

METHODOLOGY

1. INTRODUCTION

This background document outlines the analytical methodology used in the report *Global landscape of renewable energy finance 2023*. Jointly developed by the International Renewable Energy Agency and Climate Policy Initiative (IRENA and CPI, 2023), the report presents a comprehensive overview of global renewable energy investment trends, breaking down financial flows by region, sector and technology.

In particular, two renewable energy finance flows are analysed in the main report:

- **Global renewable energy investment flows** during 2013-2020 (with preliminary data for 2021 and 2022); and
- **Off-grid renewable energy investment flows** during 2010-2021.

2. TRACKING GLOBAL RENEWABLE ENERGY INVESTMENT FLOWS IN 2013-2020

Chapter 2 of the *Global landscape of renewable energy finance 2023* analyses key trends in global annual investments in renewable energy over the period 2013-2020, and provides preliminary insights and figures for 2021 and 2022. This analysis is based on empirical data drawn from a wide range of primary and secondary sources. The methodology used stems from the approach developed by CPI to produce the *Global landscape of climate finance* reports since 2011. The analysis extracts relevant data from the CPI database and analyses key trends in renewable energy investment flows, which, in 2019-2020, represented over half (51%) of total climate finance flows and 57% of total climate mitigation finance (CPI, 2022).

2.1 Scope of the analysis

The sub-sections below detail the main variables covered by the analysis, including types of investors, types of recipients, financial instruments and technologies.

Types of investors

The analysis distinguishes between public and private investors, depending on the nature of financing.

Private investors include the following:

- **Commercial financial institutions**, *i.e.* providers of private debt capital (and other instruments, on occasion), including commercial and investment banks.
- **Corporations**, which include project developers (*i.e.* entities that develop renewable energy projects, from inception to realisation, and can enter into a power sale agreement with off-takers) and non-energy-producing companies (*i.e.* corporate actors in the renewable energy sector that source energy mainly for self-consumption or to offset carbon and do not engage in renewable energy projects for the primary purpose of profit making).¹
- **Households/individuals**, *i.e.* family-level economic entities, that include high-net-worth individuals and their intermediaries (*e.g.* family offices investing on their behalf).
- **Institutional investors**, including insurance companies, asset management firms, pension funds, foundations and endowments.
- **Funds**, including private equity, venture capital and infrastructure funds.

Public actors include the following:

- **Development finance institutions (DFIs)**, further sub-categorised as follows:
 - » **Multilateral and regional**, where the institution has multiple shareholder countries and directs flows of finance internationally.
 - » **Bilateral**, where the institution is owned by a single country and directs flows of finance internationally.
 - » **National**, where the institution is owned by a single country and directs flows of finance domestically.
- **Export credit agencies (ECAs)**.
- **Governments and their agencies**, including:
 - » **Bilateral** climate-related development finance reported to the Creditor Reporting System of the Organisation for Economic Co-operation and Development's Development Assistance Committee (OECD-DAC) (OECD, 2022a).
 - » **Domestic** financing through public budgets carried out by central, state or local governments and their agencies.
- **Public funds**, including national and multilateral climate funds.
- **State-owned enterprises (SOEs) and financial institutions (SOFIs)**, *i.e.* companies and financial institutions, which are at least majority owned by a government or government agency.

Types of recipients

The analysis tracks the recipients of investments² as public or private as follows:

- **For publicly sourced finance:** Information on recipients is taken from the OECD-DAC Creditor Reporting System, reporting from DFIs and the datasets of climate funds. For climate funds, when information on a recipient was not available, the public or private nature of the implementing entity was used.

¹ This category merges project developers and corporate actors, two groups of investors kept distinct in the previous editions of the *Global landscape of renewable energy finance* reports.

² This category merges project developers and corporate actors, two groups of investors kept distinct in the previous editions of the *Global landscape of renewable energy finance* reports.

- **For privately sourced finance:** Given the lack of detailed data, recipients are classified as public or private based on the classification of a project's equity provider(s) as tracked by Bloomberg New Energy Finance (BNEF, 2022) in its renewable energy and asset finance databases.³
- **For unknown sources:** Recipients are assumed to be private.

