits, loan guarantees	Renewable energy
	CHIPS Act 2022; American Jobs Plan 2021	Tax credits, grants	Energy transition assets

Source: D'Olier-Lees et al., 2023.

6.0 Other Factors That Influence Renewable Energy Deployment

The amount of public financial support provided to renewable power is not the only factor determining the rate of deployment. Other fiscal, energy, and regulatory policy settings can have a major influence, including the following:

- fossil fuel subsidies, taxation, and carbon pricing;
- electricity market rules and tariffs affecting the ability of renewable power generators to enter the market;
- timely and adequate grid connection for renewable projects and grid modernization and expansion;
- the length and ease of processing renewable power installation permit and approval applications;
- the extent to which state-owned energy enterprises are willing or able to diversify into renewable power or provide the necessary infrastructure for renewable power integration; and
- levels of public engagement and sound communication strategies for increased societal support for the transition.

Governments must address these factors to create an enabling environment for renewable power. In the case of fossil fuel subsidies, reforms to phase out and eliminate subsidies for producers and consumers can provide the double benefit of sending price signals for the private sector to switch to renewables while raising revenue to support a just transition to renewable power. Any reforms to fossil fuel subsidies need to use a portion of the savings to support vulnerable businesses and households in coping with higher power prices or job losses.

7.0 Conclusions

To achieve the tripling renewable energy target by 2030, G20 governments need to scale up their ambition and policy action, including by providing additional public financial support, until the current investment gap to achieve the tripling goal is eliminated.

Action is urgently needed because policies take time to be put in place, expanded, or strengthened, and renewable power projects take time to be built, connected to the grid, and commissioned, even when significant project pipelines exist. Grid investment and other integration measures to connect and balance new renewable power capacity are just as urgent given development lead times for grid infrastructure are often longer than for wind and solar PV projects. Higher-capacity additions are leading to longer connection queue times, which ranged from 2 to 5 years in France, the United Kingdom, and the United States in 2022 (IEA, 2024b). Putting policies and funding in place now will increase the likelihood of capacity being in place by the 2030 deadline, aligned with the 1.5 °C temperature scenario.

Countries may wish to reflect their more ambitious renewable power capacity targets and implementation strategies in their revised nationally determined contributions (NDCs) to be submitted in 2025. These climate action plans will include updated goals for 2030, providing an opportunity for governments to ensure that their NDCs align with their renewable energy tripling pledges (IEA, 2024a; IRENA, 2023).

The types of measures used to accelerate deployment will depend on each country's circumstances. In line with the recent trends observed from the inventory, countries are moving toward measures that limit impacts on government budgets by linking support to renewable power costs and electricity markets, such as auctions, CFDs, and FIPs. Support measures such as these can de-risk investment for developers while limiting budget outlays, or, as happened in recent years in some markets, return money to the government or consumers. Other subsidies with higher budgetary impacts (such as grants, loan guarantees, direct transfers to utilities, and tax exemptions) are also likely to be needed for general infrastructure like grids (i.e., connections, extensions, interconnectors, upgrades, and smart grids) to support nascent technologies and foster innovation.

Moreover, governments may consider taking steps to increase transparency around the levels of support provided to renewable power and related infrastructure. While the authors of this report have aimed to bridge this data availability gap, challenges remain, and concerted action from policy-makers is needed to address them. Improved transparency and data alone are not sufficient to drive change. However, data can be used to inform the development of better policies that use public funds more effectively and strategically, increasing the pace of energy transition. One approach is by identifying gaps in current or planned support, analyzing best practices, and determining trends (i.e., what can late adopters learn from early adopters?).

