RBE HUB
RENEWABLES-BASED ECONOMY

RENEWABLES-BASED ECONOMY

Tracker 2026

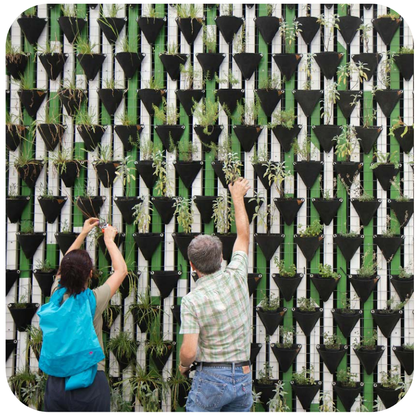
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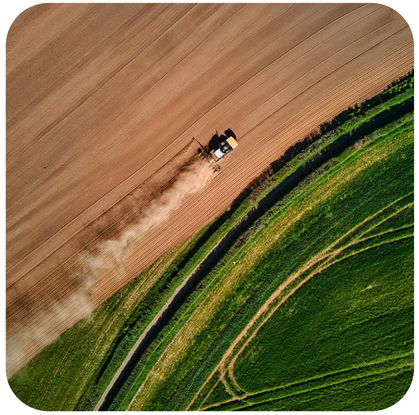
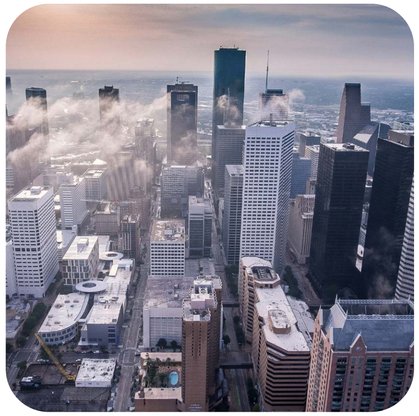













Status Report:
How Renewables Are Transforming Economies and Societies

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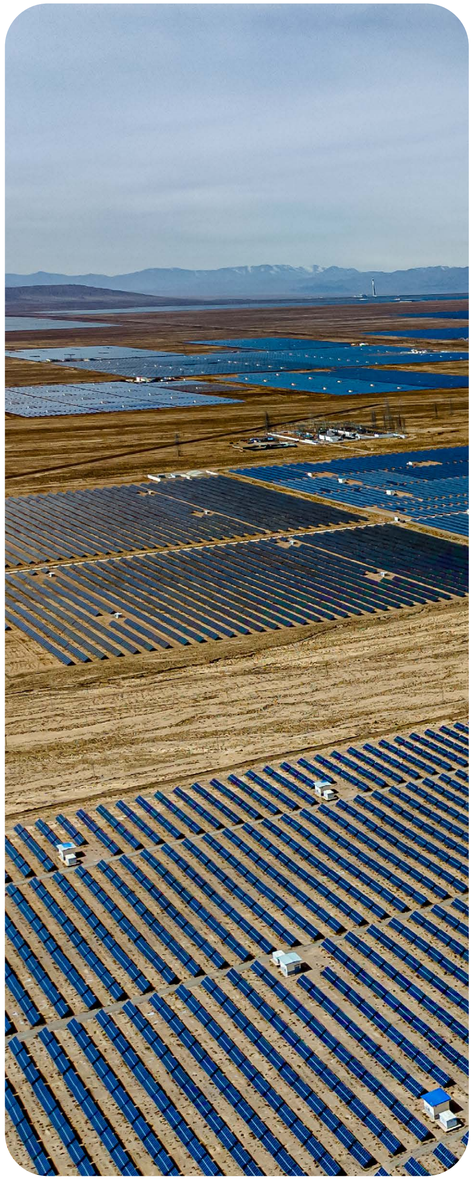
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Foreword

The world is accelerating toward a future powered by renewables. Every solar panel, wind turbine, biofuel plant, geothermal installation and grid connection does more than produce energy; it helps reshape how economies function, industries grow, jobs are created and communities thrive. Fossil fuel dependence drives economic instability, geopolitical tension, and social disruption. Renewables offer a foundation for stability, opportunity, and a fairer, more sustainable future.

The potential of renewables is no longer theoretical. Countries such as Uruguay demonstrate what is possible when long-term vision, political commitment, and integrated planning come together. Over the past two decades, shifting from imported fossil fuels to locally produced renewable energy, strengthening energy security, stabilising electricity costs and creating new economic opportunities. Its experience shows that renewable energy can be the answer for countries seeking resilience, competitiveness and prosperity.

The Renewables-Based Economy (RBE) framework captures this broader transformation. Renewable energy goes beyond generating power: it drives economic and industrial development, supports job creation, strengthens energy security and reduces fossil fuel reliance. Yet these wider impacts are often overlooked, leaving a gap in how decision makers understand the systemic benefits of renewable deployment and guide policy and investment. RBE makes these benefits visible.

The Renewables-Based Economy Tracker and Hub provide a data-driven view of this change. The RBE Tracker proposes a new framework that measures progress across four interconnected dimensions: energy systems and energy security, economy, society and governance, and environment and climate. Going beyond traditional energy metrics, it tracks renewable energy's influence on the economy, industry, finance and governance. The RBE Hub makes this information interactive and accessible, providing policymakers, investors and practitioners with the tools to understand and act on the systemic changes needed to overcome structural barriers and seize the full opportunity renewables present. This work is the result of a collective effort, and we would like to thank everybody who has participated. For the REN21 network, the current context of multiple global crises and economic and political disruption calls for a new approach: one that shapes the narrative around the economic power of renewables, builds confidence in the feasibility of the transition, and tracks progress to demonstrate that it is already happening.

The renewables-based economy is not a distant dream, but the reality of a new era.

Rana Adib
Executive Director, REN21

Ramon Mendez Galain
President, REN21

About REN21

REN21 is a global network bringing together diverse stakeholders — governments, industry, NGOs, academia, and more — to drive the systemic transitions towards renewables-based economies by enabling engagement and knowledge exchange in a collaborative and co-ordinated manner.

What makes REN21 unique is its methodology: a network-driven, crowd-sourced approach that combines local insight with rigorous peer review, transforming fragmented data into decision-useful intelligence. Through inclusive dialogue, structured convenings, and targeted communications, REN21 shapes narratives, informs policy and enables co-ordinated action across regions, sectors and scales.

Since 2005, REN21's flagship *Renewables Global Status Report* (GSR) has captured the evolution of the renewable energy sector. Produced with contributions from hundreds of experts worldwide, the GSR provides a comprehensive annual snapshot of policies, markets, and deployment trends, offering a trusted reference point for decision-makers and thought leaders alike. Over nearly two decades, it has charted the shift from renewables as niche technologies to mainstream drivers of energy, economic, and social change.

Building on this legacy, REN21 is now evolving the GSR into the Renewables-Based Economy (RBE) Tracker, supported by the RBE Hub. This evolution reflects a strategic shift: moving beyond deployment metrics to measure how renewable energy is reshaping economies, societies, governance systems and the environment.

The Tracker assesses progress across interconnected dimensions; providing policy makers, investors and practitioners with the insights they need to identify barriers, explore opportunities and accelerate the transition to inclusive, resilient and renewables-based economies worldwide.



REN21 RENEWABLES NOW

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REN21 is run by a small team of committed individuals that supports and develops the REN21 network.

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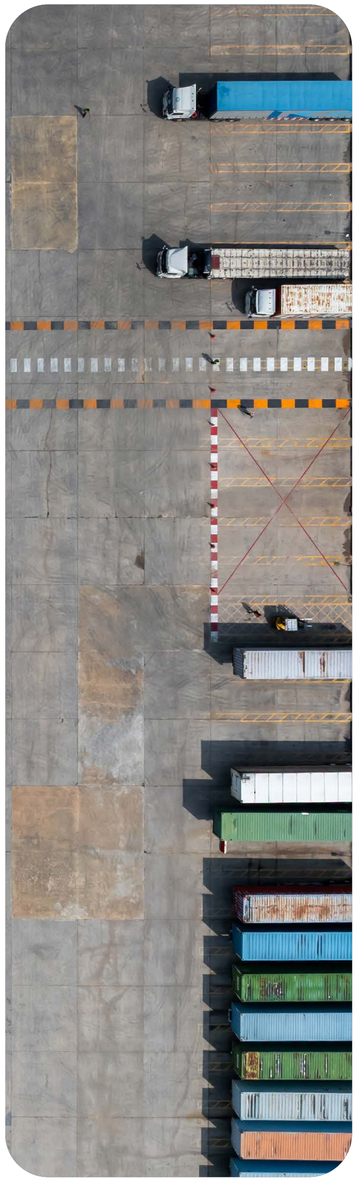
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What Is a Renewables-Based Economy?

Energy underpins how societies function and how economies are organised. It shapes how value is created, how industries evolve and how countries interact. Today's global energy systems are the outcome of two centuries of fossil fuel-based development, where coal, oil and gas structured industrialisation, trade and geopolitical power. Yet, globally, these fossil-fuel based systems are incompatible with economic prosperity and harm the environment.

In a **renewables-based economy**, renewable energy[i] becomes the organising principle of energy systems and shapes how economies function, create value and structure development. Renewable energy, combined with energy efficiency and sufficiency[ii], reshapes patterns of production, consumption, infrastructure and resource flows.

Framing the energy transition through a renewables-based economy lens shifts the focus from renewable energy deployment alone to how energy is produced, distributed and used across key demand sectors – agriculture, buildings, industry and transport – and how these changes drive **broader economic and social transformation**.

Because renewable energy resources are widely available and increasingly cost-competitive, they offer a fundamentally different economic and geopolitical profile compared with fossil fuels. Renewables reduce fossil fuel import dependence and exposure to fuel price volatility, strengthening **energy security**, improving **access** to reliable, sustainable and affordable energy services, and creating **jobs** and opportunities for **industrialisation**.

Anchoring energy systems in widely available renewable resources creates opportunities for more local value creation, while enabling broader participation from citizens, communities and enterprises in energy production and ownership. By cutting greenhouse gas emissions and pollution, renewable energy contributes to climate change mitigation and pollution reduction, improving human health and biodiversity protection, while also supporting climate adaptation and resilience.

At the same time, renewables-based systems rely increasingly on regional interconnections, integrated grids and markets – strengthening regional collaboration while creating co-ordinated industrial development through new interdependencies related to manufacturing capacity, supply chains and critical minerals.

At the system level, a renewables-based economy requires **deep structural transformation**, reshaping the relationship between renewable energy deployment, energy consumption, flexible **infrastructure**, industrial **development**, **trade**, **policy** and **governance**. It shifts the focus beyond energy supply alone to how renewables can reshape economies and societies to become more secure, inclusive and resilient.

CORE ATTRIBUTES OF RENEWABLE ENERGY

Available Everywhere

Renewable resources exist in every region, offering universal potential for energy access and production.

Technology Driven

Renewable energy technologies harness free natural flows, turning energy services into a question of innovation rather than extraction.

Free and Abundant

Renewable energy sources are naturally replenished and continuously available, with patterns that can be forecast and balanced in modern energy systems.

Scalable and Flexible

Renewables can be deployed at any scale – from utility-size projects to decentralised community and household systems.

i Renewable energy is any form of energy from solar, geophysical or biological sources that is replenished by natural processes at a rate that equals or exceeds its rate of use. Renewable energy is obtained from the continuing or repetitive flows of energy occurring in the natural environment and includes low-carbon technologies such as solar energy, hydropower, wind, tides and waves, and ocean thermal energy, as well as renewable fuels such as biomass. The term "modern renewables" excludes the traditional use of biomass – that is, the burning of woody biomass or charcoal, as well as dung and other agricultural residues, in simple and inefficient devices to provide energy for residential cooking and heating in developing and emerging economies.

ii Energy efficiency: involves delivering the same service or output with less energy input. Sufficiency: encompasses policies and daily practices that avoid demand for energy and materials while ensuring human well-being within planetary boundaries. Sources: IEA, Glossary (https://www.iea.org/glossary#E); CEA-I-Tésé, Energy Sufficiency https://www.cea.fr/energies/i-tese/en/Pages/our-activities/flagship-projects/Sufficiency.aspx

Tracking the Transition Towards a Renewables-Based Economy

Tracking progress towards a renewables-based economy goes beyond measuring the deployment of renewable energy. It encompasses analysis of how renewable energy, together with energy efficiency and system integration, affects broader socio-economic systems, including value creation, energy security, equity and environmental performance. This analysis helps to reveal structural changes, identify barriers and assess the outcomes (economic, social and environmental) that renewables-based energy systems are delivering.

Tracking progress also requires assessing the enabling conditions – such as policy, technology maturity, infrastructure, governance, and financial and market structures – that shape how renewable energy is deployed and integrated.

The **Renewables-Based Economy (RBE) Tracker** builds on a framework co-developed with policy makers, industry, researchers and civil society across the REN21 community. It is grounded in a participatory methodology rooted in **REN21's longstanding crowd-sourced and crowd-owned approach** and reflects diverse perspectives on how renewable energy is transforming economies beyond the power sector. By translating complex system dynamics into accessible, decision-relevant insights, the RBE Tracker is designed to inform and guide decision makers in understanding what actions, policies and investments are needed to actively build renewables-based economies.

The RBE Tracker applies a structured methodology to identify indicators that capture system-level change across four interconnected dimensions:

1. Energy Systems and Energy Security
2. Economy
3. Society and Governance
4. Environment and Climate

The selection of indicators is guided by their relevance for understanding structural transformation, rather than by data availability alone. Revealing **data gaps** is a key purpose of this first edition of the RBE Tracker, with the objective of starting to build the evidence base needed to guide decision making. To capture these structural shifts, each indicator is tracked and presented in a figure within this RBE Tracker, while data gaps are explicitly highlighted by section in clearly marked boxes. A comprehensive table summarises all indicators and data gaps, detailing their corresponding sections, descriptions and rationale within the broader framework of a renewables-based economy.

Through iterative consultation, expert review, and crowd-sourced input, the RBE Tracker provides a coherent and decision-relevant framework to ground the evidence on how economies and societies are evolving towards renewables-based systems, while also highlighting data gaps and areas requiring further development.



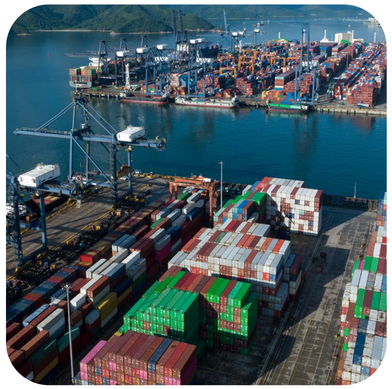


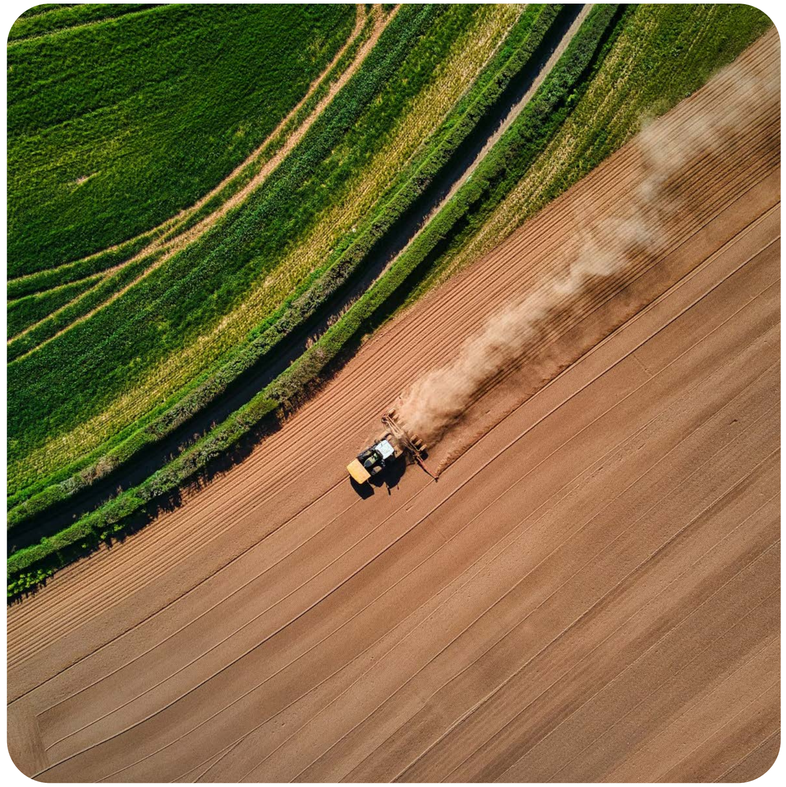
DIMENSION	WHAT SUCCESS LOOKS LIKE	KEY TRANSITION INDICATORS	SUPPORTING TRANSITION INDICATORS	KEY DATA GAPS
Energy Systems and Energy Security	Energy demand widely met by renewable electricity, heat and fuels	• **Renewable energy (RE) share in total final energy consumption (TFEC)** › Economy-wide 15% › Agriculture 20% › Buildings 18% › Industry 19% › Transport 5% • **Electricity share in TFEC (2023)** › Economy-wide 23% › Agriculture 32.5% › Buildings 36.2% › Industry 30% › Transport 1.5% • **Share of RE per energy carrier** › Electricity 33.7% › Heat 10% › Fuels 4% • **Net energy imports** › 92 net importer countries › 36 net exporter countries • **Cross sectoral policies** › 17 countries with policies for the uptake of renewables in the four main demand sectors • **Renewable Energy Targets** › 169 countries with targets for renewable energy share	• **Capacity** › Solar PV 2,889 GW › Wind 1,305 GW › Hydropower 1,280 GW › Total 5,655 GW • **Grids** › ~2,500 GW of renewables and storage projects awaiting grid connection • **Storage capacity** › Batteries 267 GW › Pumped Storage 199 GW • **Curtailment** › Variable • **Heat pumps** › Steady growth in China, volatile in Europe and the US • **Electric vehicles** › 20 million global sales – ¼ of global sales (2025) • **Biofuels** › 193 billion litres in 2024	• **Distributed renewable energy generation** • **Flexibility** • **Interconnections** • **Integrated planning tracking**