Financial instruments

The analysis of global renewable energy investments captures investment made through the following financial instruments:

- **Balance sheet financing**, *i.e.* direct debt or equity investment in a recipient entity by a company or financial institution.
- **Grants**, *i.e.* transfers made in cash, goods or services for which no repayment is required.
- **Project-level debt**, *i.e.* debt relying on a project's cash flow for repayment, further distinguished between:
 - » **Low-cost (or concessional) debt**, which refers to loans extended at terms preferable to those prevailing on the market. In this case, the analysis tracks the full amount of the loan, not the grant equivalent.
 - » **Market-rate (or commercial) debt**, which refers to loans extended at regular market conditions.
- **Project-level equity**, *i.e.* equity investment relying on the project's cash flow for repayment.

Despite the importance of **risk mitigation instruments** (such as guarantees and insurance) in enabling increased private climate flows, following the principle of conservatism (see section 2.3), these instruments are excluded from the CPI database and the analysis because actual disbursements from these instruments are contingent upon uncertain future events. For example, guarantees are only exercised in particular circumstances, and there is a chance of there never being any financial outflow from the guarantor.

Technologies

The analysis captures investment in electricity and/or heat production made in the following technologies:

- **Biomass and biogas power**
- **Biofuels**, including biodiesel, bioethanol and biomethane
- **Solar**, including photovoltaic (PV) (both utility scale and rooftop solar PV), concentrated solar power and solar heating systems (*e.g.* solar water heaters)
- **Geothermal**
- **Hydropower**, small and large scale
- **Wind**, onshore and offshore
- **Marine**, including wave, tidal, ocean currents and salt gradient technologies.

Private research and development (R&D) and investment in manufacturing for the production of green technologies (*e.g.* new types of wind turbines) are excluded from the analysis, as well as any investment in energy efficiency.

Investments in transmission and distribution projects which do not explicitly benefit renewable energy are also excluded. Although general upgrades to transmission and distribution infrastructure are often important for renewable energy, investment in these infrastructure typically benefit a wide variety of electricity generating plants. For this reason, such investments are excluded unless it can be shown they largely benefit renewable energy.

³ Data limitations, as well as methodological and definitional issues, can lead to misclassifications of recipients, causing omissions or inconsistent tracking of recipients across sources of climate finance data. The methodology attempts to standardise recipient classifications to the greatest extent possible given the data limitations.

Power generation vs end-use applications

For the first time this year, the *Global landscape of renewable energy finance 2023* report also distinguishes between renewable energy investments for power generation and for end-use applications, *i.e.* heating and cooling, and transport. All renewable energy projects in the CPI database were assigned either fully or partially to “power generation” or “end-use applications” based on the information provided in project descriptions, and in line with the assumptions detailed in Table 1.

Table 1 Assumptions used to assign renewable energy projects to power generation or end-use applications

TECHNOLOGY	ASSUMPTIONS FOR ASSIGNING INVESTMENTS TO POWER GENERATION VS END-USE APPLICATIONS
Bioenergy	<ul style="list-style-type: none"> • Biomass-, biogas- or biofuel-fired power plants (including waste-fired power plants) were assigned 100% to power generation unless the project description specified that the investment was for a combined heat and power (CHP) plant. • For CHP plants running on solid biomass, based on the 2019 global energy balance (IRENA, 2022a), 62% was assigned to heat generation and 38% to power generation. • For CHP plants running on biogas/biomethane, based on the 2019 global energy balance (IRENA, 2022a), 36% was assigned to heat generation and 64% to power generation. • Biofuel production for transportation (<i>i.e.</i> gasoline/petrol, diesel, natural gas substitutes) was assigned to end-use applications. • The database does not include biomass boilers.
Solar PV	<ul style="list-style-type: none"> • 100% assigned to power generation.
Solar thermal (including CSP)	<ul style="list-style-type: none"> • Concentrated solar power (CSP) projects were 100% assigned to power generation. • Solar water heaters were 100% assigned to end-use applications (heating and cooling).
Geothermal	<ul style="list-style-type: none"> • 100% assigned to power generation unless specified in the project description that the investment is for a CHP plant. • For CHP plants, the share of finance going to end-use applications (<i>i.e.</i> heat generation) was estimated based on the average heat/power ratios in the destination countries using IRENA energy balances (IRENA, 2022a). • The database does not include geothermal heat pumps.
Hydropower	<ul style="list-style-type: none"> • 100% assigned to power generation.
Offshore wind	<ul style="list-style-type: none"> • 100% assigned to power generation.
Onshore wind	<ul style="list-style-type: none"> • 100% assigned to power generation.
Marine	<ul style="list-style-type: none"> • 100% assigned to power generation.