While this inventory did not include measures by public finance institutions, concessional financing and loan guarantees are instrumental in reducing the cost of capital, particularly in EMDEs outside China. Public finance can catalyze much larger amounts of private investments by reducing the risk profiles associated with investing in emerging economies,

reducing the cost and increasing the availability of debt finance. For EMDEs, particularly lower-income countries, international donor support and public finance will be crucial to delivering the capital needed to invest in the renewable energy transition, given that almost no infrastructure is built without their support in many countries. A new climate finance goal (the New Collective Quantified Goal) is being considered for agreement at COP 29. The agreement is expected to specify a public finance goal, with civil society organizations calling for at least USD 1 trillion per year in grants and other types of concessional finance from developed countries for financing climate mitigation, adaptation, and loss and damage in developing countries (Climate Action Network, 2024). In addition, 41 countries and public finance institutions have pledged to end international public financing for fossil fuels while scaling up financing for renewable energy under the Clean Energy Transition Partnership. In addition, financing is being provided through Just Energy Transition Partnerships to help coal-dependent EMDEs transition away from fossil fuel energy and toward renewable energy in a way that also addresses the social issues associated with the transition (Kramer, 2022).

The benefits of increasing support to renewable power extend beyond achieving climate goals. It will also increase access to energy and clean cooking solutions, especially in areas with limited grid infrastructure. It will ensure that economies benefit from a source of energy that is price-stable and less geopolitically risky than fossil fuels, has fewer negative impacts and lower social costs associated with pollution and climate change, and establishes new jobs and industries compatible with sustainable development.

References

Agreement on Subsidies and Countervailing Measures, 272 (1994). https://www.wto.org/english/docs_e/legal_e/24-scm.pdf

Birol, F. (2022, December). *A call to clean energy.* International Monetary Fund. https://www.imf.org/en/Publications/fandd/issues/2022/12/a-call-to-clean-energy-fatih-birol

Black, S., Liu, A. A., Parry, I. W. H., & Vernon, N. (2023, August 24). *IMF fossil fuel subsidies data: 2023 update* (Working paper no. 2023/169). https://www.imf.org/en/Publications/WP/Issues/2023/08/22/IMF-Fossil-Fuel-Subsidies-Data-2023-Update-537281

China Environment Network. (2022, March 28). *The 400 billion shortfall, six years of arrears of renewable energy subsidies is expected to be filled* (in Chinese). https://www.cenews.com.cn/news.html?aid=964271;%20https://m.jiemian.com/article/7262295.html

Christophers, B. (2024). *The price is wrong: Why capitalism won't save the planet.* Verso.

CleanEnergy.gov. (2022). *Building a clean energy economy: A guidebook to the Inflation Reduction Act's investments in clean energy and climate action.* The White House. https://www.whitehouse.gov/cleanenergy/inflation-reduction-act-guidebook/

Climate Action Network. (2024). *Climate Action Network submission: NCQG.* https://climatenetwork.org/resource/climate-action-network-submission-ncqg/

Climate Policy Initiative & IRENA. (2023). *Global landscape of renewable energy finance 2023.* https://www.irena.org/Publications/2023/Feb/Global-landscape-of-renewable-energy-finance-2023

D'Olier-Lees, T., Cantabrana Fernandez, G., Prabhu, A., Li, L., Georges, P., Gunter, E., Gardett, P., Diwan, R., Sala de Vedruna, E., DeLucia, C., Long, A., & Donaghey, C. (2023). *Renewable energy funding in 2023: A "capital transition" unleashed.* S&P Global. https://www.spglobal.com/en/research-insights/special-reports/renewable-energy-funding-in-2023-a-capital-transition-unleashed

Fossil Fuel Subsidy Tracker. (2024). https://fossilfuelsubsidytracker.org/

G20 Leaders. (2023). *G20 New Delhi Leaders' Declaration.* https://www.mea.gov.in/Images/CPV/G20-New-Delhi-Leaders-Declaration.pdf

Government of China. (2011). Notice of the Ministry of Finance and the National Development and Reform Commission on the Issuance of the Interim Measures for the Administration of the Collection, Use and Management of the Renewable Energy Development Fund. *State Council Gazette No. 13 of 2012* (in Chinese). https://www.gov.cn/gongbao/content/2012/content_2131981.htm