DIMENSION	WHAT SUCCESS LOOKS LIKE	KEY TRANSITION INDICATORS	SUPPORTING TRANSITION INDICATORS	KEY DATA GAPS
Economy	Renewable energy becomes a driver of economic activity and competitiveness	• **Renewable manufacturing** › Solar PV >1,100 GW/year › Wind energy ~210 GW/year › Batteries >3.5 TWh/year • **Investment in renewable energy and enabling technologies (2025)** › Renewables USD 690 billion › Grids USD 483 billion › Electrified transport USD 893 billion • **Subsidies for fossil fuels (direct subsidies)** › 3X higher than subsidies for renewables • **Renewable energy jobs** › 16.6 million	• **Fiscal and financial incentives** › 114 countries, 388 recorded policies • **Trade policies** › 212 trade measures related to renewables and enabling technologies (2024)	• **Economic contribution of renewables (GDP, tax income)** • **Supply chains** • **Manufacturing policies** • **Renewable energy technologies trade** • **Upstream & downstream renewable energy jobs** • **Job quality**

DIMENSION	WHAT SUCCESS LOOKS LIKE	KEY TRANSITION INDICATORS	SUPPORTING TRANSITION INDICATORS	KEY DATA GAPS
Society & Governance	Benefits of the transition are broadly shared	• **Distributed renewables** › 41% of solar PV is distributed • **Community participation** › 114 policies for renewables-based community energy and citizen engagement across 41 countries • **Energy access** › 69 countries without universal access to electricity › 53 countries with policies targeting renewables for energy access	• **Reskilling** › 56 policies worldwide • **Affordability policies** › 64 countries with policies for energy affordability with renewables and energy efficiency • **Citizen energy** › 118 policies across 42 countries	• **Affordability** • **Ownership** • **Participation**
Environment & Climate	Renewable energy deployment translates into environmental gains	• **Energy-related CO_2 emissions over time** › +15% since 2010 • **Recycling rates** › From 2% (Rare Earth Elements) to 75%(aluminium), 2021	• **NDCs** › ~90% mentions to renewables in 109 submitted Third NDCs • **National adaptation plans** › ~90% mentions to renewables in 85 submitted NAPs • **Permitting** • **Circularity**	• **Circular economy value** • **Policy integration**







Methodology

The RBE Tracker applies a structured, participatory methodology rooted in REN21's longstanding crowd-sourced and crowd-owned approach to evidence generation. Building on more than two decades of tracking the status of renewable energy through the *Renewables Global Status Report* (GSR), the RBE Tracker builds on the co-development of the renewables-based economy framework across REN21's global community and is designed to identify what needs to be tracked in order to understand and enable a renewables-based economy. This forward-looking framing allows the RBE Tracker to capture system-level change, highlight structural gaps and signal priority areas for future data development.

Indicators are selected based on their relevance in capturing system-level transformation across four interconnected dimensions: energy systems and energy security; economy; society and governance; and environment and climate.

The process began with the development of a longlist of indicators drawing on REN21's analytical work, policy tracking and engagement with partner institutions. REN21's policy database provides a central, globally comparable evidence base on renewable energy targets, policies and enabling measures, complemented by external datasets and qualitative inputs to ensure breadth and system relevance.

This longlist was assessed through a survey of members of REN21's global community – including policy makers, researchers, and representatives of industry and civil society – who evaluated indicators based on relevance, clarity and usefulness for understanding how a renewables-based energy system can serve as the foundation of economies and societies. The results provided an initial prioritisation via a shortlist.

Participants in a multi-stakeholder workshop refined the shortlist through qualitative assessment, focusing on usability, narrative value and policy relevance. Discussions examined whether indicators reveal enablers and barriers, highlight gaps between ambition and implementation, and capture economic, social, environmental and energy security implications.

Indicators were subsequently consolidated through internal review, clarifying definitions, assessing data availability and identifying complementarities across dimensions. Data gaps and methodological limitations were explicitly acknowledged and are treated as analytical findings, pointing to areas where improved monitoring is needed.

To strengthen transparency and collective ownership, the renewables-based economy framework was reviewed by a group of special advisors and then opened to broader peer review across REN21's extended network. This process not only ensured rigorous scrutiny of the framework, but also created a valuable opportunity for the wider community to actively contribute to data collection and consolidation, reflecting the same crowd-sourced approach that has long been at the heart of REN21's work.

The resulting framework and data support coherent, decision-relevant analysis. Rather than presenting isolated metrics, the RBE Tracker emphasises how indicators interact to reveal system dynamics, trade-offs, and transition pathways, providing a robust foundation for decision making.

The Renewables-Based Economy (RBE) Tracker



Energy Systems and Energy Security

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Economy

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Society and Governance

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Environment and Climate

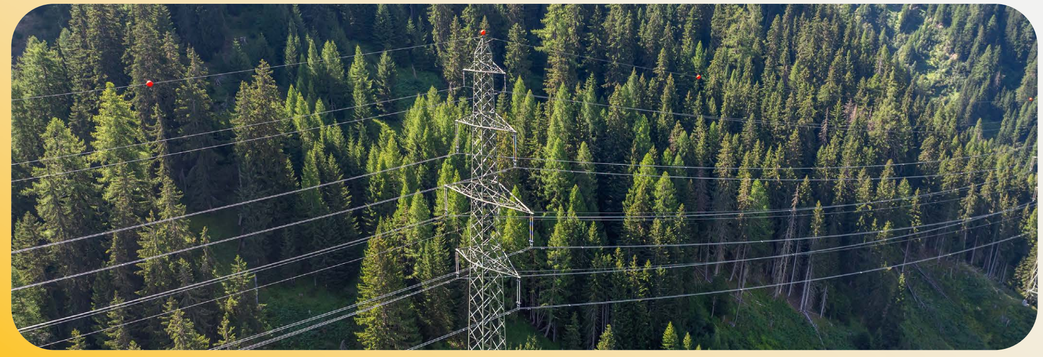
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RBE TRACKER

Energy Systems and Energy Security

15%
modern renewable in total final energy consumption

80%
fossil fuel in total final energy consumption



Energy systems sit at the core of the transition to a renewables-based economy, linking how energy is produced with how it is ultimately consumed across the key sectors of agriculture, buildings, industry and transport. The past decade has seen unprecedented growth in renewable energy deployment. Costs have fallen dramatically, renewable power has become the dominant source of new electricity generation, and several countries now operate electricity systems with very high shares of variable renewables. The ongoing global crises reinforce these trends by increasing the attention to energy security affordability and domestic energy resources. Yet translating this momentum into a broader transformation of energy demand remains a challenge. Renewable energy is gaining ground and electrification is expanding, but both continue to represent a limited share of total final energy consumption (TFEC).[1]

Globally, renewables account for less than one-fifth of TFEC (15%), while electricity represents less than one-quarter (around 23%) of final energy use.[2] This underscores the reality that fossil fuels still dominate large parts of the energy system. Even where progress is more advanced, it is often uneven across sectors, reflecting structural constraints, legacy infrastructure and differing policy priorities.

Crucially, the transition to a renewables-based economy is not only about scaling renewables or increasing electricity use in isolation – rather, it is about aligning both in a way that drives system-wide change. While electrification plays a central role across many sectors, renewables-based solutions beyond electricity also remain important for addressing diverse energy needs efficiently and cost-effectively across end-uses.

In many cases, electrification is advancing faster than the decarbonisation of electricity supply, while in others, renewable energy deployment remains concentrated in power production, without fully transforming energy demand across end-uses. This misalignment limits the extent to which energy systems currently deliver on broader objectives such as energy security, resilience and greenhouse gas emissions reduction. Advancing towards a renewables-based economy therefore requires a more integrated approach, where renewable energy deployment, infrastructure expansion and demand-side transformation evolve together to reshape the entire energy system.

Continued reliance on imported fossil fuels leaves many economies exposed to external price volatility, supply disruptions and geopolitical tensions, whereas expanding renewables and electrification can progressively reduce these risks by anchoring energy supply in more widely available domestic resources. This shift alters the nature of energy dependencies, moving away from dependence on imported fuels from a limited number of suppliers towards systems based on infrastructure, technology, and upfront investment, with lower exposure to fuel price uncertainty. At the same time, a renewables-based system can strengthen long-term resilience by improving the predictability of energy planning, reducing exposure to external shocks and supporting more stable and co-ordinated economic development.

ENERGY SYSTEMS AND ENERGY SECURITY

Renewable Energy Share in Total Final Energy Consumption

Purpose: Tracking the share of renewables in total final energy consumption (TFEC) and across demand sectors helps assess whether the energy transition is driving system-wide transformation beyond electricity generation.



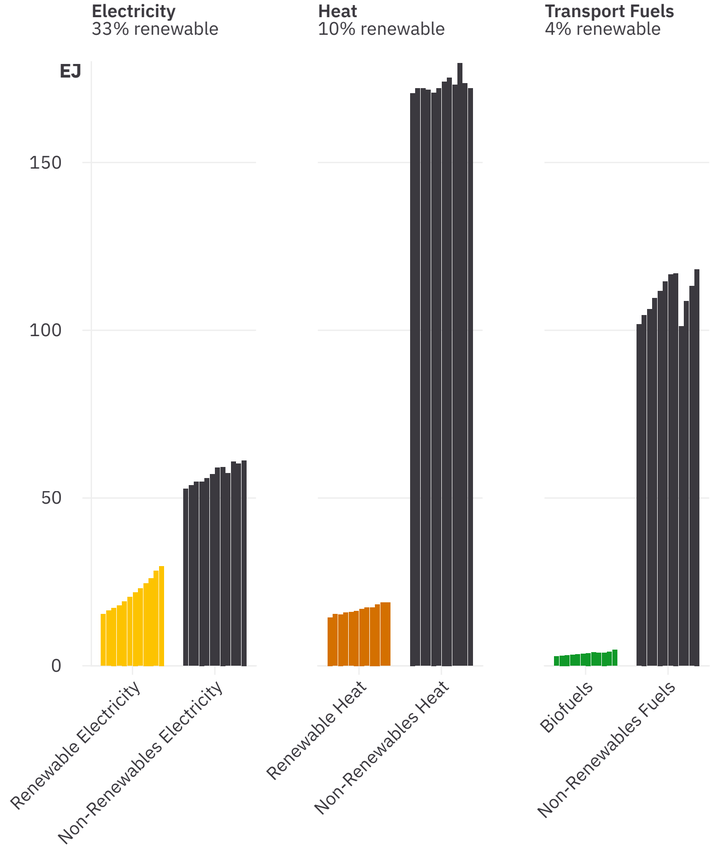
The **global energy mix** remains dominated by fossil fuels, with renewable energy still representing a relatively limited share of TFEC. In 2024, modern renewables[iii] accounted for around 15% of TFEC, increasing only gradually from 10% in 2014.[3] Absolute renewable energy use has grown over this period, but the rise in overall energy demand has limited the pace of change in relative terms. This relatively slow progress contrasts with developments in the power sector, where renewables now account for the vast majority of new capacity additions globally, reaching 85-90% in recent years.[4]

At the same time, fossil fuels continue to represent the largest share of final energy consumption, at around 80% in 2023, with the remainder (after modern renewables) largely comprising nuclear energy and traditional biomass.[5] These trends highlight that, despite sustained progress, the global energy system remains structurally reliant on fossil fuels. Accelerating the uptake of modern renewables across all end-use sectors is therefore critical to shifting the overall energy balance.

Renewable energy uptake differs greatly across end-uses. Over the past decade, the fastest progress has occurred in electricity, with renewables accounting for around 33% of total electricity consumption globally in 2023. By contrast, renewable energy penetration remains much lower in heat and transport fuels, at around 10% and 4% respectively in 2023, highlighting the slower pace of transition in sectors that remain heavily dependent on fossil fuels.

FIGURE 1.
Global Renewable and Non-Renewable Energy Consumption, by Carrier, 2013-2023[6]

Renewables account for only 15% of total final energy use, with uptake lagging in heat and transport



Source: IEA, 2026 •
Note: Fuels only refer to fuels used in transport.

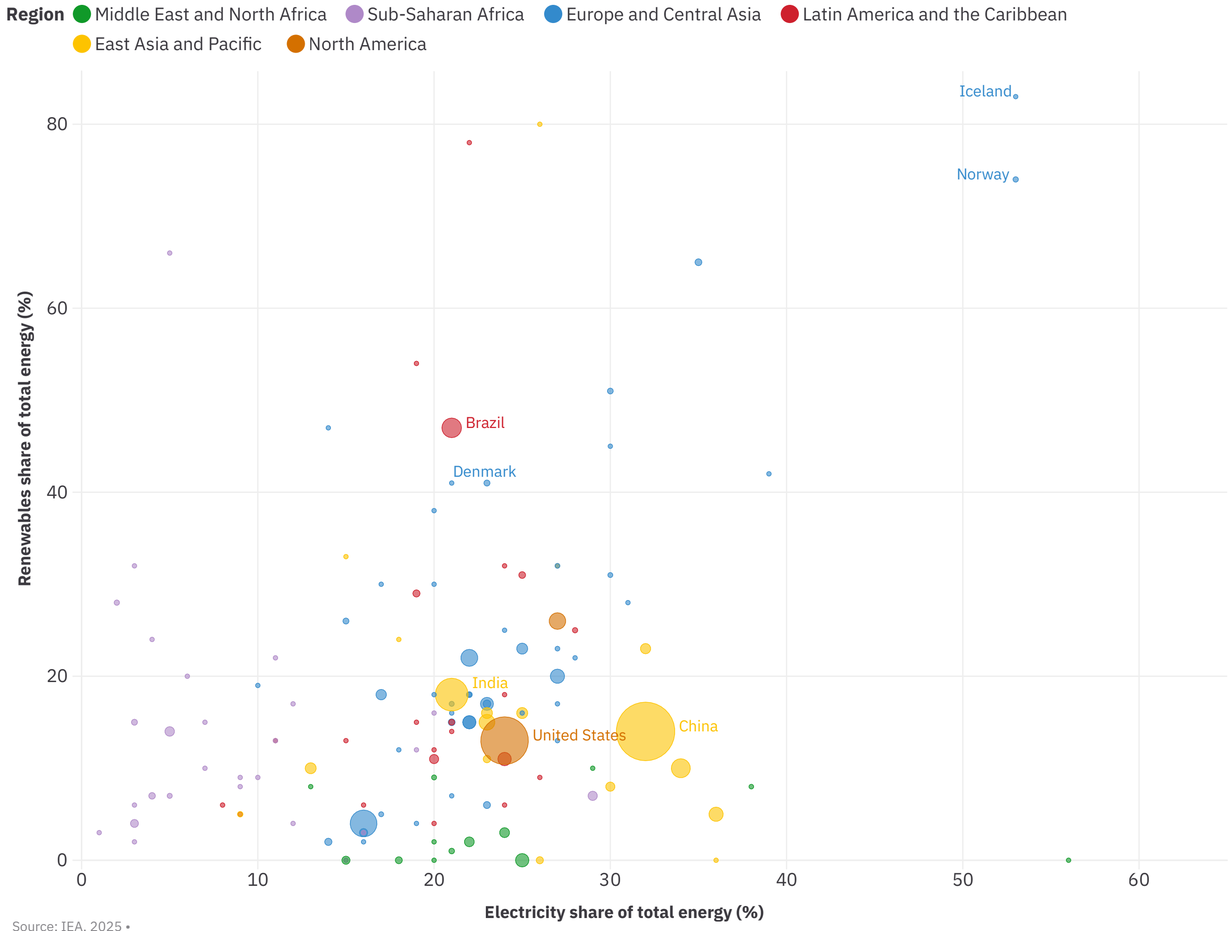
REN21

iii Modern renewables include renewable electricity, modern bioenergy and renewable heat technologies, excluding the traditional use of biomass in inefficient applications.

FIGURE 2.

Shares of Electricity and Modern Renewables in Total Final Energy Consumption, by Country, 2023[8]

Higher electrification must be accompanied by renewable electricity deployment and the uptake of direct renewable energy in heat and transport.



Source: IEA, 2025 •
Note: The size of the bubble refers to the total final energy consumption (TJ).

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Across end-use sectors, the penetration of renewables remains uneven and is generally limited. In transport, renewables accounted for only around 5% of TFEC in 2023, reflecting continued reliance on fossil fuels despite growing electrification and biofuel uptake. In buildings, the share was around 18%, supported by renewable electricity and bioenergy, but constrained by slow transitions in heating and cooling. Industry shows a similarly low level of renewables, at around 19% in 2023, where high-temperature processes and fossil fuel dependence remain significant barriers. In agriculture, renewables accounted for roughly 20% of final energy use, with progress driven by electrification and bioenergy but still at an early stage. These sectoral differences underline that achieving a renewables-based economy will require targeted efforts to accelerate adoption across all demand segments.[7]

Energy systems are undergoing a gradual but incomplete transformation, with both electrification[iv] and renewable energy expanding across most economies. However, levels vary greatly across countries depending on resource availability, infrastructure and policy choices. Despite this progress, electricity and renewable energy still account for a small share of final energy consumption in most economies, highlighting the significant transformation still required across.

iv In sub-Saharan Africa, low electrification rates reflect both limited uptake of electricity in end-use sectors and persistent access gaps, with around 550-600 million people lacking access to electricity. This highlights that increasing electrification in the region is closely tied to expanding basic energy access.