Note: CHP = combined heat and power; CSP = concentrated solar power; PV = photovoltaic.

2.2 Data sources

The analysis is based on empirical data drawn from a wide range of primary and secondary sources, depending on the public or private nature of the investment flows, as determined by the type of investor undertaking a given transaction.

Private finance flows capture the following:

- **Large-scale renewable energy projects:** The research team individually analysed direct primary financing data from large-scale renewable energy projects based in 158 countries to identify their financing structure and the entities providing financing. These data are retrieved from the BloombergNEF renewable energy and asset finance databases (BNEF, 2022).
- **Small-scale renewable energy investments:**⁴ Data were obtained from the BloombergNEF market size, generation capacity, and finance databases (BNEF, 2023a).
- **Investments in solar water heating systems by households, corporates and governments:** These were estimated based on cost data from the International Energy Agency Solar Heating and Cooling Programme (IEA SHC, 2018), country-level inflation rates from the World Bank (2021) and capacity additions data from IEA SHC (2021).⁵

The data for public finance flows were gathered from:

- CPI’s own quantitative aggregate survey and project-level data template;
- The OECD-DAC Creditor Reporting System for DFI data (OECD, 2022a);
- Project-level assessments of transactions tracked by BloombergNEF (2022a); and
- National and multilateral climate funds’ commitments retrieved from the Climate Funds Update (ODI and HBF, 2020).

Table 2 summarises the relevant sources used to collect data in the report, categorised by type of investment and the level of data.

Table 2 Data sources in Chapter 2 of the *Global landscape of renewable energy finance 2023*

CATEGORY	INVESTMENT	SOURCE	DATA LEVEL
Private	Private finance	BNEF, 2022	Project level (large scale)
		BNEF, 2023a	Aggregated (small scale)
		IEA SHC, 2021	Aggregated (solar water heater capacity additions)
Public	Development finance institutions	Surveys*	Project level and aggregated (depending on reporting institution)
		EF, 2022	Project level
		OECD, 2022a	Project level
	Climate funds	Climate Funds Update via ODI and HBF (2020)	Project level
		OECD, 2022a	Project level
	Governments and their agencies	OECD, 2022a	Project level
BNEF, 2022		Project level	

(*) This year’s report includes primary survey data from 40 DFIs.

Note: BNEF = Bloomberg New Energy Finance; HBF = Heinrich Böll Foundation; IEA SHC = International Energy Agency’s Solar Heating and Cooling Programme; ODI = Overseas Development Institute; OECD = Organisation for Economic Co-operation and Development.

4 Namely, residential and commercial solar PV projects with capacity of less than 1 megawatt (MW).

5 We considered new installed capacity in 2019 and 2020 as reported in IEA SHC (2021), and system capital costs reported in IEA SHC (2018). Since the latest capital costs available in this report were from 2016, we used country-level consumer inflation rates from the World Bank (2021) from 2016 to 2019 and 2020, respectively, to produce actualised capital costs. In the IEA SHC (2021) report, installed capacity estimates were broken down by segment (governments, households and corporates) and geography.

2.3 The principles applied in data collection and reporting

Track primary investment

The analysis of the global landscape of renewable energy finance captures total primary financial transactions and investment costs and components of activities that directly contribute to renewable energy. Secondary market transactions (e.g. reselling of stakes or public trading in financial markets) are not tracked, as they do not represent new investment targeting new renewable energy assets, but rather capital being exchanged for existing assets.

Maximise granularity

Wherever possible, the analysis uses project-level data to check and select flows. Project-level information is more likely to provide verifiable details on project characteristics, instruments, and financing destinations and structures. Where project-level data are not available or complete, aggregated data are used.