Government of China. (2012). *Interim measures for the administration of the collection and use of the Renewable Energy Development Fund* (in Chinese). https://www.gov.cn/gongbao/content/2012/content_2131981.htm

Grant, N., Aboumahboub, T., Welder, L., & Fyson, C. (2023). *Tripling renewables by 2030: Interpreting the global goal at the regional level.* Climate Analytics. https://climateanalytics.org/publications/tripling-renewables-by-2030-interpreting-the-global-goal-at-the-regional-level

Indian Renewable Energy Development Agency. (2023, December). *NDCs and renewable energy targets in 2023: Tripling renewable power by 2030.* https://www.irena.org/Publications/2023/Dec/NDCs-and-renewable-energy-targets-in-2023-Tripling-renewable-power-by-2030

Indian Renewable Energy Development Agency, Global Renewables Alliance, & COP 28 Presidency. (2023). *Tripling renewable power and doubling energy efficiency by 2030: Crucial steps towards 1.5°C.* https://www.irena.org/Publications/2023/Oct/Tripling-renewable-power-and-doubling-energy-efficiency-by-2030

Indian Renewable Energy Development Agency & International Labour Organization. (2023). *Renewable energy and jobs: Annual review 2023.* https://www.irena.org/Publications/2023/Sep/Renewable-energy-and-jobs-Annual-review-2023

Indian Renewable Energy Development Agency. (2024a, March). *Renewable capacity statistics 2024* [Dataset]. https://www.irena.org/Publications/2024/Mar/Renewable-capacity-statistics-2024

International Renewable Energy Agency. (2024b, July). *Renewable energy statistics 2024.* https://www.irena.org/Publications/2024/Jul/Renewable-energy-statistics-2024

International Monetary Fund. (2023). *World economic outlook: A rocky recovery.* https://www.imf.org/en/Publications/WEO/Issues/2023/04/11/world-economic-outlook-april-2023

International Energy Agency. (2023). *Government energy spending tracker: December 2022 updates.* https://www.iea.org/reports/government-energy-spending-tracker-2

International Energy Agency. (2024a). *COP28 tripling renewable capacity pledge: Tracking countries' ambitions and identifying policies to bridge the gap.* https://www.iea.org/reports/cop28-tripling-renewable-capacity-pledge

International Energy Agency. (2024b, January 11). *Renewables 2023: Analysis and forecasts to 2028.* https://www.iea.org/reports/renewables-2023

International Energy Agency. (2024c). *Strategies for affordable and fair clean energy transitions* (World Energy Outlook special report). https://www.iea.org/reports/strategies-for-affordable-and-fair-clean-energy-transitions

International Energy Agency. (2024d). *World energy investment 2024.* https://www.iea.org/reports/world-energy-investment-2024

International Energy Agency & International Finance Corporation. (2023). *Scaling up private finance for clean energy in emerging and developing economies*. https://www.iea.org/reports/scaling-up-private-finance-for-clean-energy-in-emerging-and-developing-economies

Kramer, K. (2022). *Just Energy Transition Partnerships: An opportunity to leapfrog from coal to clean energy.* International Institute for Sustainable Development. https://www.iisd.org/articles/insight/just-energy-transition-partnerships

Laan, T., Geddes, A., Do, N., Cameron, L., Goel, S., & Jones, N. (2023). *Burning billions: Record public money for fossil fuels impeding climate action.* Energy Policy Tracker. https://www.energypolicytracker.org/burning-billions-record-fossil-fuels-support-2022/

National Development and Reform Commission. (2021, June 11). Notice on matters related to the 2021 new energy feed-in tariff policy, No. 833 (in Chinese). https://www.ndrc.gov.cn/xxgk/zcfb/tz/202106/t20210611_1283088_ext.html

Nemet, G. F. (2019). *How solar energy became cheap: A model for low-carbon innovation.* Routledge. https://doi.org/10.4324/9780367136604