A small group of countries combine high electrification with high renewable energy shares, while most economies remain in the early stages of both transitions.



The relationship between these two dimensions remains uneven and often misaligned. In many large economies, electrification is progressing faster than the integration of renewables, with electricity still largely supplied by fossil fuels, as seen in China (32% electrification, 14% renewables) and the Republic of Korea (36% electrification, 5% renewables).[9] Conversely, some countries exhibit relatively high renewable energy shares without fully electrified systems, such as Brazil (47% renewables, 21% electrification) and Denmark (41% renewables, 21% electrification).[10] In these cases, high renewable shares are often driven by renewable electricity, bioenergy or renewable heat in specific sectors, while large parts of transport, industry and buildings continue to rely on direct fuel use.

In most cases, both electrification and the deployment of renewables remain below levels required for structural transformation, with electricity typically below one-third of final energy use and renewables below half. Advancing towards a renewables-based economy requires accelerating both dimensions in parallel, ensuring that rising electricity demand is increasingly met by renewable energy sources.



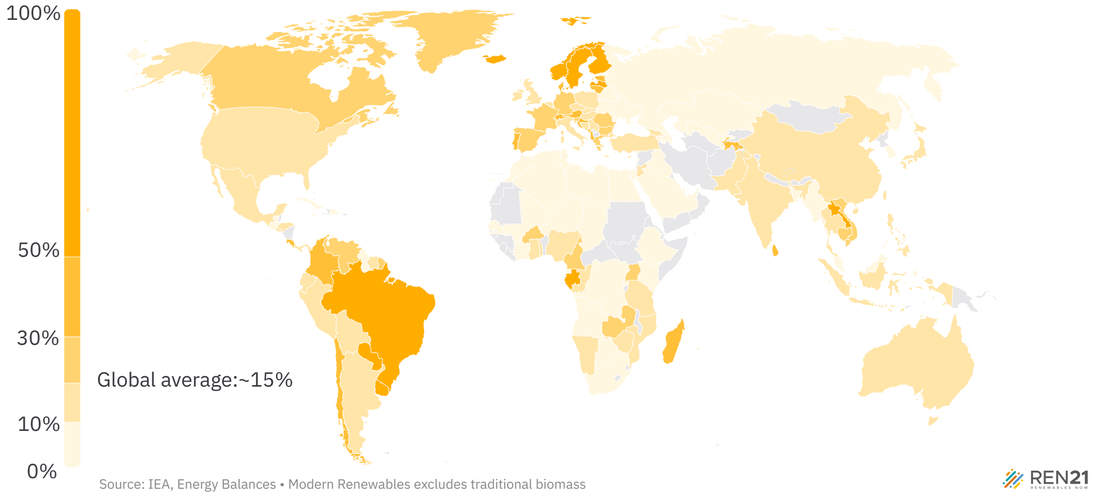
23%

electricity share in total final energy consumption

FIGURE 3.

Renewable Energy Share in Total Final Energy Consumption, by Country, 2023[11]

Renewable energy uptake remains uneven across countries, with most economies still below 20% of final energy use and significant disparities in progress toward system-wide transformation



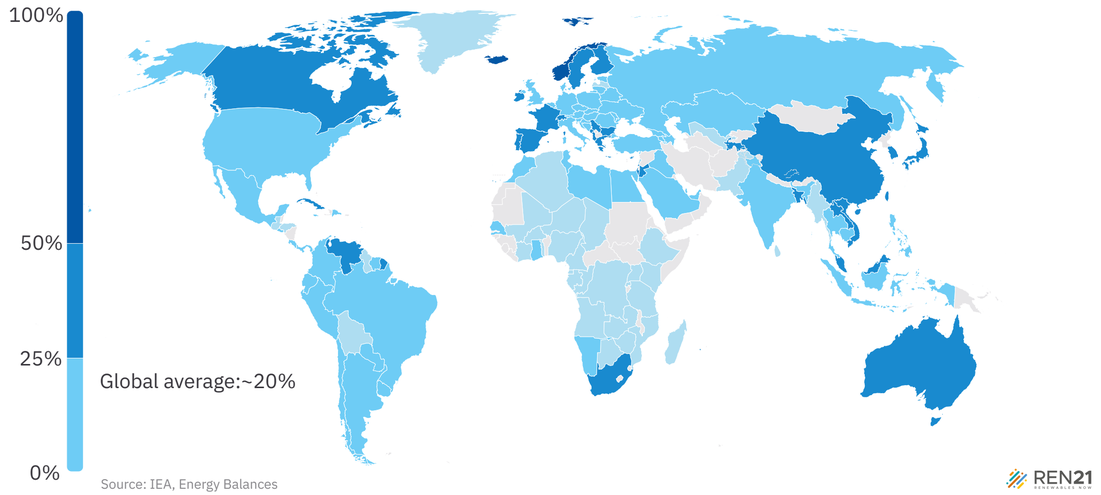
Source: IEA, Energy Balances • Modern Renewables excludes traditional biomass

REN21

FIGURE 4.

Electricity Share in Total Final Energy Consumption, by Country, 2023[12]

Electrification is progressing across most regions, but remains below levels needed to drive deep energy system transformation and support a renewables-based economy



Source: IEA, Energy Balances

REN21

Renewable energy has made significant progress in the power sector, with its share in electricity generation rising steadily across all regions since 2000. Globally, renewables accounted for around **33.7% of electricity generation** in 2025, up from less than 20% in 2010.[13] Growth has been particularly strong across **Europe and Oceania**, where renewable energy shares have exceeded **40%**, driven by sustained policy support and rapid expansion of wind and solar. **Latin America and the Caribbean** continue to lead globally, with shares above **60%**, due largely to hydropower alongside growing contributions from other renewables.[14]

Despite this progress, regional differences remain. **Asia and Africa**[v], while experiencing steady growth, still lag with renewable energy shares below **30%**, reflecting rising electricity demand and continued reliance on fossil fuel-based generation.[16] These trends highlight both the momentum and the limits of current progress: while the power sector is leading the transition, renewable electricity expansion alone is not yet sufficient to drive system-wide transformation without parallel changes in end-use sectors.

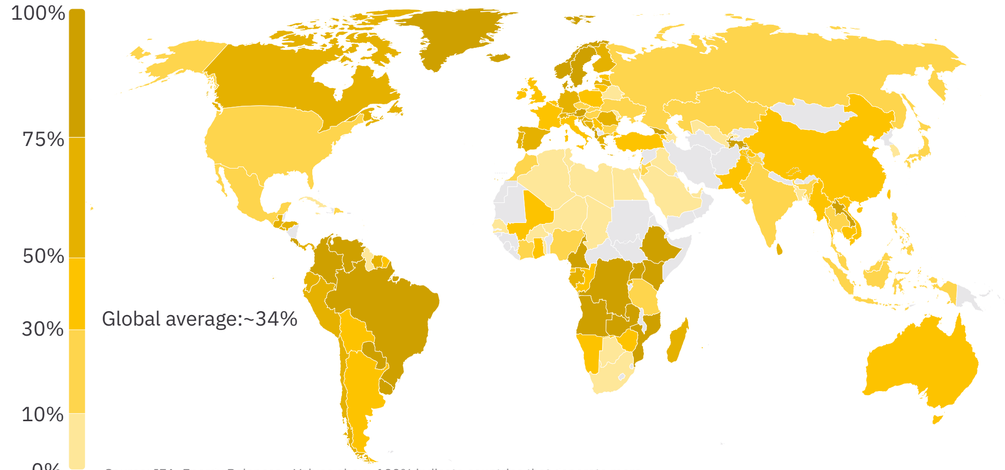
34%

renewable energy share of global electricity generation

FIGURE 5.

Renewable Energy Share in Electricity Generation, by Country, 2024[15]

Renewables are rapidly expanding in the power sector across most regions, providing a strong foundation for broader energy system transformation



Source: IEA, Energy Balances • Values above 100% indicate countries that generate more renewable electricity than they consume domestically and are net exporters of electricity.

REN21

v Some countries, particularly in Africa, record high renewable electricity shares due to low overall electricity consumption and reliance on hydropower; however, accounting for limited electricity access significantly reduces the share of renewable electricity available across the population.

ENERGY SYSTEMS AND ENERGY SECURITY

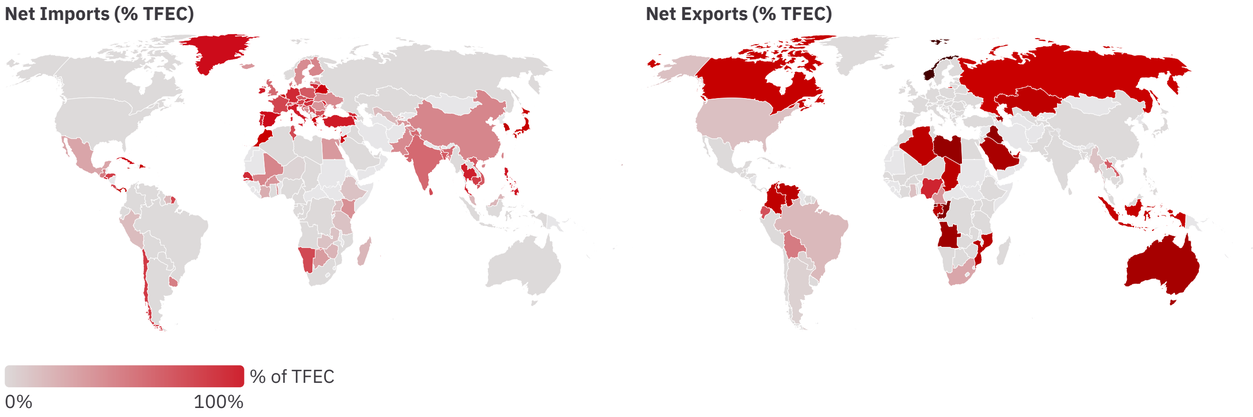
Energy Import Dependence

Purpose: Tracking energy import dependence helps assess exposure to external supply risks and broader structural dependencies across energy systems.

The expansion of renewable energy systems offers a pathway to reduce dependence on energy imports, improve resilience and reshape energy trade dynamics. Current energy trade patterns, covering all energy carriers including fossil fuels and electricity, remain highly imbalanced – with most countries relying on imports to meet domestic demand while a relatively small number of economies dominate global exports.

FIGURE 6.
Net Energy Importers and Exporters, by Country, 2023[17]

Of the countries covered, most countries remain net energy importers: 92 countries import more energy than they produce, compared with only 36 net exporters.



Source: IEA, 2026 •
Note: Please note that some countries are lacking comprehensive energy imports and export data.

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Energy import dependence is particularly pronounced in Europe, large parts of Asia and many countries in Africa, reflecting limited domestic resource availability, infrastructure constraints and/or rapidly growing demand. In contrast, net energy exports are concentrated in a handful of fossil-rich economies, where fossil fuel production continues to underpin national energy systems and trade balances. This structural asymmetry exposes a large share of the global economy to external supply risks, price volatility and geopolitical disruptions, making energy security a central concern for many countries.[18]

These patterns highlight a fundamental dimension of the transition to a renewables-based economy. Unlike fossil fuels, which are unevenly distributed and traded globally, renewable energy resources are more widely available and can be developed domestically in most countries. This creates opportunities to strengthen energy security and reduce exposure to fuel price volatility and supply disruptions. At the same time, renewable energy systems rely on global supply chains for technologies, components and certain critical minerals, with manufacturing capacity for several key technologies remaining concentrated in a limited number of countries, particularly China. These dependencies differ from fossil fuel imports in that they are largely associated with upfront investments and industrial supply chains rather than ongoing fuel consumption.

Strengthening renewable energy systems can reduce exposure to external shocks while improving the predictability of energy supply and costs. At the same time, the transition is not only about replacing energy sources. It also requires transforming underlying system dependencies, infrastructure and investment patterns that have long reinforced global economic and power imbalances.

DATA GAPS:

Tracking Material Dependencies in Renewables-Based Economies

Current assessments of energy security and trade dependencies continue to focus primarily on fossil fuel imports and exports, while the material requirements of renewables-based economies remain comparatively under-tracked. Renewable energy technologies and supporting infrastructure rely on large volumes of materials such as copper, aluminium, steel, lithium, nickel, cobalt, graphite, quartz and rare earth elements, alongside manufacturing inputs for grids, batteries, electric vehicles, wind turbines and solar photovoltaic (PV) systems. Tracking these emerging material flows and trade will be increasingly important to understand supply chain resilience, industrial competitiveness, trade exposure and resource governance in renewables-based economies.

However, data remain fragmented across mining, processing, refining, manufacturing and trade stages, with limited integration into energy or macroeconomic statistics. Existing metrics often focus narrowly on critical minerals supply, without systematically capturing broader material demand, domestic processing capacity, recycling rates, embodied material trade and value creation across supply chains. Developing clearer definitions and tracking frameworks for transition materials and supporting technologies will be essential to complement traditional energy security indicators and better assess the evolving resource foundations of renewables-based economies.

ENERGY SYSTEMS AND ENERGY SECURITY

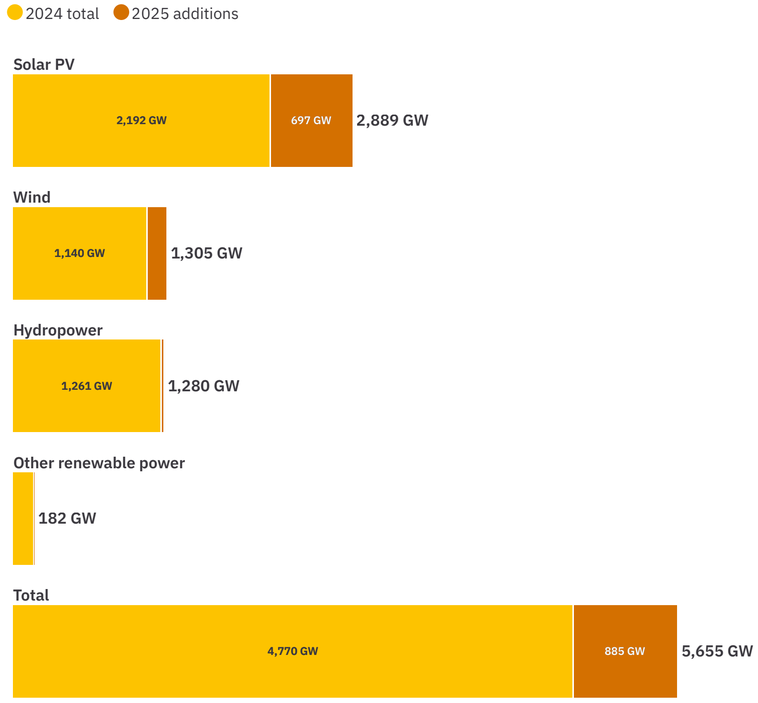
Renewables in Energy Supply

Purpose: Tracking deployment of renewable energy generation across the energy system provides a clearer understanding of which technologies are shaping the transition towards a renewables-based economy.

Renewable power capacity continued to expand in 2025, reaching an estimated 5,655 gigawatts (GW) globally, with annual additions of around 885 GW. Solar PV accounted for the largest share of installed renewable power capacity, reaching around 2,889 GW, with annual additions of around 697 GW. Of these additions, around 59% were utility-scale solar and 41% decentralised or off-grid solar. Wind power installed capacity reached an estimated 1,305 GW globally, while hydropower capacity was around 1,280 GW, with comparatively lower annual additions. Together, solar PV and wind power accounted for most renewable power additions in 2025, reflecting continued growth in variable renewable electricity technologies.[19]

FIGURE 7.
Global Renewable Power Capacity and Annual Additions, by Technology, 2025[20]

Solar PV dominates new capacity additions by a wide margin, while wind continues to expand and hydropower growth remains comparatively limited, reinforcing a shift toward faster-deploying technologies



Source: IEA-PVPS, 2026, GWEC, 2026 , IRENA, 2026 • CSP Guru, 2026 (personal communication)
Note: Data for 2025 are compiled from multiple technology-specific sources. Solar PV additions and total capacity are based on direct current (DC) values. "Other renewable power" includes concentrated solar thermal power (CSP), bio-power, geothermal and ocean power. CSP additions are based on personal communication, indicating around 900 MW of new CSP capacity additions in China in 2025. Bio-power additions of 3.25 GW and geothermal additions of 259 MW are based on the cited IRENA data. No new ocean power capacity additions were identified for 2025. Total renewable power capacity additions for 2025 therefore amount to around 885 GW, bringing cumulative global renewable power capacity to around 5655 GW by the end of 2025.

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This growth, however, remains highly concentrated geographically. China continues to account for a dominant share of global renewable power expansion (53% of total additions in 2025), particularly solar PV (50%), and a growing share of wind additions (73%). By contrast, deployment in many emerging and developing economies remains constrained by financing costs, grid limitations and weaker industrial capacity, although decentralised solar systems are expanding rapidly in several regions, supported by low-cost solar modules from China that improve energy access and reduce reliance on costly or unreliable grids.