Include tangible financial commitments

In the analysis, “investment” is defined as a financial commitment represented by a firm obligation by means of a board-level decision on investment programmes, the closure of financing contracts or similar actions. Such commitments are backed by the necessary funds to provide the specified financing to a project.

The category of “financial resources committed” records the amount of an expected transfer at the time the corresponding contract was closed (or the commitment otherwise established), irrespective of the time required to complete the disbursement. This approach can yield results that differ from those of approaches that consider investment based on disbursements. For example, under the approach adopted in this analysis, a project which reaches financial close in 2017 but becomes operational in 2018 will be recorded as a 2017 investment, regardless of when construction starts and ends. By contrast, an approach which records investment when an asset becomes operational would treat the same investment as having occurred in 2018.

Although the focus on commitments rather than disbursements may affect the sequencing of flows over time – given that committed amounts are often disbursed over several years – disbursement information would provide a more accurate picture of the actual volume of financial resources devoted to renewable energy in a given year. However, consistent data on disbursements are often lacking.

A conservative approach

In case of insufficient details, a conservative approach is taken, and under-reporting of renewable energy investments is preferred to over-reporting. Based on this principle, the analysis excludes risk mitigation instruments, such as guarantees and insurance products, since actual disbursements from these instruments are contingent upon uncertain future events.

Avoiding double counting

The analysis tracks only investments in new renewable energy projects. Investments in private R&D are excluded, since costs to develop new technologies are capitalised and factored into the investment amounts of new projects implementing these technologies. Including R&D investments would, therefore, increase the risk of double counting.

Similarly, policy-induced revenue support mechanisms and other public subsidies whose primary function is to pay back investment costs are not tracked. Revenue-support mechanisms, such as feed-in tariffs, pay back investment costs, so including the investments made for their implementation would constitute double counting.

Finally, many overlaps exist between the datasets used as sources for the analysis, implying that the same transactions may be recorded several times. During the data consolidation phase, sources of duplicate transactions are ranked according to reliability and comprehensiveness; only the best entry for each overlapping transaction is selected to avoid double counting.

2.4 Data assumptions

Gearing ratios

Gearing ratios describe the ratio of a project's long-term debt to the total capital invested. Where a project-specific gearing ratio is provided, it is used directly to calculate debt and/or equity values for the relevant project. Where no gearing ratio is provided, a 70/30 ratio is assumed, except for wind power projects in China, where an 80/20 gearing is assumed, based on the higher debt-to-equity ratios observed in historical transactions.

Cost multipliers

Where information on investment is not available, technology- and geography-specific investment cost multipliers are used to estimate total investment amounts. Country-level multipliers from the Global Status Report by the Renewable Energy Policy Network for the 21st Century (REN21, 2019) are used whenever possible. If country-level multipliers are not available, REN21 regional multipliers are used. If neither country-level nor REN21 regional multipliers are available, regional multipliers from IRENA's *Renewable Power Generation Costs* series (IRENA, 2022b) or the REN21 transregional multipliers are used.

Cost of solar water heaters

When country-level data on the cost of solar water heaters are not available, cost estimates are derived by averaging available values for other countries in the same region. In regions where no country-level estimates are available, the global average is used. Some exceptions have been made to this rule where appropriate. For example, the European average cost for large domestic hot water applications does not include France, given that it is an outlier relative to other countries' cost ranges and does not comprise a significant portion of the European solar water heating market.

2.5 Geographic classification

Table 3 shows the regional grouping used in Chapter 2 of the *Global landscape of renewable energy finance 2023*. The designations employed do not imply the expression of any opinion on the part of IRENA or CPI concerning the legal status of any region, country, territory, city or area or of its authorities, or concerning the delimitation of frontiers or boundaries. Flows are classified as "transregional" when resources are channelled to more than one region.