Norton Rose Fulbright. (2024, April). *EU scales up green subsidies: How you can benefit from new support for clean investments.* https://www.nortonrosefulbright.com/en-au/knowledge/publications/b01d19d5/eu-scales-up-green-subsidies-how-you-can-benefit-from-new-support-for-clean-investments

Oil Change International. (2024). *Public finance for energy database.* https://energyfinance.org/#/

Raizada, S., Sharma, D., Laan, T., & Jain, S. (2024). *Mapping India's energy policy 2023: A decade in action.* International Institute for Sustainable Development. https://www.iisd.org/publications/report/mapping-india-energy-policy-2023

REN21. (2024). *Renewables 2024: Global status report collection.* https://www.ren21.net/wp-content/uploads/2019/05/GSR2024_GlobalOverview_Full_Report_with_endnotes_web.pdf

Roser, M. (2020). Why did renewables become so cheap so fast? *Our World in Data.* https://ourworldindata.org/cheap-renewables-growth

Taylor, M. (2020). *Energy subsidies: Evolution in the global energy transformation to 2050.* International Renewable Energy Agency. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Apr/IRENA_Energy_subsidies_2020.pdf

UN Climate Change. (2023). *COP28: Global renewables and energy efficiency pledge.* https://www.cop28.com/en/global-renewables-and-energy-efficiency-pledge

World Bank. (2024). *World Bank Open Data* [Dataset]. https://data.worldbank.org/

Appendix A. International Databases and Dashboards on Public Financial Support for Renewable Energy and Climate

Tracker	Developed by	Content	Link to resource
Renewable energy subsidies (quantified)			
Government Energy Spending Tracker	International Energy Agency (IEA)	Government commitments to "clean energy," including all government spending that directly underpins increasing levels of clean energy investment. A subset of the IEA Policies and Measures Database.	https://www.iea.org/data-and-statistics/data-tools/government-energy-spending-tracker-policy-database
European Union (EU) energy subsidies	European Commission, Enerdata, and Trinomics	EU renewable energy subsidies. The database is also available in a separate Excel file from the authors.	https://op.europa.eu/en/publication-detail/-/publication/32d284d1-747f-11ee-99ba-01aa75ed71a1/language-en
Energy Policy Tracker (not currently collecting data)	IISD + network of think tanks	Tracked post-COVID public funding flows supporting the production or consumption of fossil or low-carbon energy.	https://www.energypolicytracker.org/

Tracker	Developed by	Content	Link to resource
Renewable energy policy progress (not quantified)			
Renewables 2023: *Global Status Report* & 2024 modules	REN21	The reports and the accompanying data pack provide the number of countries that have at least one regulatory policy in direct support of renewables, feed-in electricity and net metering policies, and selected renewable tenders and auctions. The modules on Renewables in Energy Demand and Renewables in Energy Supply are particularly relevant sources of information and data. Policies are not inventoried or quantified.	Renewables 2022: *Global Status Report:* https://www.ren21.net/wp-content/uploads/2019/05/GSR2022_Full_Report.pdf Renewables 2023: *Global Status Report Collection: Energy Demand:* https://www.unep.org/resources/report/renewables-2023-global-status-report-collection-energy-demand REN21 GSR 2022 data pack: https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2 Fwwwren21.net%2Fwp-content%2 Fuploads%2 F2019%2 F05%2FGS R2022_ Data_Pack_Final.xlsx&wdOrigin= BROWSELINK
Renewable Energy Tracker	Climate Action Network	Tracks progress of countries toward 100% renewable energy, covering 60 countries over 20 indicators, by categorizing countries as Champions, Frontrunners, Moderates, Trailers, or Slow-Starters, based on indicators.	https://climatenetwork.org/wp-content/uploads/2023/11/Renewable-Energy-Tracker-2023.pdf