The rapid growth in solar PV and other variable renewables is also exposing broader challenges across electricity systems, where grid infrastructure, storage deployment and system flexibility are often not expanding at the same pace as generation capacity. Sustaining renewable power growth will depend not only on continued investment in generation technologies, but also on accelerating grid modernisation, storage deployment and broader enabling infrastructure, while reducing regional disparities in deployment and manufacturing capacity.

ENERGY SYSTEMS AND ENERGY SECURITY

Energy Systems and Infrastructure

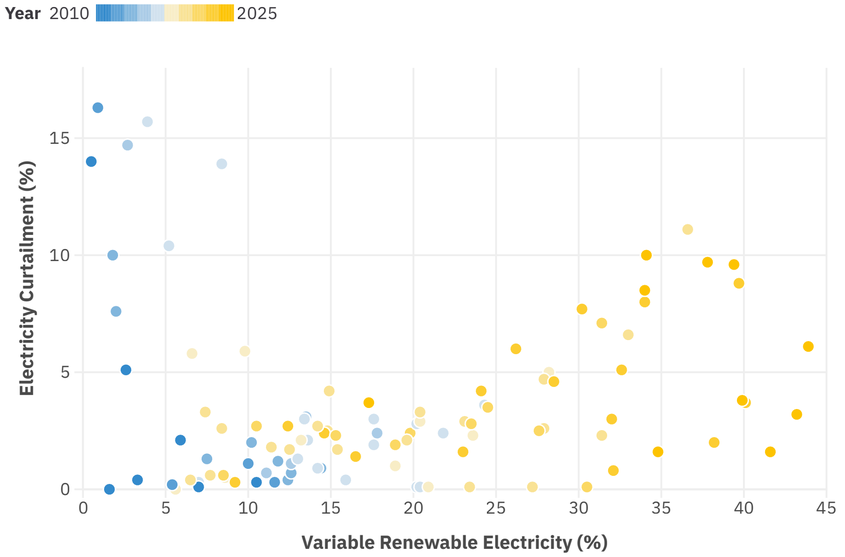
Purpose: Tracking system reliability, losses and flexibility helps assess whether energy systems are evolving in parallel with rising electrification and renewable energy deployment.

To meet growing electricity demand while accommodating an increasing share of variable renewable energy within it, power systems must expand their capacity and enhance their flexibility.

In 2025, more than 1,600 GW of renewable electricity projects were **awaiting connection** to the grid, of which around 600 GW were near completion stage.[21] For grid-connected battery storage, around 650 GW of capacity was waiting for connection, with 250 GW of this near completion.[22] These growing connection queues reflect the increasing pressure placed on electricity systems as renewable energy deployment accelerates, particularly in regions where grid expansion, modernisation and system flexibility are not keeping pace with new generation capacity.

FIGURE 8.
Electricity Curtailment and Variable Renewable Energy Share, Selected Countries, 2010-2025[23]

Higher shares of variable renewables are associated with rising curtailment, but wide variation across countries highlights the role of system flexibility, grid capacity and integration strategies



Source: IEA, 2025

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As the share of variable renewable energy (wind and solar) in electricity systems increases, curtailment[vi] can rise if grid infrastructure, storage and system flexibility do not expand at a similar pace. However, the disperse data points across countries and over time show that this relationship is not uniform. At similar levels of penetration of variable renewables, curtailment rates can vary greatly, indicating that system outcomes depend strongly on factors such as grid capacity, interconnections, storage availability and operational flexibility.

Countries with more advanced system flexibility, supported by strong grid infrastructure and investment, can accommodate higher shares of renewables with relatively low curtailment, while others experience higher losses at lower penetration levels. This highlights that curtailment is driven primarily by how effectively energy systems are planned and managed, including timely investment in grids, storage, interconnections, digitalisation and demand-side flexibility.[24]

vi Curtailment refers to the reduction or non-use of available renewable electricity generation, typically due to grid congestion, insufficient system flexibility, oversupply during certain periods, or limitations in transmission, storage or demand response capacity.

DATA GAPS:

System Integration and Flexibility Policies

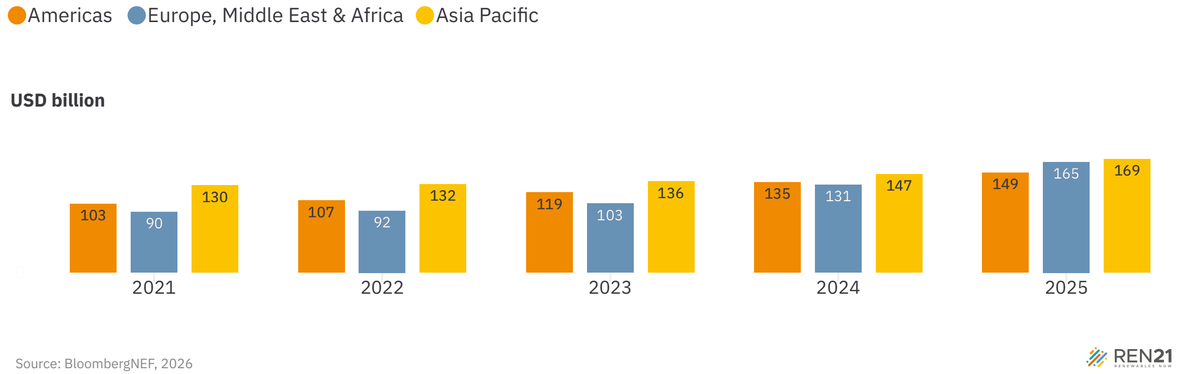
REN21 has begun expanding its policy tracking to better capture how governments are enabling higher shares of renewable energy through system integration and flexibility. This includes policies and measures related to flexibility markets, storage targets and fiscal or financial incentives for storage, off-taker agreements, solar-compatible tariff design, smart metering, demand-side management and sector coupling. While these areas are increasingly central to renewables-based economies, they are not yet tracked consistently across countries, and definitions, policy categories and implementation details vary widely. REN21 intends to publish an initial policy mapping for contributor review in later iterations of the RBE Tracker, with the aim of refining the methodology, improving comparability and progressively building a more comprehensive evidence based RBE Tracker on policies that support the integration of renewables across power, heat, transport and industry.

Investment in enabling infrastructure is increasing, reflecting the growing demands of more electricity-based and renewable energy systems. Global spending on power grids rose from around USD 323 billion in 2021 to USD 483 billion in 2025, highlighting the continued need to expand and modernise networks.[25] Investment increased across all major regions, with the fastest growth occurring in Europe, the Middle East and Africa, driven by renewable integration, electrification and energy security priorities.[26] Asia Pacific continued to account for a large share of total spending due to rising electricity demand and rapid grid expansion, while investment in the Americas grew steadily but at a slower pace.[27]

FIGURE 9.

Global Annual Investment in Power Grids, by Region, 2021-2025[28]

Grid investment rose from USD 323 billion in 2021 to USD 483 billion in 2025, with the fastest growth occurring in Europe, the Middle East and Africa



Source: BloombergNEF, 2026



1,600 GW

of renewable electricity projects are awaiting connection to the grid, in 2025.

DATA GAPS:

Regional Interconnections

Although a growing number of initiatives provide partial data on electricity networks and cross-border infrastructure, globally consistent tracking of regional interconnections remains limited. Existing platforms such as MapYourGrid, Awesome Electrical Grid Mapping and Electricity Maps offer important insights into grid infrastructure, electricity flows and transmission networks. However, these sources often focus on physical infrastructure or operational electricity data rather than systematically tracking regional interconnection strategies, enabling policy frameworks, investment plans, permitting processes, institutional co-ordination and implementation progress across countries and regions.

Data coverage also remains uneven, particularly in emerging and developing economies, where transmission and cross-border infrastructure data are often incomplete or unavailable. As renewables-based systems increasingly rely on interconnected grids and regional co-ordination to balance supply and demand, stronger monitoring frameworks and more harmonised global datasets will be needed to assess the pace, scale and effectiveness of regional interconnection development.

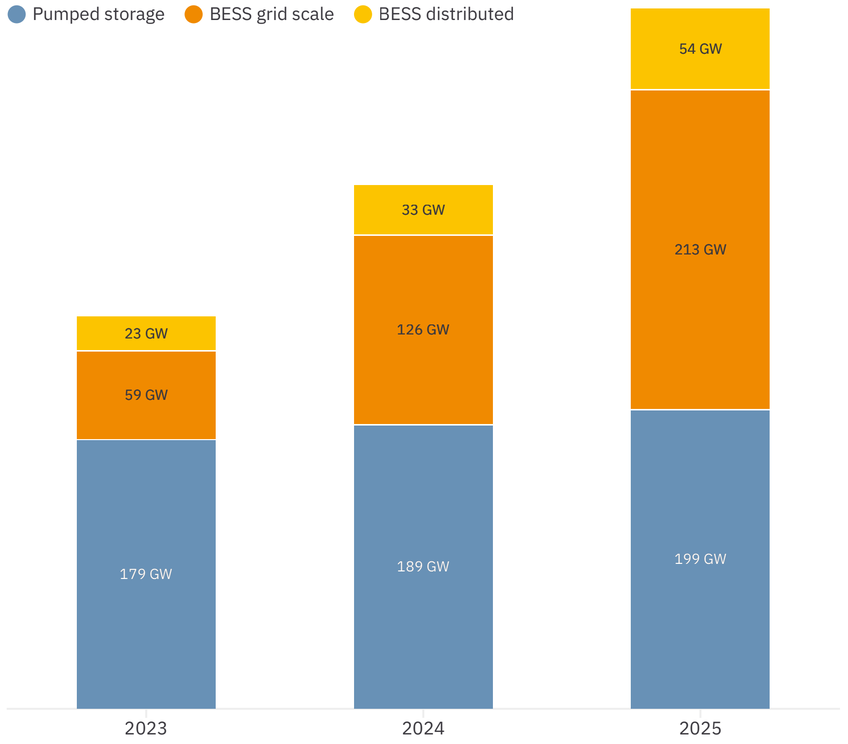
Battery storage continued its exponential growth in 2025, with more than 100 GW of stationary capacity added during the year, most of it utility-scale battery energy storage systems (BESS).[29] The rapid deployment of battery storage, driven by continuous price decreases over the past decade, led the total global stationary energy storage capacity (including pumped storage hydropower) to rise from around 260 GW in 2023 to nearly 470 GW in 2025.[30] Utility-scale BESS capacity nearly quadrupled over the period – rising from around 59 GW in 2023 to more than 212 GW in 2025 – highlighting the growing role of batteries in supporting renewable electricity integration and power system flexibility.[31]

In the context of record electric vehicle sales, mobility continued to represent the largest source of battery demand globally, with transport-related battery deployment remaining several times larger than stationary applications.

FIGURE 10.

Stationary Energy Storage, Global Installed Capacity, 2023, 2024 and 2025[32]

Utility-scale battery storage remains the fastest growing technology and surpassed pumped storage in 2025



Source: IEA, 2026, Volta Foundation, 2025 , Energy Institute, 2025 • IHA, 2024 (personal communication) IRENA, 2026
Note: Pumped storage data for 2023 and 2024 are based on personal communication between the International Hydropower Association and REN21. Pumped storage data for 2025 are derived from the cited IRENA data.

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ENERGY SYSTEMS AND ENERGY SECURITY

Energy Demand and Electrification

Purpose: Tracking energy demand, electrification of end-uses and renewable energy consumption helps assess how renewables are being integrated across buildings, industry and transport.

As renewables continue to expand in the power sector, electrification becomes essential for extending their use in additional end-use sectors, through technologies such as electric heating and cooling, transport and industrial processes.[33] Indicators such as the **electrification of end-uses** help measure the extent to which energy demand is shifting towards electricity. Tracking electrification provides insights on how to reduce overall energy demand through more efficient energy use, increase the role of renewable electricity in end-use sectors and assess whether infrastructure, system flexibility and policy frameworks are evolivng to support this transition. As of 2023, the highest share of end-use electrification was in the buildings sector (heating, cooling and appliances), whereas electrification of transport remained marginal despite rising electric vehicle sales.[34] At the same time, electricity demand is expected to increase greatly due to the expansion of data centres, digital infrastructure and artificial intelligence applications, as well as rising living standards, urbanisation and growing demand for cooling in emerging and developing economies. These trends are already influencing energy markets, with big technology companies increasingly signing power purchase agreements with renewable energy developers, reinforcing the need for rapid renewable power deployment, grid expansion and greater system flexibility.[35]



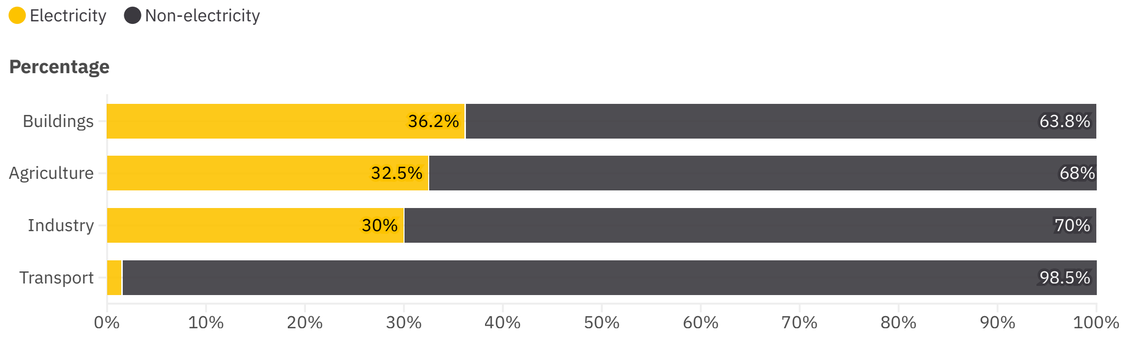
1.5%

Transport electrification remains limited, despite the rapid uptake of electric vehicles.

FIGURE 11.

Share of Electricity in Total Final Energy Consumption, by Energy Demand Sector, 2023[36]

Electrification has advanced across buildings, agriculture and industry, yet transport remains overwhelmingly reliant on non-electric energy sources

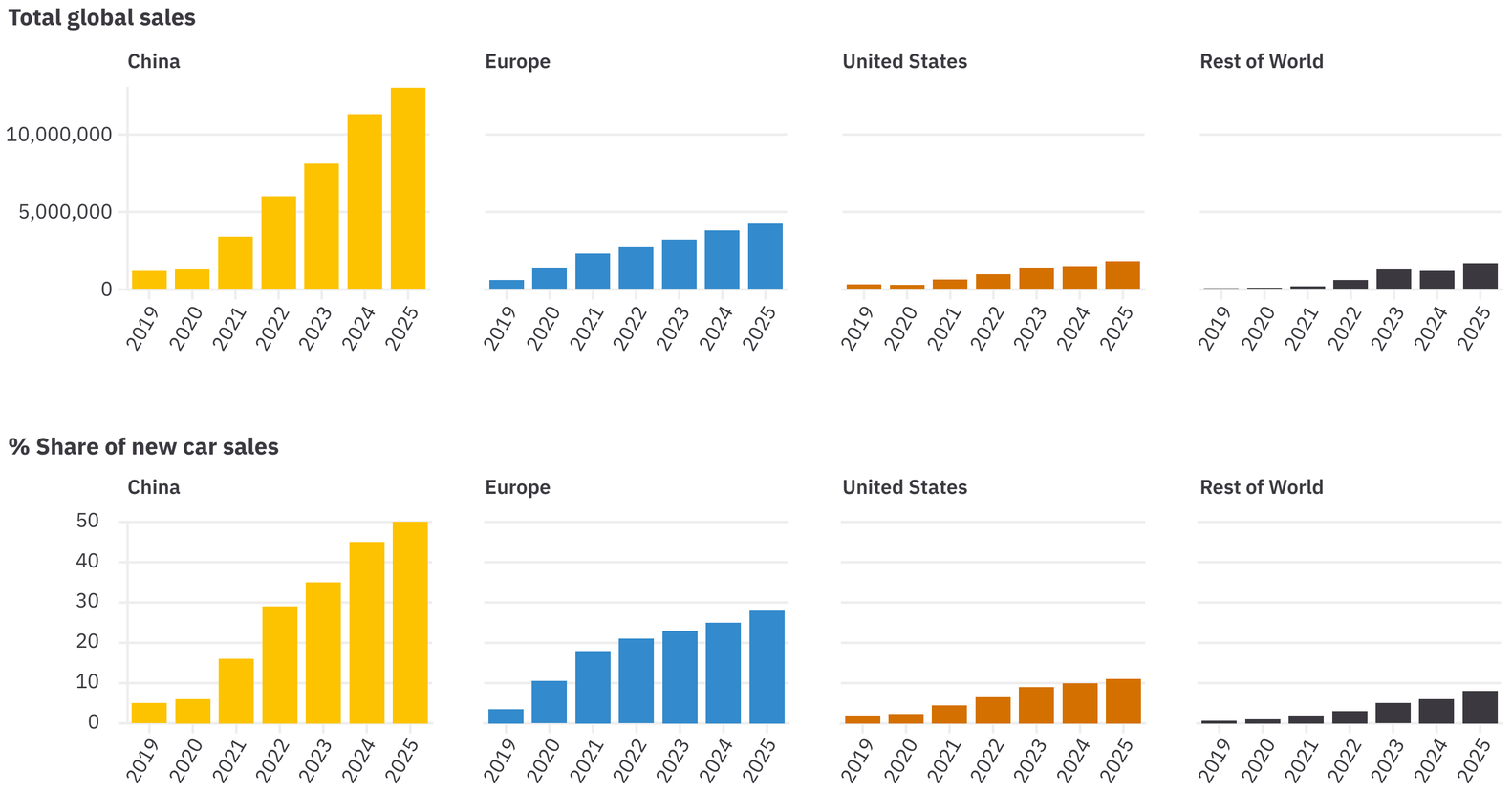


Source: IEA, 2025

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FIGURE 12.
Electric Vehicle Share of New Car Sales, by Region, 2019–2025[38]