Table 3 Regional grouping used for the analysis in Chapter 2 of the *Global landscape of renewable energy finance 2023*

REGION	COUNTRY
East Asia and Pacific	Brunei Darussalam, Cambodia, China, Cook Islands, Fiji, Indonesia, Japan, Kiribati, Lao People's Democratic Republic, Malaysia, Marshall Islands, Federated States of Micronesia, Mongolia, Myanmar, Nauru, Palau, Papua New Guinea, Philippines, Republic of Korea, Samoa, Singapore, Solomon Islands, Thailand, Timor-Leste, Tonga, Tuvalu, Vanuatu, Viet Nam
Eurasia	Armenia, Azerbaijan, Georgia, Russian Federation, Türkiye
Europe	Albania, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Montenegro, Netherlands, North Macedonia, Norway, Poland, Portugal, Republic of Moldova, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom
Latin America and the Caribbean	Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Plurinational State of Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, Uruguay, Bolivarian Republic of Venezuela
Middle East and North Africa	Algeria, Bahrain, Egypt, Islamic Republic of Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Qatar, Saudi Arabia, State of Palestine, Sudan, Syrian Arab Republic, Tunisia, United Arab Emirates, Yemen
North America (excl. Mexico)	Bermuda, Canada, United States
Other Asia	Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan
Other Oceania	Australia, New Zealand
South Asia	Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka
Sub-Saharan Africa	Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Djibouti, Equatorial Guinea, Eritrea, Eswatini, Ethiopia, Gabon, the Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, São Tomé and Príncipe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, South Sudan, Togo, Uganda, United Republic of Tanzania, Zambia, Zimbabwe

3. TRACKING OFF-GRID RENEWABLE ENERGY INVESTMENT FLOWS IN 2010-2021

Chapter 4 of the *Global landscape of renewable energy finance 2023* analyses key trends in off-grid renewable energy investment over the period 2010-2021. Data for this analysis were initially gathered by IRENA from the Wood Mackenzie (2022) Off-Grid Renewable Investment database. At the time the analysis was conducted, this database tracked information for 1063 commitments made to companies operating in the off-grid renewable energy space in emerging and developing countries. The database, which initially covered some 15 035 datapoints, was further expanded by IRENA to include additional variables necessary to carry out a comprehensive analysis of financing flows; it now includes over 81 000 datapoints.

3.1 Description of the database

This database tracks off-grid renewable energy investments in the form of financial commitments, *i.e.* firm obligations to provide specified financing, backed by the necessary funds. The full amount of financial commitments is recorded as of a certain date, irrespective of the time required for the completion of disbursements. Because commitments do not necessarily equate to capacity additions, information on disbursements would provide a more accurate picture of the actual investment volume for each year. However, accurate and comprehensive data on financial disbursements are not always available (SEforAll, 2021).

All transactions are converted and deflated to constant United States dollar (USD) values to control for inflation and exchange rate fluctuations with 2020 as the base year (OECD, 2022b).

3.2 Scope of the analysis

The subsections below provide details regarding the main variables covered by the off-grid renewable energy investment database, including types of investors, financial instruments, energy uses, products and sources.

Types of investors

The database distinguishes between public and private investors, depending on the nature of financing. Investors are further disaggregated by type, as listed below:

- **Commercial financial institutions**, *i.e.* providers of private debt capital such as commercial and investment banks
- **Corporations and business associations**, *i.e.* energy and non-energy companies
- **Development finance institutions**, including multilateral DFIs (public finance institutions that have multiple countries as shareholders and direct flows of finance internationally); bilateral DFIs (single-country ownership of the institution; flows directed internationally) and national DFIs (single-country ownership of the institution; flows directed domestically)
- **Government agencies and intergovernmental institutions**
- **Individuals**, *i.e.* family-level economic entities, high-net-worth individuals, investing either directly or through crowdfunding platforms
- **Institutional investors**, *i.e.* insurance companies, pension funds, sovereign wealth funds, endowments and foundations
- **Private equity**, venture capital and infrastructure funds
- **Others**, including non-profit organisations, impact funds and research institutes

Financial instruments

The database captures commitments made through the following financial instruments:

- **Debt**, including bonds, convertible notes, term loans and venture debt
- **Equity**
- **Grants**

Where possible, IRENA used Wood Mackenzie data to identify investments that were financed under a blended financing mechanism.