Tracker	Developed by	Content	Link to resource
Regulatory Indicators for Sustainable Energy (RISE)	World Bank Energy Sector Management Assistance Program (ESMAP)	RISE is a set of indicators to help compare national policy and regulatory frameworks for sustainable energy. It assesses countries' policy and regulatory support for each of the four pillars of sustainable energy—access to electricity, access to clean cooking (for 54 access-deficit countries), energy efficiency, and renewable energy.	https://rise.esmap.org/about-us
Finance and investment			
Public Finance for Energy Database	Oil Change International (OCI)	The Public Finance for Energy Database tracks international finance for energy from more than one government-owned institution. OCI tracks energy finance from G20 governments' export credit agencies and development finance institutions, as well as the major multilateral development banks. OCI is developing a proposal to expand its database to include domestic public finance.	https://energyfinance.org/#/
Global Landscape of Renewable Energy Finance	Climate Policy Initiative (CPI) and IRENA	Public and private investment in renewable energy.	https://www.irena.org/Publications/2023/Feb/Global-landscape-of-renewable-energy-finance-2023
United Nations Development Programme (UNDP) Investment and Financial Flows Assessments	UNDP	Methodology to track domestic public investments and financial flows for the transition. Results for countries that undertook the assessment with the support of UNDP.	https://climatepromise.undp.org/research-and-reports/undp-methodology-assessing-investment-and-financial-flows

Tracker	Developed by	Content	Link to resource
World Energy Investment report	IEA	Public and private investment data, including by national oil companies.	https://www.iea.org/reports/world-energy-investment-2024
Net Zero Finance Tracker	CPI	Tracks the private finance response to climate change at the country level (the United Kingdom as the pilot).	https://www.climatepolicyinitiative.org/publication/net-zero-finance-tracker/
Renewable energy capacity, generation, projects, and technology costs			
IRENA Climate Action data	IRENA	Renewable energy tracker, including finance, costs, and avoided emissions calculator at the global and country level.	https://www.irena.org/Energy-Transition/Country-engagement/Climate-Action
Renewable Energy Statistics Database	IRENA	Provides detailed statistics on renewable energy capacity, power generation, and renewable energy balances. The database also allows users to access data on costs, finance, and investment.	https://www.irena.org/Data
BloombergNEF	Bloomberg	*Power Transition Trends* provides power capacity and generation data from 140 markets—along with aggregated data from the rest of world—including renewable energy capacity installations.	https://about.bnef.com/blog/clean-electricity-breaks-new-records-renewables-on-track-for-another-strong-year-bloombergnef/
Global Electricity Review	Ember	Renewable energy generation from 78 countries representing 93% of global electricity demand.	https://ember-climate.org/insights/research/global-electricity-review-2023/
Global Energy Monitor	Global Energy Monitor	Tracks large, utility-scale projects for bioenergy, hydro, geothermal, solar, and wind.	https://globalenergymonitor.org/

Tracker	Developed by	Content	Link to resource
Climate commitments and performance			
Climate Watch	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ), World Resources Institute, others	Tracks commitments and targets (nationally determined contributions), emissions, and sectoral indicators at the country level.	https://www.wri.org/initiatives/climate-watch
Climate Action Tracker	Climate Analytics; NewClimate Institute	Quantifies and evaluates climate change mitigation targets, policies, and actions.	https://climateactiontracker.org/
Systems Change Lab	World Resources Institute	Tracks global performance in key indicators for climate change (namely transformation shifts in different sectors).	https://www.wri.org/initiatives/systems-change-lab
Climate Action Dashboard	Organisation for Economic Co-operation and Development	In the context of the International Programme for Action on Climate, country actions and progress toward climate objectives and trajectories toward net-zero. Includes emissions, climate risks, and policy.	https://www.oecd.org/en/data/dashboards/climate-action-dashboard.html
Climate Change Dashboard	International Monetary Fund	Statistics link economic and climate indicators, such as economic activity, trade, financial risks, and policy.	https://climatedata.imf.org/
Climate Change Performance Index	German Watch, New Climate Institute	Tracks the climate protection performance of 59 countries and the EU. Aims to enhance transparency in international climate politics and enables comparison of individual countries' climate protection efforts and progress.	https://ccpi.org/

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