Electric car adoption is expanding across all regions, with EVs exceeding 25% of global new car sales in 2025



Source: IEA, 2026

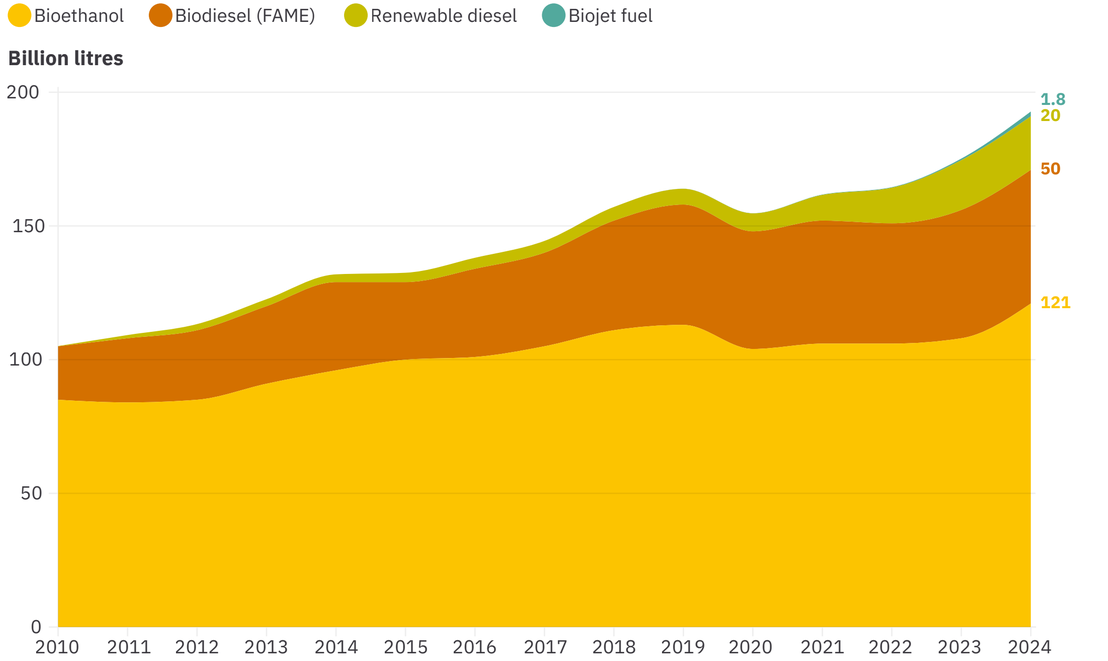
Electric mobility is scaling rapidly, with both sales volumes and market shares increasing across all major regions. Global electric car sales grew more than tenfold between 2018 and 2025, reaching over 20 million units annually. China remains the biggest market, accounting for around 60% of global electric car sales in 2025, followed by Europe (20%) and the United States (10%), while growth is also accelerating in the rest of the world. Within regions and countries, electric vehicles are capturing a growing share of total new car sales, including an estimated 55% in China, 28% in Europe, and 11% in the United States – pushing the global average to around 25%. Although adoption remains uneven, all regions show a clear upward sales trajectory.[37]

Electrification is also expanding beyond passenger cars to buses and commercial vehicles. China remains the dominant market for electric buses and trucks, accounting for around 60% of global electric bus sales and more than 90% of electric medium- and heavy-duty truck sales in 2025. Electric buses represented around 60% of China's total new bus sales that year, and electric truck deployment has accelerated rapidly in the country, supported by industrial policies, charging infrastructure expansion and lower operating costs. Europe is the second largest market for electric buses, reaching sales shares above 12% in 2025. In the United States, electric truck deployment is also increasing, particularly in freight and logistics fleets, although market shares remain comparatively low.[39]

FIGURE 13.

Global Production of Liquid Biofuels, by Fuel Type, 2010-2024[40]

Global liquid biofuel production reached nearly 193 billion litres in 2024, with renewable diesel and biojet fuel recording the fastest growth rates



Source: World Bioenergy Association, 2025

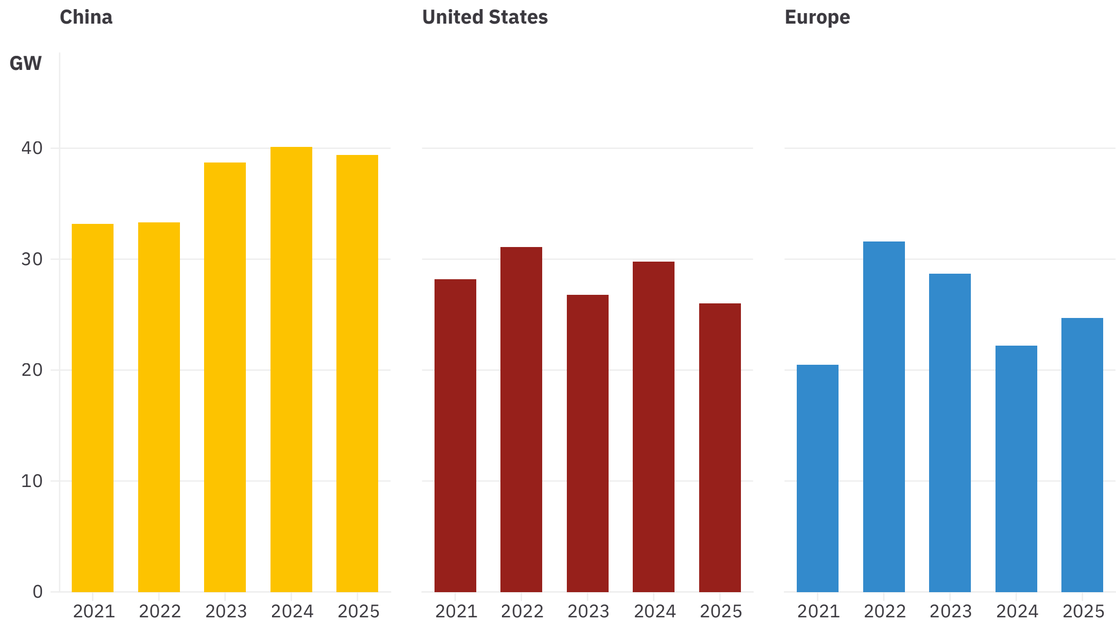
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Global liquid biofuel production has resumed strong growth in recent years, reaching nearly 200 billion litres in 2024 after a decline during 2019-2021. This increase is driven by stronger policy mandates and blending requirements across major and emerging markets. Growth in the United States has been supported by the rapid expansion of renewable diesel, while Brazil has increased ethanol production and Indonesia has expanded biodiesel output through higher blending mandates. Rising demand for low-emission fuels in transport, alongside higher fossil fuel prices and energy security concerns, has further supported uptake.

FIGURE 14.

Heat Pump Capacity Additions in Selected Regions, 2021-2025 [41]

China shows steady growth in heat pump additions, while Europe and the United States display more volatile, policy- and market-driven trends



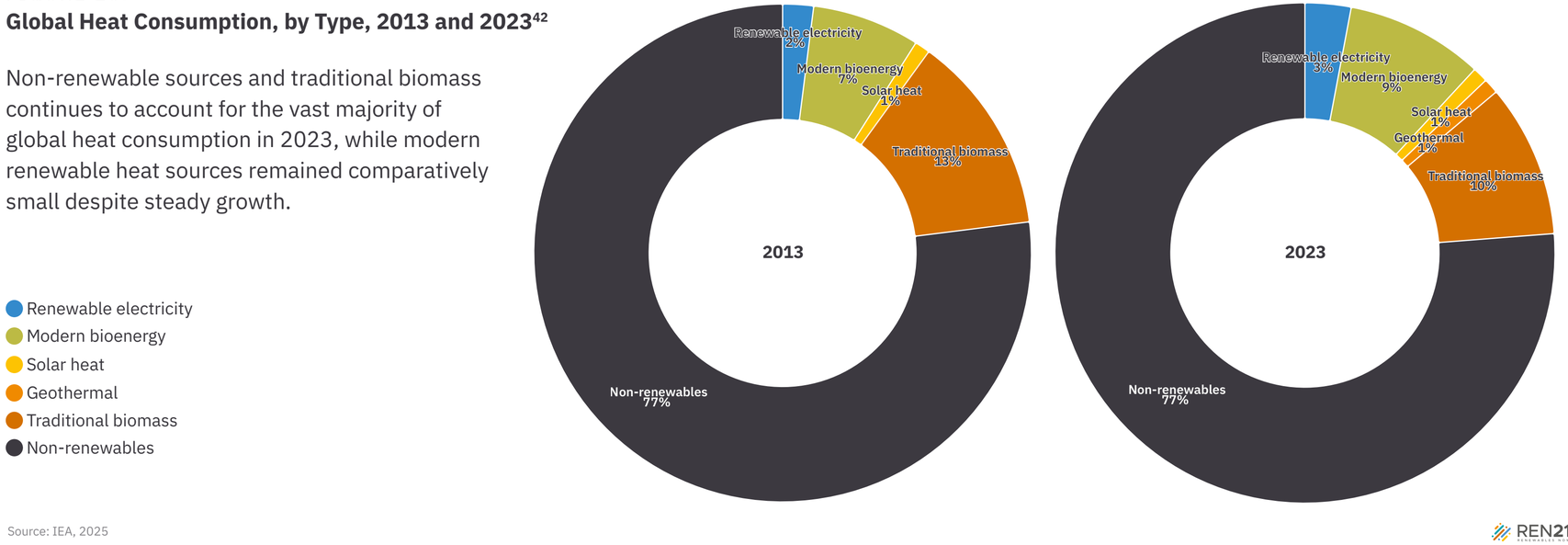
Source: IEA, 2026

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The deployment of **electric heat pumps** is expanding across major markets, with distinct regional patterns. China has shown steady growth in heat pump sales – nearing 40 GW in 2024 and 2025 reflecting strong policy support and integration into electrification strategies. In contrast, Europe and the United States display more volatile, policy- and market-driven trends, with fluctuations in annual sales despite overall growth. These differences highlight the rising role of heat pumps in decarbonising heating and cooling, while underlining the continued influence of policy frameworks and market conditions on adoption.

FIGURE 15.
Global Heat Consumption, by Type, 2013 and 2023[42]

Non-renewable sources and traditional biomass continues to account for the vast majority of global heat consumption in 2023, while modern renewable heat sources remained comparatively small despite steady growth.



Source: IEA, 2025

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DATA GAPS:
Renewable Energy Use in Industry

Tracking renewable energy use in industry remains fragmented and incomplete at the global level. While sector-specific initiatives and databases such as the Mission Possible Partnership provide valuable insights into industrial decarbonisation projects and the adoption of low-emission technologies in sectors such as steel, cement and chemicals, no comprehensive global database currently exists to systematically track renewable energy use across industrial activities.[45]

Existing datasets often focus on industry emissions, energy efficiency, technology deployment or individual projects, rather than measuring the full contribution of renewable electricity, renewable heat and renewable fuels in industrial energy demand. Coverage also varies greatly across regions and industrial sub-sectors, with limited visibility on smaller-scale applications and emerging economies. As industry represents one of the largest and most difficult sectors to decarbonise, improving data availability and harmonising methodologies will be essential to assess progress towards renewables-based industrial systems and to identify remaining gaps and opportunities.

Although **electrification** through technologies such as heat pumps and electric vehicles is a central pillar of the transition towards renewables-based economies, electrifying all end-uses is neither technically necessary nor always the most efficient pathway for integrating renewables across the energy system. **Direct renewable heat applications**, particularly solar thermal and geothermal energy, also play a growing role in decarbonising buildings, industry and district heating networks. These technologies can provide renewable heat directly, avoiding additional conversion losses and reducing pressure on electricity systems, grids and storage infrastructure.

Solar thermal technologies remain an important source of renewable heat globally, particularly for water heating, district heating and industrial processes. China continues to dominate the global solar thermal market, accounting for the majority of installed capacity worldwide, while Türkiye, India, Brazil and several European countries also maintain significant markets. In parallel, large-scale solar thermal systems for district heating and industrial heat applications have continued to expand in Europe and China.[43]

Geothermal energy plays an important role in direct renewable heat applications, particularly in district heating and buildings. China remained the global leader in geothermal heating in 2024-2025, with geothermal space heating serving an estimated 808 million square metres. Iceland, Türkiye, New Zealand and several European economies also rely heavily on geothermal resources for heating and industrial applications. Unlike variable renewable electricity technologies, geothermal systems can provide stable baseload heat, making them particularly valuable for continuous heat demand.[44]

Despite their growing role, direct renewable heat applications remain underrepresented in many energy transition strategies, which often focus mainly on electrification and renewable power deployment. Expanding solar thermal and geothermal energy will be important to accelerate renewable energy uptake across buildings and industry while supporting more balanced and efficient energy system development.

Policies for the Uptake of Renewables in Energy Demand Sectors

Tracking national policies targeting renewable energy integration across demand sectors offers a practical lens to assess where ambitions are being translated into implementation and where gaps remain.

As of 2025, **136 countries** had national policies[vii] targeting the integration of renewables in at least one of four main energy demand sectors: agriculture, buildings, industry and transport.[46] Only 17 countries had policies in place covering each of these four sectors.[47] Fiscal and financial incentives remained the most common policy instrument to incentivise the adoption of renewables and enabling technologies such as electric vehicles and heat pumps.[48]

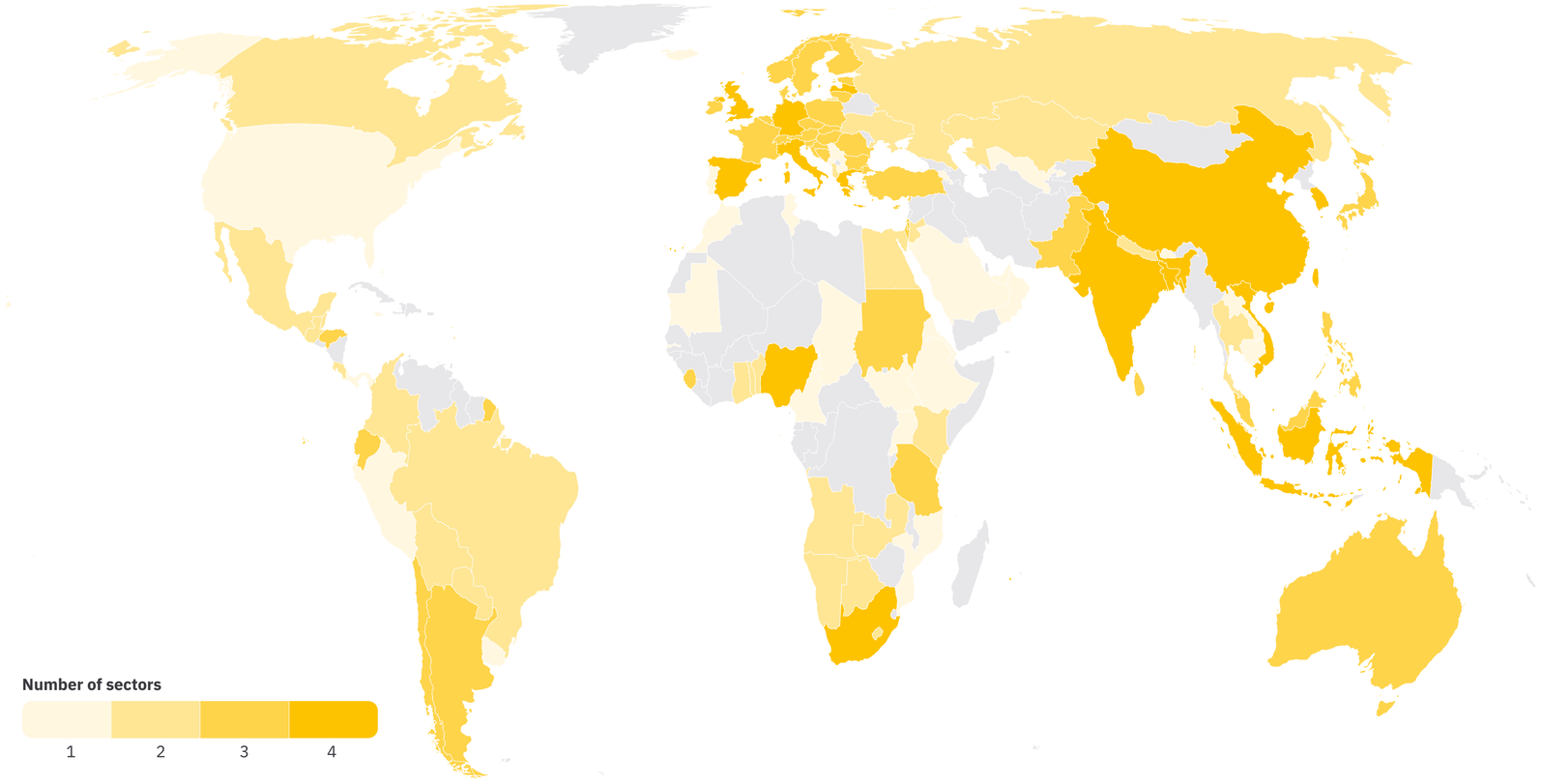
Only 17 countries

had policies in place covering all four demand sectors

FIGURE 16.