Energy uses

Investors' financial commitments for off-grid renewable energy are directed towards a variety of uses. The database aggregates these in the following way:

- **Residential use**, *i.e.* energy access for household uses that do not include any revenue-generating activities
- **Commercial and industrial use**, *i.e.* energy access for commercial and industrial revenue-generating activities, such as farming and fishing
- **Communities and other economic activities**, *i.e.* energy access benefitting entire communities, which includes energy systems for public buildings (*e.g.* hospitals and schools), installation of streetlights and electricity access for refugee camps
- **Support for infrastructure and services**, *i.e.* a variety of ancillary products and services necessary to sustain the provision of energy, including storage systems, smart meters, voltage converters, software services and data platforms

Energy products and services

Off-grid renewable energy in this analysis refers to both stand-alone systems and mini-grids. In particular, the database includes the energy products and ancillary products and services listed below.

Energy products:

- **Clean cookstoves**, *i.e.* solar-powered or biofuel-burning household stoves
- **Micro-/mini-grids**, *i.e.* remote, distributed, autonomous grids designed to provide electricity to residential and small commercial users
- **Solar home systems**, *i.e.* small- to mid-size stand-alone solar PV systems
- **Solar kiosks**, *i.e.* centralised community-scale solutions which do not include household distribution networks
- **Solar lights**, *i.e.* solar-powered lanterns that may include mobile charging stations
- **Solar refrigerators**, *i.e.* refrigerators running on energy directly provided from the sun (either solar PV or solar thermal systems)
- **Solar water heaters**, *i.e.* devices that convert sunlight into heated water
- **Solar water pumps**, *i.e.* devices that convert solar power into mechanical work

Ancillary products and services:

- **Data platforms**, *i.e.* databases and tools to support investment decisions
- **R&D**
- **Smart meters**
- **Software applications**, *i.e.* applications which provide services for energy management
- **Storage systems**, *i.e.* systems that capture the energy generated at one time for use at a later time
- **Training**
- **Voltage converters**, *i.e.* electric power converters which change the voltage of an electric power source.

Energy sources

Given the flexibility and modularity of solar PV, this energy source accounts for 92% of total investment tracked. In addition, the database also covers other renewable energy sources used to power off-grid solutions, such as bioenergy, hybrid bioenergy and solar power, and mini hydropower.

3.3 Data sources

Data on off-grid renewable energy commitments were gathered from a wide range of primary and secondary sources, including press releases, annual reports, public disclosures, crowdfunding filings, investment data aggregators and competitor analysis.

3.4 Geographic classification

Table 4 shows the regional grouping used for the analysis of the off-grid renewable energy financing landscape in Chapter 4 of the *Global landscape of renewable energy finance 2020*. The designations employed do not imply the expression of any opinion on the part of IRENA or CPI concerning the legal status of any region, country, territory, city or area or of its authorities, or concerning the delimitation of frontiers or boundaries.

Table 4 Regional grouping used for the analysis in Chapter 4 of the *Global landscape of renewable energy finance 2023*

REGION	SUB-REGION	COUNTRY
Latin America and the Caribbean	Caribbean	Anguilla, Antigua and Barbuda, Aruba, Bahamas, Barbados, Cayman Islands, Cuba, Dominica, Dominican Republic, Grenada, Haiti, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, Turks and Caicos Islands
	Central America	Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama
	South America	Argentina, Plurinational State of Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname, Uruguay, Bolivarian Republic of Venezuela
Middle East and North Africa	Middle East	Bahrain, Islamic Republic of Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, United Arab Emirates, Yemen
	North Africa	Algeria, Egypt, Libya, Morocco, Sudan, Tunisia
Sub-Saharan Africa	Central Africa	Angola, Cameroon, Central African Republic, Chad, the Congo, Democratic Republic of the Congo, Equatorial Guinea, Gabon, São Tomé and Príncipe
	East Africa	Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Mauritius, Rwanda, Seychelles, Somalia, South Sudan, Uganda, United Republic of Tanzania
	Southern Africa	Botswana, Eswatini, Lesotho, Madagascar, Malawi, Mozambique, Namibia, South Africa, Zambia, Zimbabwe
	West Africa	Benin, Burkina Faso, Cabo Verde, Côte d'Ivoire, the Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo
South and Southeast Asia	Southeast Asia	Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Timor-Leste, Viet Nam
	South Asia	Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka

4. OTHER ENERGY DATA

In some sections of the *Global landscape of renewable energy finance 2023*, global renewable energy investment flows are analysed in the broader context of the energy transition and compared with investments in fossil fuel technologies. To support the broader scope of these analyses, additional data were gathered from sources different from the CPI database, as detailed in Table 5.