Policies for the Uptake of Renewables in Energy Demand Sectors, as of 2025[49]

Few countries have policies in place for all four main demand sectors (agriculture, buildings, industry, transport)



Source: REN21 Policy Database, 2026 •
Note: Policies include national-level strategies and roadmaps, targets, regulations, fiscal and financial incentives, standards and guidelines aiming to integrate renewables and enabling technologies in end-use sectors. Carbon taxes are not included. When a policy explicitly addresses several end-use sectors, it is counted for each sector. Policies not targeting a specific end-use sector are not included. US policy tracking may be incomplete or inaccurate; the current federal administration has rolled back elements of the Inflation Reduction Act, and the status of individual policies, whether fully cancelled, partially rescinded, or still being applied, remains uncertain

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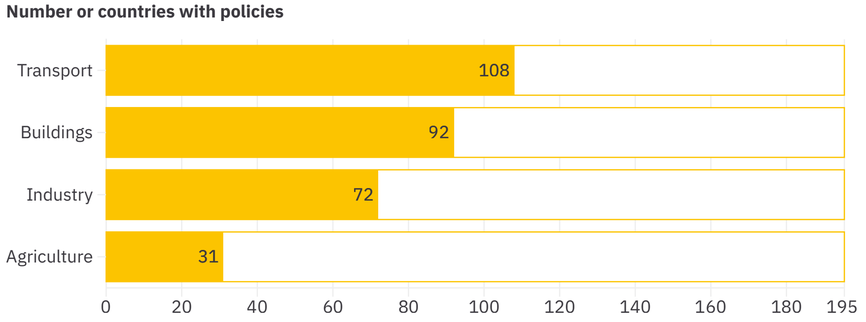
vii In the REN21 Policy Database, policies are categorised as: Strategies/roadmaps, Fiscal/financial incentives, Regulations/mandates, Guidelines and Targets.

The transport sector, although the lowest in terms of renewable energy shares, accounted for the largest number of policies for the uptake of renewables among those identified, followed by the buildings and industry sectors; in contrast, very few policies targeted the integration of renewables in the agriculture sector.[50]

Policies for the uptake of renewables in end-use sectors mostly target electrification (through the adoption of electric technologies such as heat pumps, electric vehicles and solar irrigation), as well as the installation of distributed renewable energy generation (such as rooftop solar PV). In the transport sector, the adoption of biofuels is widely promoted through blending mandates.[52]

FIGURE 17.

Countries with Policies for Energy Demand Sectors, per Sector, as of 2025[51]

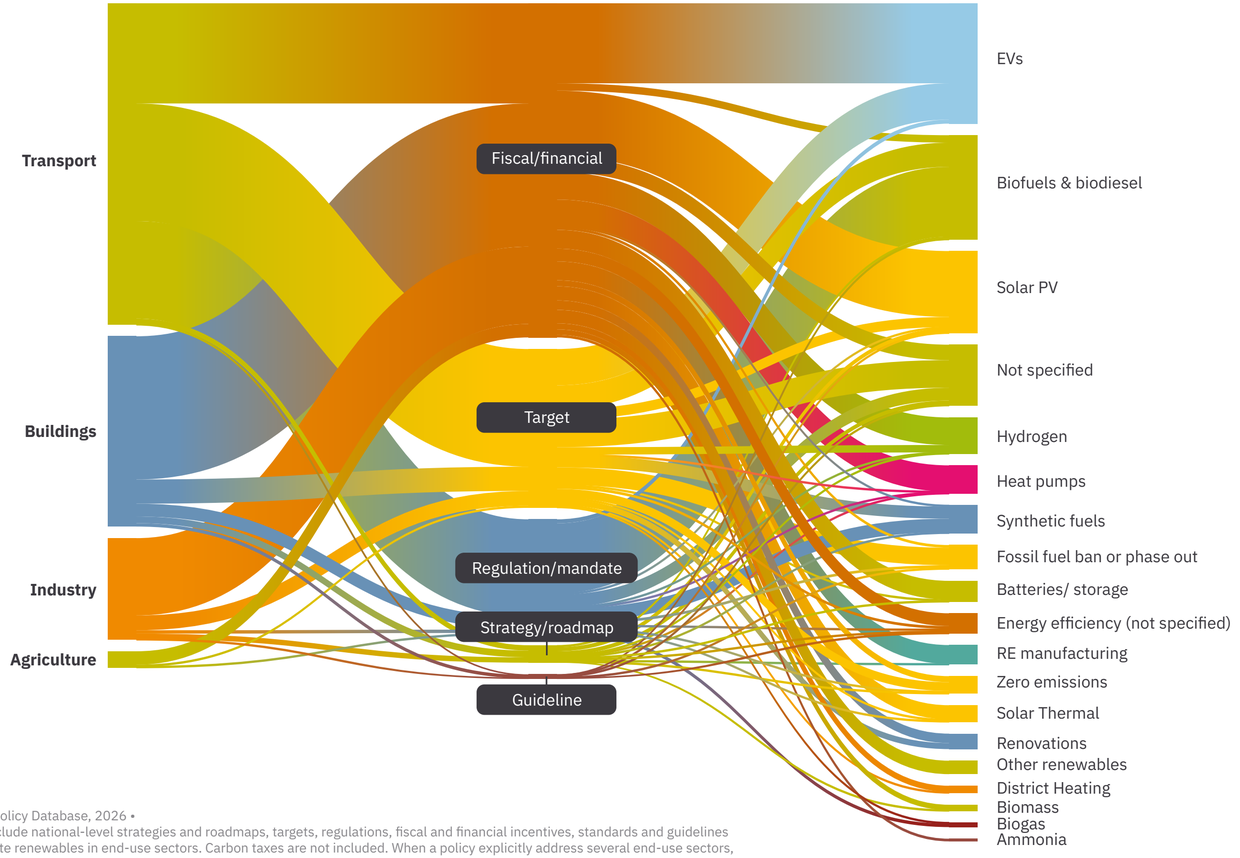


Source: REN21 Policy Database, 2026 •
195 countries including 193 UN member states and two observer states are considered.

FIGURE 18.

Policies for the Uptake of Renewables and Enabling Technologies in Energy Demand Sectors, as of 2025 [53]

Policies are concentrated in transport and buildings, with targets and fiscal incentives the most common instruments and growing attention to electrification, biofuels and renewable heating



Source: REN21 Policy Database, 2026 •
Note: Policies include national-level strategies and roadmaps, targets, regulations, fiscal and financial incentives, standards and guidelines aiming to integrate renewables in end-use sectors. Carbon taxes are not included. When a policy explicitly address several end-use sectors, it is counted for each sector. Policies not targeting a specific end-use sector are not included. Other renewables include wind energy, hydropower and geothermal. Solar PV also includes a few policies for agrivoltaics.

ENERGY SYSTEMS AND ENERGY SECURITY

Renewable Energy Targets and Energy Plans

Purpose: Tracking renewable energy targets alongside countries' long-term energy plans helps assess whether countries are aligning policy ambitions, infrastructure development and sectoral transformation with the transition towards renewables-based economies.

Long-term cross-sectoral planning includes diverse forecasting and planning tools and policies, such as long-term energy transition scenarios, wider decarbonisation plans (e.g. National Energy and Climate Plans, Nationally Determined Contributions), and policies for sectoral integration and infrastructure development. To strengthen this holistic view, it is important to also consider electrification targets for end-use sectors and, where available, energy savings and energy efficiency goals, as these are central to transforming demand in agriculture, buildings, industry and transport.

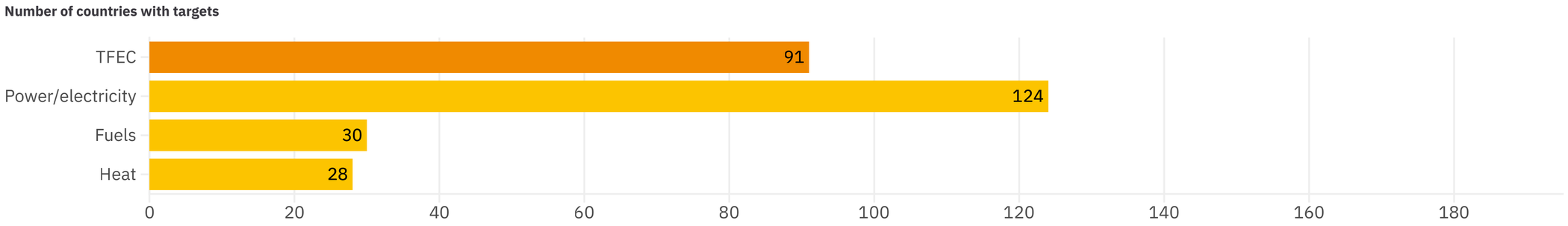
Focusing targets on the share of renewables in the overall energy mix is crucial because it reflects how deeply renewables are replacing fossil fuels, capturing real progress towards system-wide transformation.

As of 2025, **169 countries had renewable energy targets in place**, expressed as a share of total energy consumption.[viii] [54] Among these, 91 countries had targets for renewable energy shares in total final energy consumption.[55] Most of the countries (124) had targets addressing **renewables in electricity**, whereas targets for renewables in fuels (30 countries) and heat (28 countries) remain largely overlooked.[56]

viii Selected policies from REN21 policy database include national level targets expressed in percentage (%) of energy consumption. For fuels, the percentage refers to share of biofuels in fuel blends.

FIGURE 19.
Countries with Targets for Renewable Energy Share, as of 2025[57]

Renewable energy targets are most common in the power sector, while targets for renewable heat and fuels remain far less widespread



Source: REN21 Policy Database, 2026 •
Note: From 195 countries including 193 UN member states and two observer states. Targets for capacity or generation that do not mention a share of final consumption or generation are not included. For fuels, targets include biofuel blends if expressed as share of total content. Due to changes in the methodology, the figure cannot be compared to previous publications from REN21.

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Beyond renewable energy targets, embedding energy planning in broader economic and sectoral strategies is critical to ensure that renewable energy deployment is in line with **energy demand** across end-use sectors, such as agriculture, buildings, industry and transport.

DATA GAPS:

Systemic Review of Countries' Energy Plans

This first edition of the RBE Tracker does not include a systematic review of countries' energy plans to assess the extent to which they are cross-sectoral, or a review of the policies supporting their implementation. Future editions will examine these plans in greater depth and report back on findings.

Research shows that when long-term energy planning[i] is co-ordinated across sectors and stakeholders, energy scenarios and plans are more comprehensive, capturing both infrastructure needs and end-use transformations such as electrification, energy efficiency and the integration of renewables. However, analysis of long-term energy scenarios and low-emission development strategies points to significant variation across countries. Planning documents produced by integrated or multi-ministerial bodies score higher on comprehensiveness across energy transition elements, and strategies co-ordinated across energy and climate institutions tend to cover end-use sectors more thoroughly; this suggests that the institutional architecture behind energy planning matters as much as its technical content.

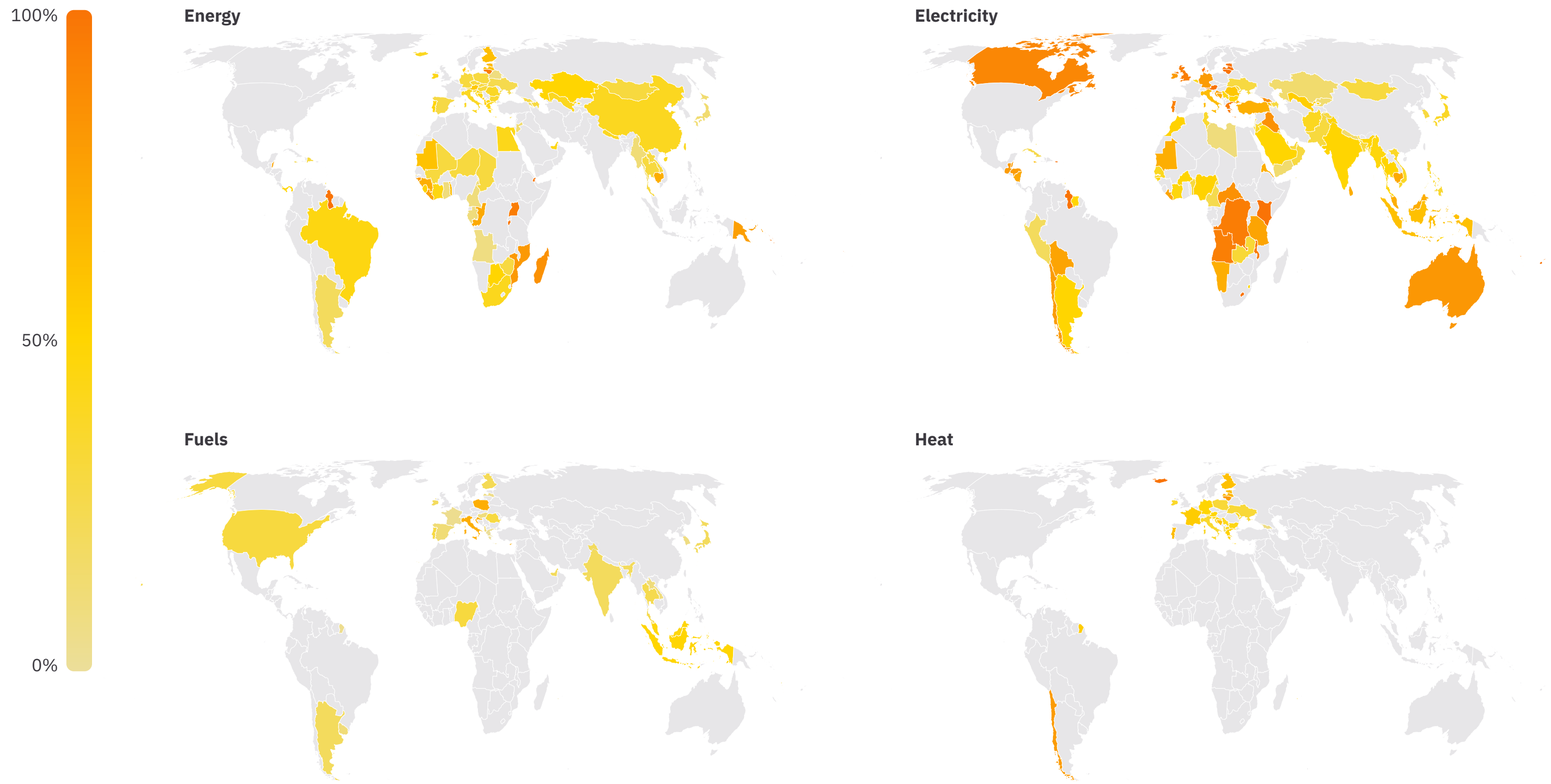
Integrating energy planning with wider economic priorities reduces blind spots and enables more coherent policy making.

i Long term energy plans encompass diverse type of energy planning instruments and policies. The wider concept of integrated energy planning refers to energy planning that considers not only for energy supply, but also includes energy demand needs, demand-side management, energy efficiency measures, grid modernisation, and distributed energy resources, and accounts for broader economic development objectives. See Laura Van Wie McGrory, Ashwini Chitnis, and Umesh Kumar Sharma Ramamoorthi, "Integrated Resource Planning Offers a Strategy to Accelerate Clean Energy," World Resources Institute, February 5, 2026 https://www.wri.org/insights/integrated-resource-planning-accelerates-clean-energy

FIGURE 20.

Countries with Targets for Renewable Energy Share, as of 2025[58]

Renewable energy targets are most common in the power sector, while targets for renewable heat and fuels remain less widespread



Source: REN21 Policy Database, 2026 •
Note: National level targets expressed as renewable energy shares in final energy consumption (economy-wide and transport for fuel blends).
US policy tracking may be incomplete or inaccurate; the current federal administration has rolled back elements of the Inflation Reduction Act, and the status of individual policies, whether fully cancelled, partially rescinded, or still being applied, remains uncertain.
The figure populates targets with diverse target years, ranging from 2026 to 2070. When a country has progressive targets over time, the figure shows the most. ambitious target per country.
Policies for which the target year was before 2026 are not included.

RBE TRACKER

Economy

USD 1.6 trillion

invested in 2025 in renewable energy and enabling infrastructure.

Renewables, electrification, grids and storage are becoming major drivers of economic activity and industrial development.

A renewables-based economy is one where energy is not simply an input to existing systems, but the structural foundation of how an economy produces, trades and grows. This goes beyond financial and investment flows alone. While investment captures the scale and momentum of deployment, it does not by itself indicate whether renewable energy is reshaping industrial production, transport systems, trade patterns or domestic value chains. A renewables-based economy emerges when renewable energy becomes embedded across these broader economic structures, reducing import dependence, creating new industrial opportunities and strengthening long-term resilience.

Increasingly, the transition is being driven not only by climate and energy objectives, but also by the growing economic advantages associated with renewable energy. Greater price stability, reduced exposure to fossil fuel markets and expanding domestic renewable energy capacity are reshaping competitiveness and influencing how countries position themselves within future energy and industrial systems.

The economic dimensions of the transition can be assessed through indicators related to investment, industrial development, employment, trade, fiscal policy and economic value creation. Together, these indicators provide insights into how renewable energy is reshaping economic activity, creating new industries and jobs, influencing trade patterns and contributing to long-term resilience and competitiveness.



ECONOMY

Renewable Energy Manufacturers and Local Supply Chains

Purpose: Tracking renewable energy manufacturing and local supply chains helps assess how countries are building the industrial capabilities needed to support the transition towards renewables-based economies, including the development of manufacturing capacity, value creation and supply chains across regions.