Table 5 Additional data sources used in the *Global landscape of renewable energy finance 2023*

INVESTMENT FLOWS	SOURCE	DATA LEVEL
Renewable energy investments in 2021 and 2022^a	BNEF, 2023b	Aggregated (broken down by technology and region of destination)
Fossil fuel investments	IEA, 2022b	Aggregated (broken down by technology and region)
Energy transition investments	Energy efficiency^b	IEA, 2022b
	Electrified transport (including sales of electric cars, commercial vehicles and buses, as well as home and public charging investments)	BNEF, 2023c
	Electrified heat (including residential heat pump investments)	BNEF, 2023c
	Energy storage	BNEF, 2023c
	Hydrogen (including hydrogen electrolyser projects, fuel cell vehicles and hydrogen refuelling infrastructure)	BNEF, 2023c
	Carbon capture and storage	BNEF, 2023c

^a As BNEF has limited coverage of large hydropower investments, these were estimated for 2021 using the annual average investment over 2019-2020.

^b These values are in constant 2019 USD billions, while all other values are in current prices and exchange rates. Due to the lack of more granular data, the units could not be harmonised across the different databases. For this reason, these numbers are presented together for indicative purposes and should not be used to make cross-comparisons between the different data sources.

Note: BNEF = Bloomberg New Energy Finance; IEA = International Energy Agency.

Box 1 Energy transition investments vs climate finance for the energy sector explained

When it comes to energy sector investments, climate solutions and energy transition technologies can often overlap. As a result, there can be confusion as to how financial flows targeting these two groups of investments differ in practice.

While there is no clear internationally accepted definition of what constitutes climate finance, the Climate Policy Initiative (CPI, 2021) defines it as capital flows directed towards low-carbon and climate-resilient development interventions with direct or indirect greenhouse gas mitigation or adaptation benefits.

Energy transition investments are broadly understood as investments into technologies and solutions advancing the decarbonisation of energy systems. However, although the global energy transition is expected to reduce global greenhouse gas emissions and contribute to climate mitigation, **not all energy transition investments are considered climate finance.**

While technologies such as renewable energy and battery electric vehicles, unequivocally fall under both categories of finance, other energy transition solutions cannot be considered climate finance as they prolong the use of fossil fuel assets, thus working against climate mitigation. This is, for example, the case of energy efficiency measures applied to fossil fuel power assets, or plug-in hybrid electric vehicles partially running on fossil fuels.

When tracking climate finance flows, CPI takes a conservative approach, excluding all technologies and solutions which do not unequivocally contribute to climate mitigation and adaptation. Table 6 provides an overview of various energy sector technology and solutions, comparing how they would be included under energy transition investments and climate finance, respectively.

Table 6 Energy transition investments vs climate finance for the energy sector

SECTOR/ TECHNOLOGY	ENERGY TRANSITION INVESTMENTS	CLIMATE FINANCE (ENERGY SECTOR ONLY)*
Renewable energy (power generation and direct uses)	Included	Included. Given the debate around risks and benefits of large hydropower plants, these projects are included only when financed by development finance institutions that have proper environmental safeguards
Energy efficiency	Included	Included but generally taking a more conservative approach, e.g. including energy efficiency measures for power plants only when applied to renewable assets (not fossil fuels) or retrofits only when they bring clean energy gains
Electrified transport	Includes all types of electric vehicles	Includes only battery electric vehicles; excludes plug-in hybrid electric vehicles as these also partially run on fossil fuels
Electrified heat	Included	Included only when using renewable energy
Hydrogen	Included	Included only when exclusively using green hydrogen
Carbon capture and storage, and other carbon removal measures	Included	Excluded as technology as it is still in its early stage and there are cautions that it may further lock in fossil-fuel-based development
Energy storage	Included	Included only when supporting renewable energy systems
Nuclear	Excluded	Excluded given the debate around risks and benefits of nuclear power plants
Fossil fuels (coal, oil, natural gas)	Excluded	Excluded

* As tracked in the [Global Landscape of Climate Finance \(CPI, 2022\)](#).

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