Global manufacturing of renewable energy and enabling technologies[ix] is expanding rapidly, although this growth varies widely across technologies and regions. The greatest capacity increases have occurred in solar PV and battery manufacturing, driven by strong investment, economies of scale and expectations of continued growth in demand. Currently, the announced manufacturing capacity in these two technologies exceeds projected deployment, contributing to downward price pressure and intensified global competition.

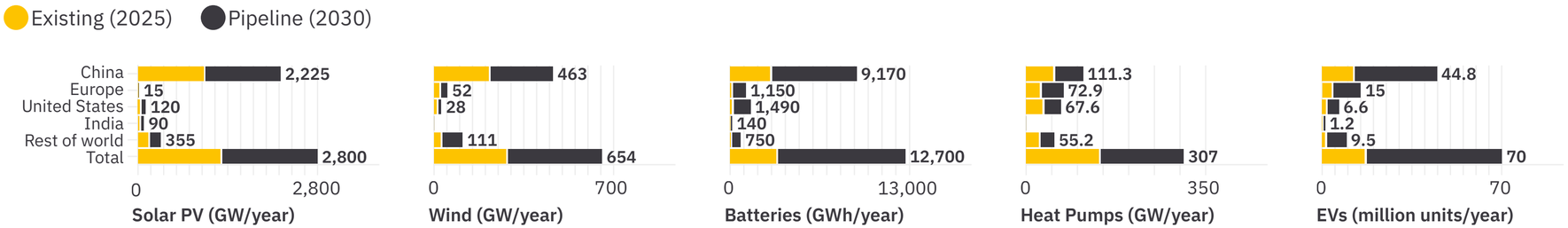
In contrast, wind energy manufacturing remains more closely aligned with deployment needs but continues to face supply chain and project delivery constraints. Heat pump manufacturing follows a different pattern, with production more regionally anchored and closely tied to local markets, standards and policy frameworks. Electric vehicle manufacturing has expanded rapidly in all major regions, as governments increasingly view transport electrification as both an energy transition objective and an industrial development opportunity.

ix Enabling technologies refer to technologies and infrastructure that facilitate the deployment, integration, storage, distribution and efficient use of renewables across energy systems and end-use sectors, including grids, energy storage, digital and flexibility solutions, electric vehicles, heat pumps and charging infrastructure.

FIGURE 21.

Status and Pipeline of Manufacturing Capacity for Renewable Energy and Enabling Technologies, by Technology and Region, 2025-20300[59]

Manufacturing expansion differs across technologies, with rapid scale-up of solar PV, more constrained wind energy supply and regionally diversified heat pump production, reflecting varied market and policy dynamics



Source: IEA, 2025, GWEC, 2026, BloombergNEF, 2026 • Benchmark Mineral Intelligence, 2026
Note: Manufacturing capacities are annual nameplate capacities. Estimated 2030 pipeline values combine both committed and preliminary/announced projects and should be interpreted as indicative rather than guaranteed deployment outcomes. Solar PV refers to module manufacturing capacity; wind refers to turbine manufacturing capacity; batteries refer to lithium-ion cell manufacturing capacity; heat pumps are expressed in thermal-equivalent manufacturing capacity; and EVs represent estimated production potential based on current production, stated policies, OEM electrification targets, and announced manufacturing expansion rather than dedicated EV-only assembly capacity. Regional values are rounded and may not sum precisely due to rounding. India is included within "Rest of world" for some technologies where the latest publicly available regional manufacturing data do not separate India explicitly. This details a REN21 analysis based on publicly available manufacturing capacity data, announced project pipelines, and industry reports from the cited sources.

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These differences reflect distinct industrial dynamics across renewable energy and enabling technologies, with solar PV and batteries characterised by highly globalised supply chains, wind power relying on more project- and infrastructure-based value chains, and heating technologies representing more locally embedded manufacturing. At the same time, manufacturing capacity remains highly concentrated geographically, with China maintaining dominance across most technologies, particularly solar PV, batteries and electric vehicles. Europe and the United States play leading roles in wind and heat pump manufacturing, while India has expanded its position across several manufacturing segments. Although differing in scale and pace, industrial policy efforts in several regions aim to expand domestic manufacturing capacity, diversify supply chains and reduce reliance on geographically concentrated production.

This uneven landscape highlights both opportunities and structural risks. Rapid capacity expansion can accelerate deployment, reduce technology costs and support industrial development; however, persistent geographic concentration and manufacturing overcapacity may also intensify supply chain vulnerabilities, declining margins, factory underutilisation and failed investments.

Policy support for renewable energy manufacturing has expanded steadily over the past decade, evolving from a limited set of measures in the early 2010s to a more structured and growing policy landscape in 2025. Asia has led this expansion, with the highest and most sustained increase in cumulative policies, underpinning the region's dominance in global manufacturing, particularly in solar PV. Europe has also strengthened its policy framework over time, and North America significantly increased manufacturing support through major industrial policy initiatives, most notably the Inflation Reduction Act, although the long-term direction of these policies has become more uncertain. In contrast, Africa, South America and Oceania have shown only limited and more recent engagement, with relatively few policies in place.

These trends suggest that the global expansion of energy equipment manufacturing is being shaped by a small number of economies that have adopted sustained industrial policy frameworks, while many countries still have opportunities to develop domestic manufacturing capacity and capture a greater share of future energy value chains.

DATA GAPS:

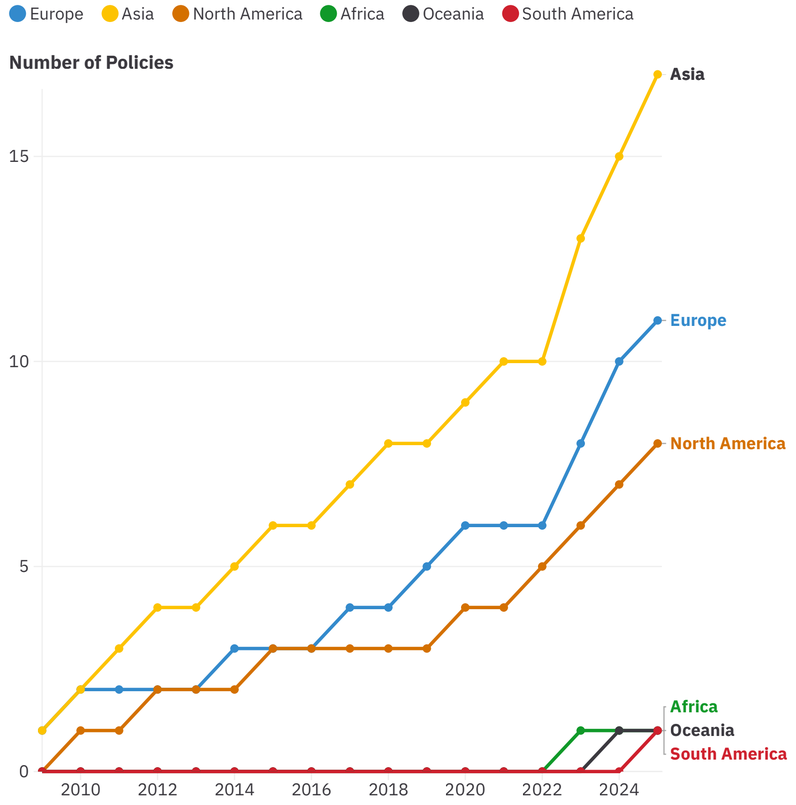
Upstream Supply Chains

Despite the growing visibility of renewable energy manufacturing capacity, significant data gaps remain across supply chains for renewables, limiting the ability to fully assess system readiness and resilience. Available data often focus on the final manufacturing stages, whereas upstream segments such as raw material extraction, processing and component-level production remain less transparent and are inconsistently tracked across regions. Information on trade flows, supply chain dependencies, bottlenecks and lead times is also fragmented, making it difficult to understand how disruptions or concentration risks propagate through the system. In addition, data on enabling components, including batteries, power electronics and critical grid equipment, are still evolving and are not systematically captured. Addressing these gaps will be essential to move from a partial view of manufacturing expansion to a more comprehensive understanding of supply chain developments and dynamics relevant for shifting to renewables-based economies.

FIGURE 22.

Cumulative Number of Renewable Energy Manufacturing Policies, by Region, 2010-2025[60]

Policy support for renewable energy manufacturing is expanding globally, led by Asia and Europe, while other regions are beginning to scale efforts more gradually



Source: REN21 Policy Database, 2026

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ECONOMY

Fiscal and Financial Policies

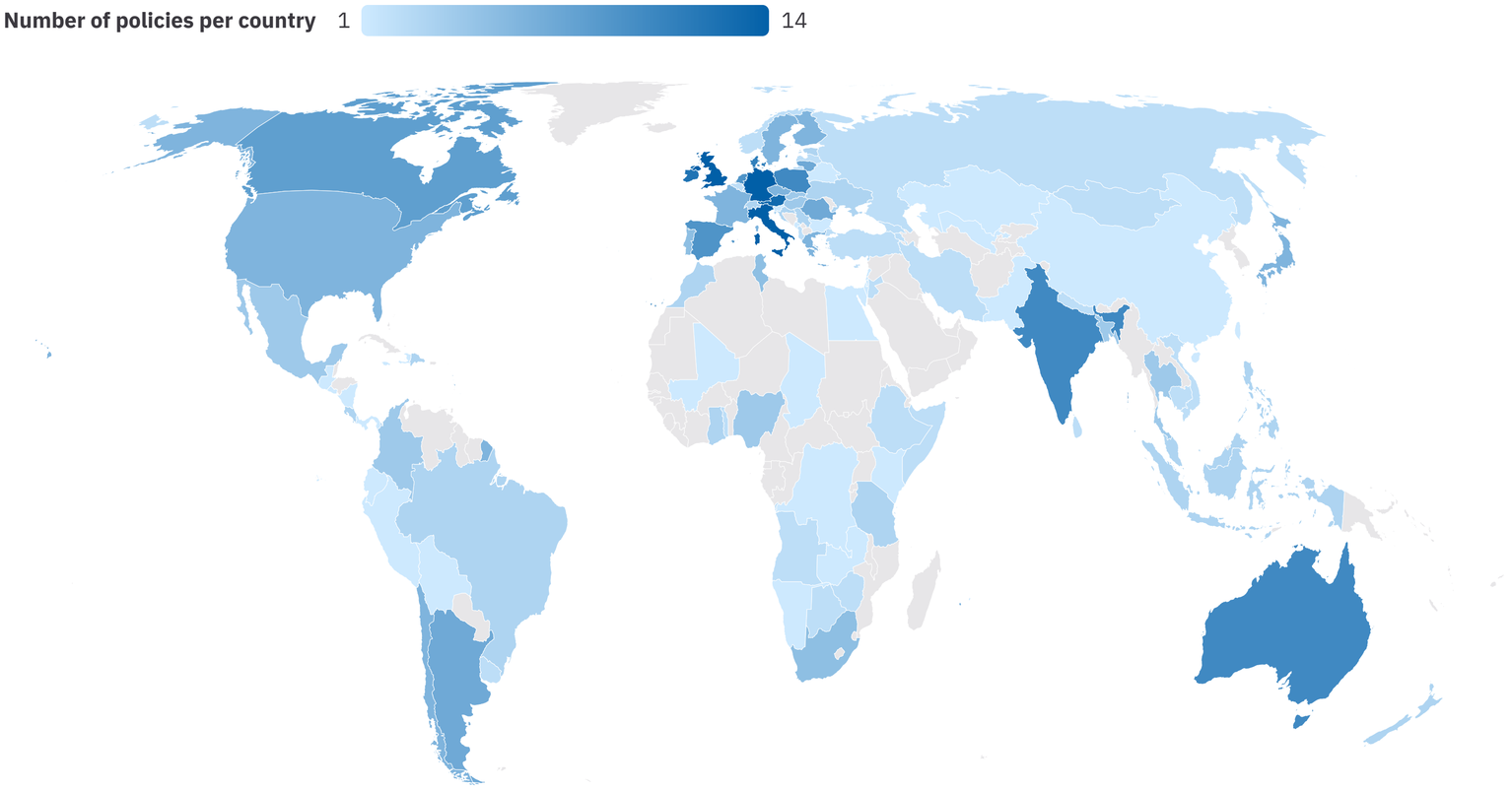
Purpose: Tracking fiscal and financial policies supporting renewables, alongside fossil fuel subsidies, helps assess how public finance and policy frameworks are shaping investment environments, market incentives, cross-sectoral alignment and the pace of the transition towards renewables-based economies.

Worldwide, more than half of all countries have fiscal and financial policies that support renewable energy.[61] However, **policy uptake across these 114 countries (with 388 total recorded policies) remains highly uneven** in both scope and depth.[62] Around one-third of the countries have adopted only a single fiscal or financial support instrument, and many high-income countries have multiple diverse measures in place, indicating a more comprehensive policy mix that addresses different barriers, actors and stages of renewable energy deployment.

FIGURE 23.

Fiscal and Financial Policies for Renewable Energy, by Country, as of 2026[63]

114 countries have fiscal or financial support measures for renewable energy in place



Source: REN21 Policy Database, 2026 •
Note: Policies reflected in this map refer to fiscal and financial policies that explicitly support renewable energy. EU-level policies are not reflected. US policy tracking may be incomplete or inaccurate; the current federal administration has rolled back elements of the Inflation Reduction Act, and the status of individual policies, whether fully cancelled, partially rescinded, or still being applied, remains uncertain. China's low policy count reflects the deliberate phase-out of fiscal support instruments as the country's renewable energy market has matured.

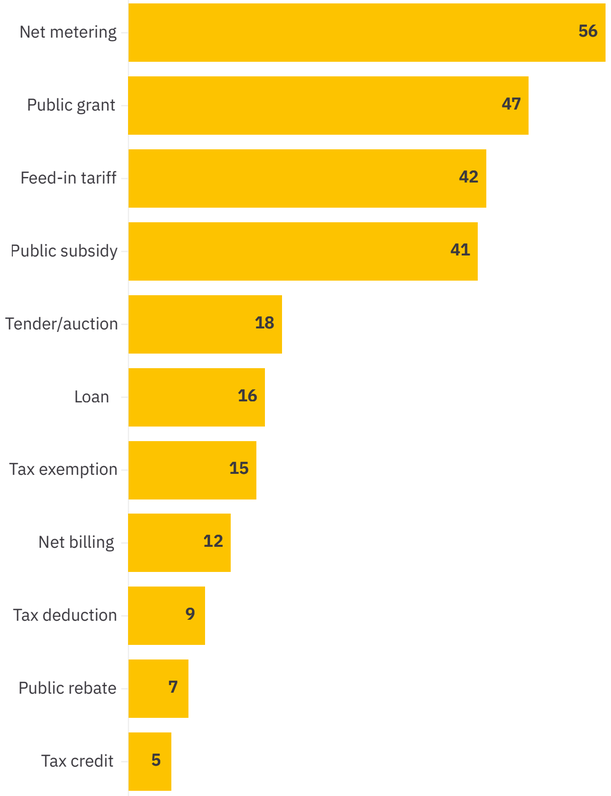
REN21

Net metering was the most geographically widespread fiscal and financial instrument supporting renewables as of 2025, present in 56 countries.[64] Net metering has become a common entry point for the adoption of distributed renewable energy, primarily benefiting households and small-scale producers able to connect to the grid. **Feed-in tariffs**, which operate at a different scale by guaranteeing fixed prices for grid-connected generation, are in place in 42 countries.[65]

Similarly, **spending-based measures** have been broadly adopted, with public grants in place in 47 countries and public subsidies in 41 countries.[66] These measures can be flexibly targeted, spanning households, businesses, and utilities, making them particularly important for reaching vulnerable or underserved groups that may lack the upfront capital to invest in renewables.[67] Instruments such as tax credits, competitive tenders and loans are less widely adopted, reflecting their dependence on specific market conditions, administrative frameworks or private sector capacity to engage with them effectively.

FIGURE 24.
Number of Countries with Fiscal and Financial Renewable Energy Policies, by Type, as of 2026[68]

Net metering and public grants lead policy coverage, while tax and market-based instruments remain selectively adopted



Source: REN21 Policy Database, 2026 •
Note: Policies reflected in this figure refer to fiscal and financial policies that explicitly support renewable energy.

REN21 RENEWABLES NOW





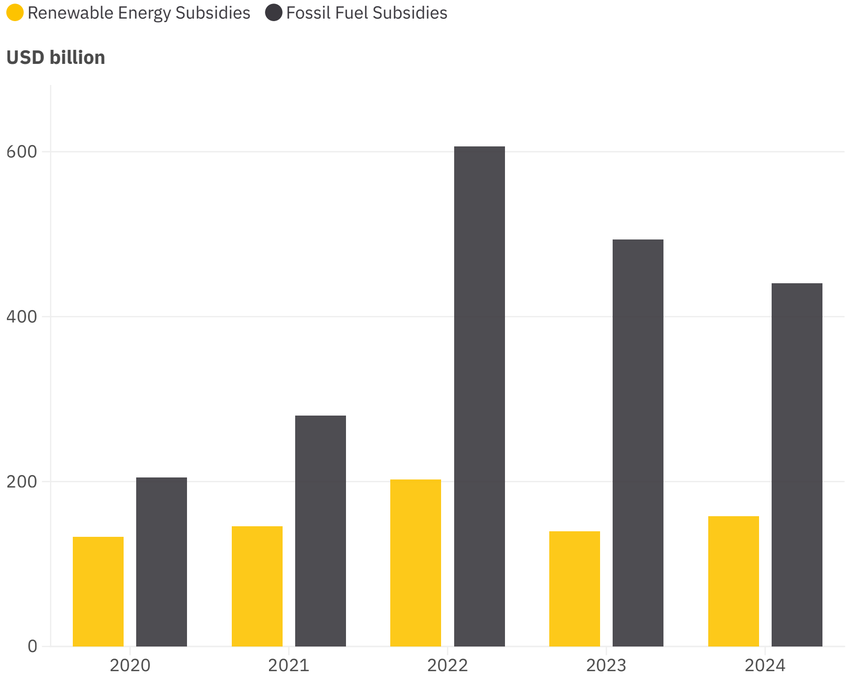
Fossil fuel subsidies remain deeply embedded in energy and economic systems, reflecting longstanding policy choices that continue to prioritise fossil-based energy. Governments maintain a wide range of support mechanisms, including tax exemptions, regulated pricing and direct transfers, which are often expanded in response to price volatility but are rarely fully phased out. These measures persist across economies, reinforcing structural dependencies, distorting energy markets and delaying the transition away from fossil fuels.[69] In many low- and lower middle-income countries, fossil fuel subsidies remain in place as a means of maintaining energy affordability and access, where the underlying challenge is less one of policy choice and more one of insufficient finance to make unsubsidised renewable energy viable at scale.[70]

By contrast, **public support for renewable energy** is designed primarily to enable investment and build new markets. Grants and concessional finance have contributed to scaling deployment, although their reach remains uneven: in many developing countries, these supports cover only a fraction of financing needs. Feed-in tariffs and premiums have driven growth in some contexts, yet their relevance varies by technology and market. Solar PV has reached cost-competitiveness in many countries, whereas larger infrastructure such as offshore wind and hydropower continues to depend on price support.

FIGURE 25

Direct Fossil Fuel versus Renewable Energy Subsidies in Selected Countries, 2020-2024 [71]

Fossil fuel subsidies remain consistently higher than support for renewables, with a sharp increase in 2022 and continued gap across major economies



Source: IEA, 2026, IISD, 2026 (personal communication) •
Note: The figure includes estimated subsidies for fossil fuels that are consumed directly by end-users or consumed as inputs to electricity generation. It does not include indirect or implicit subsidies to fossil fuels.

Overall, public support for renewable energy remains fragmented and insufficiently scaled relative to fossil fuel subsidies, and political commitment to maintaining it cannot be taken as given. In most countries, fossil fuel subsidies continue to exceed support for renewables, although this pattern is most clearly evidenced in larger economies and may not fully reflect the dynamics across the broader range of lower- and middle-income countries. Moreover, estimations of direct subsidies to fossil fuels do not account for the actual costs to society due to the harm these fuels create, such as contribution to climate change through greenhouses gas emissions, pollution, and health damages (premature deaths). Together, these costs exceed by far explicit subsidies, accounting for an estimated $6.7 trillion in 2024.[72]

Trade policies related to renewable energy and enabling technologies have increased sharply in recent years. In 2015, only 9 formal trade measures related to renewables and enabling technologies were in place; by 2024, this number had surged to 212, doubling from 2022 and including measures related to solar PV (more than 50 policies), battery components (more than 50), electric vehicles (47), wind turbines (32) and heat pumps (16).[73] Nearly 40% of new trade policies since 2020 involved tariff changes, anti-dumping measures and countervailing duties, while half of energy-related critical minerals are regulated by export controls.[74] Over the same period, around 50 new free trade agreements have been signed, most of them maintaining preferential tariffs for renewables and enabling technologies.[75]

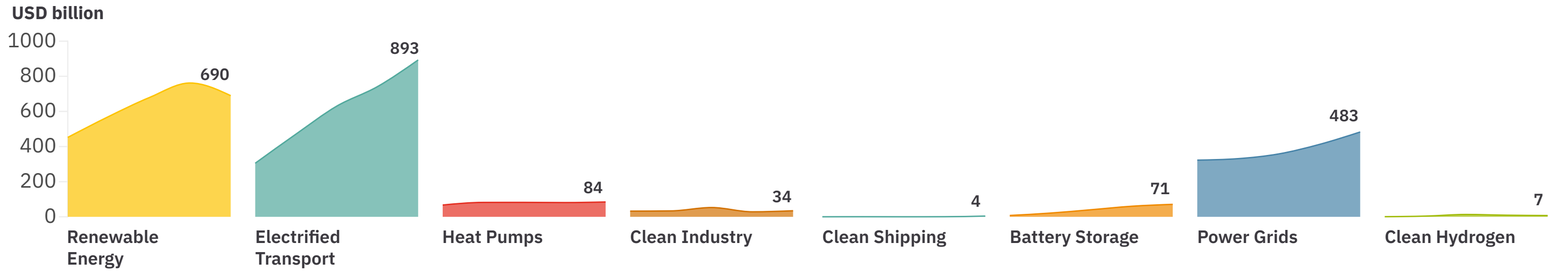
ECONOMY

Investment in Renewable Energy and Enabling Technologies

Purpose: Tracking investment in renewable energy and enabling technologies helps assess how capital is being allocated across the transition towards renewables-based economies.

FIGURE 26.
Global Investment in Renewables and Low-emission Technologies, 2021-2025[77]

Investment is rising across most technologies, but renewable energy investment has declined in 2025



Source: BloombergNEF, 2026 •
Note: Investment in electrified transport includes spending on all types of electric vehicles (electric cars, two- and three-wheelers, buses and trucks and fuel cell vehicles) and charging infrastructure (includes home and public charging but not private charging investment for commercial vehicles). Investment in clean industry includes bioplastics, circular economy, clean ammonia and clean steel. Clean shipping includes vessels with combustion engines that can use methanol, ammonia or hydrogen. Battery storage includes only utility-scale. Investment for "clean" hydrogen is captured here as defined by BNEF.

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Investment trends for renewable and low-emission energy technologies show continued expansion but also increasing divergence across technologies and segments.

Global spending on **electrified transport**[x] has risen sharply, from around USD 305 billion in 2021 to nearly USD 900 billion in 2025, making it the **fastest growing segment**. By contrast, investment in renewable power peaked at USD 762 billion in 2023 and slowed to around USD 690 billion in 2025, following several years of rapid growth.[76]

Investment in power grids increased steadily, from USD 323 billion to USD 483 billion between 2021 and 2025. Over the same period, energy storage investment grew sharply, from USD 8 billion to USD 71 billion.

Other sectors have shown more uneven trajectories. Clean hydrogen[xi] annual investment rose to USD 13 billion in 2023 before falling to USD 7 billion in 2025, while clean industry[xii] investment peaked at USD 53 billion in 2023 and dropped to USD 34 billion in 2025. Heat pump investment held relatively stable, at USD 80-85 billion annually, and invest in clean shipping remained marginal, at only USD 4 billion in 2025.

Overall, investment growth is concentrated in electrified transport, while other parts of the system – particularly grids, storage and clean industry – are expanding more slowly or inconsistently. This uneven distribution highlights a growing misalignment between where capital is flowing and what is required to support a fully integrated, renewables-based energy system.

USD 893 billion

Investment in electrified transport exceeded all other low-emission technology categories in 2025, reflecting strong policy support, falling technology costs and growing consumer adoption.

x Investment in electrified transport includes spending on all types of electric vehicles (electric cars, two- and three-wheelers, buses and trucks, and fuel cell vehicles) as well as on charging infrastructure (includes home and public charging but not private charging investment for commercial vehicles).
xi Investment for "clean" hydrogen is captured here as defined by BloombergNEF.
xii Investment in clean industry includes bioplastics, circular economy, clean ammonia and clean steel.

BOX 1.

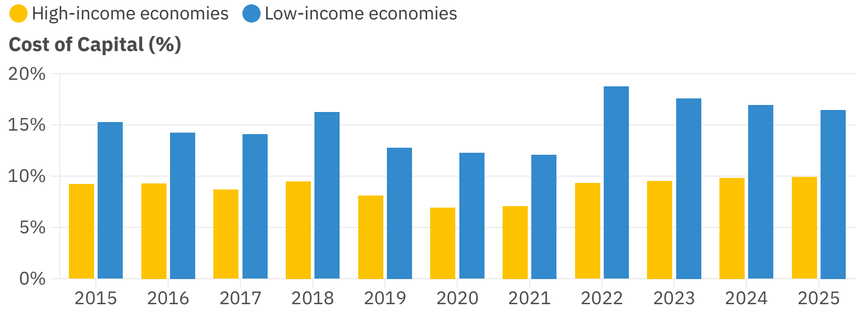
Cost of Capital

Financing conditions play a critical role in shaping the pace and distribution of renewable energy deployment across countries. While the cost of capital has fluctuated over time, clear structural differences persist among income groups. Higher-income economies consistently benefit from lower financing costs, reflecting more stable macroeconomic conditions, stronger financial systems and lower perceived risk. In contrast, lower- and lower middle-income countries face much higher costs of capital[xiii], often driven by currency volatility, limited access to affordable finance and higher perceived risk premiums. These disparities create uneven investment conditions, slowing renewable energy deployment in regions where growth potential is often highest. Addressing these financing-related challenges is essential to enabling a more balanced equitable and accelerated transition to a renewables-based economy.

FIGURE 27.

Cost of Capital for Renewable Energy Deployment in High- and Low-Income Economies, 2015-2025[78]

Financing costs remain consistently higher in lower-income economies, reflecting structural risk and access barriers that shape the pace of renewable energy deployment



Source: L. Hatton et. al, 2025 •
Note: Higher cost of capital reflects perceived risk, currency volatility and limited access to finance.

DATA GAPS:

Renewables' Contribution to the Economy

Estimating the contribution of renewable energy to gross domestic product (GDP) remains challenging due to significant data gaps and methodological limitations. Renewables contribute to economic activity through multiple channels that extend well beyond energy generation itself. Direct contributions include the construction, installation and operation of renewable energy assets, as well as manufacturing of equipment and infrastructure. Indirect contributions arise across supply chains, including mining and materials processing, component manufacturing, transport, engineering, finance, digital services and maintenance activities. Induced impacts emerge through wider economic effects, such as increased household spending linked to employment creation, lower energy costs for businesses and consumers, improved trade balances from reduced fossil fuel imports, and enhanced industrial competitiveness associated with access to low-cost electricity. Together, these effects position renewables not only as an energy technology, but as an increasingly important driver of economic growth, industrial development and investment attraction.

Despite this growing economic relevance, current national accounting systems capture only part of the value created by renewables-based economies. Existing estimates often rely on proxies such as investment flows, employment or sectoral output, which reflect only selected dimensions of economic activity. Gross investment figures, for example, do not measure domestic value-added and may overstate local economic benefits where projects rely heavily on imported technologies or foreign services. Conversely, many approaches underestimate renewable energy's contribution by failing to capture upstream industries, long-term operation and maintenance activities, electricity price effects, avoided fossil fuel imports, tax revenues and wider spillover effects across the economy. This challenge is particularly important in countries where renewable energy deployment contributes to industrialisation strategies, export development or the expansion of domestic service sectors.[79]

Several critical data gaps continue to constrain more robust assessments. These include limited firm-level value-added data, insufficient tracking of domestic versus imported components, incomplete trade statistics for renewable energy supply chains, and weak disaggregation of renewables-related activities within national accounts and industrial classifications. In many countries, renewable energy activities remain embedded in broader construction, manufacturing or utility sectors, making them difficult to isolate statistically. These limitations are generally more severe in developing economies, where statistical systems often have lower sectoral granularity, less comprehensive industrial reporting and weaker coverage of informal economic activity. As a result, the contribution of renewables to GDP may be systematically undercounted in countries where local service provision, small-scale manufacturing or distributed renewable systems play an important role in the economy.

Some progress has been made in a limited number of countries, particularly in Europe, where environmental-economic accounting frameworks provide partial insights into the economic contribution of renewables. The European Union's (EU) Environmental Goods and Services Sector (EGSS) accounts, aligned with the United Nations System of Environmental-Economic Accounting (SEEA), track gross value added, employment and exports associated with environmental activities, including renewable energy. Countries such as Denmark, Finland and the United Kingdom complement these frameworks with national methodologies that better capture renewable manufacturing, industrial activity and export-oriented value chains. Available estimates suggest that environmental and renewables-related sectors can contribute several percentage points of GDP in countries with strong domestic industries and supply chains. However, methodologies remain inconsistent across countries and often exclude broader system-wide impacts such as lower electricity prices, competitiveness gains, avoided fossil fuel imports and long-term service activities, limiting comparability and likely understating the full economic contribution of renewables.[80]

Improving measurement requires moving beyond narrow energy sector accounting towards a more integrated understanding of renewables as a driver of economy-wide transformation. This includes developing renewable energy satellite accounts, improving the granularity of input-output tables, strengthening trade and industrial statistics, and systematically tracking domestic value creation across manufacturing, services, infrastructure, public revenues and exports. Greater alignment across energy, industrial and macroeconomic statistics would also improve understanding of how renewables contribute to competitiveness, investment attraction, employment creation and economic resilience. Strengthening these statistical foundations is essential not only to better quantify renewables' contribution to GDP, but also to understand how renewables are reshaping broader patterns of economic development and structural transformation.

xiii Higher cost of capital reflects perceived risk, currency volatility and limited access to finance.

ECONOMY

Renewable Energy Employment and Workforce Transition

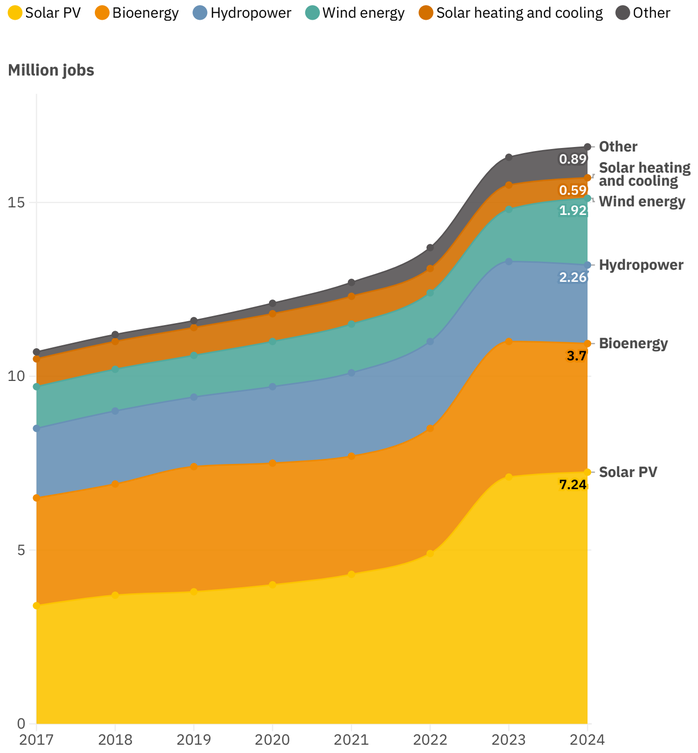
Purpose: Tracking renewable energy employment provides a critical lens on progress towards a renewables-based economy, capturing how the shift is generating durable, high-quality jobs, supporting workforce development, and building resilient economic structures for all groups.

Renewable energy employment encompasses jobs across manufacturing, installation, operation and maintenance. Although jobs in renewables continue to grow, they **remain concentrated in a few technologies and geographies**. Global renewable energy employment reached nearly **17 million jobs in 2024**, up from around 11 million in 2017, comprising both direct and indirect[xiv] jobs from equipment manufacturing to the installation and maintenance of generating capacity.[81] This represented around one in five energy sector jobs globally in 2024, a share that has increased as renewable energy employment grows.[82]

xiv Direct employment refers to jobs created within core renewable energy activities, whereas indirect employment captures jobs generated across the upstream supply chains that enable them, including industries such as steel, plastics and services that provide the support necessary for the manufacturing, construction and operation of renewable energy facilities.

FIGURE 28.
Global Renewable Energy Employment, by Technology, 2017-2024[83]

Employment in renewable energy continues to grow, reaching 16.6 million jobs in 2024, driven largely by solar PV, with steady contributions from bioenergy, hydropower and wind energy



Source: IRENA, 2026 •
Note: 'Other' refers to jobs across geothermal energy, concentrated solar power, heat pumps (ground based), municipal and industrial waste, and ocean energy.

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The rising number of renewable energy jobs is **driven primarily by solar PV**, which accounted for more than 7 million jobs in 2024, or more than 40% of total global employment in the renewables sector.[84] However, solar PV jobs are highly concentrated geographically: manufacturing capacity is largely held by a small number of countries, including China and other South-East Asian economies, whereas elsewhere solar PV jobs are mainly in construction, installation, and operation and maintenance.[85]

Other technologies show more modest or stable trends. **Bioenergy remains the second largest renewable energy employer**, with around 3.7 million jobs in 2024, while hydropower employment has plateaued at just over 2.2 million jobs.[86] Employment in wind energy has grown gradually to nearly 2 million jobs in 2024 but remains significantly lower than solar PV.[87]

Despite record capacity additions, **growth in renewable energy employment has slowed**, moderated by rising labour productivity, economies of scale, and automation, particularly in China, while the link between deployment and job creation remains strong across many other countries.[88] Geographically, **China accounted for 43.9% of global renewable energy jobs** in 2024, and its dominance in equipment manufacturing is slow to change, given the depth of its manufacturing ecosystem and considerable cost advantages, posing challenges for new entrants seeking to scale up and succeed.[89]

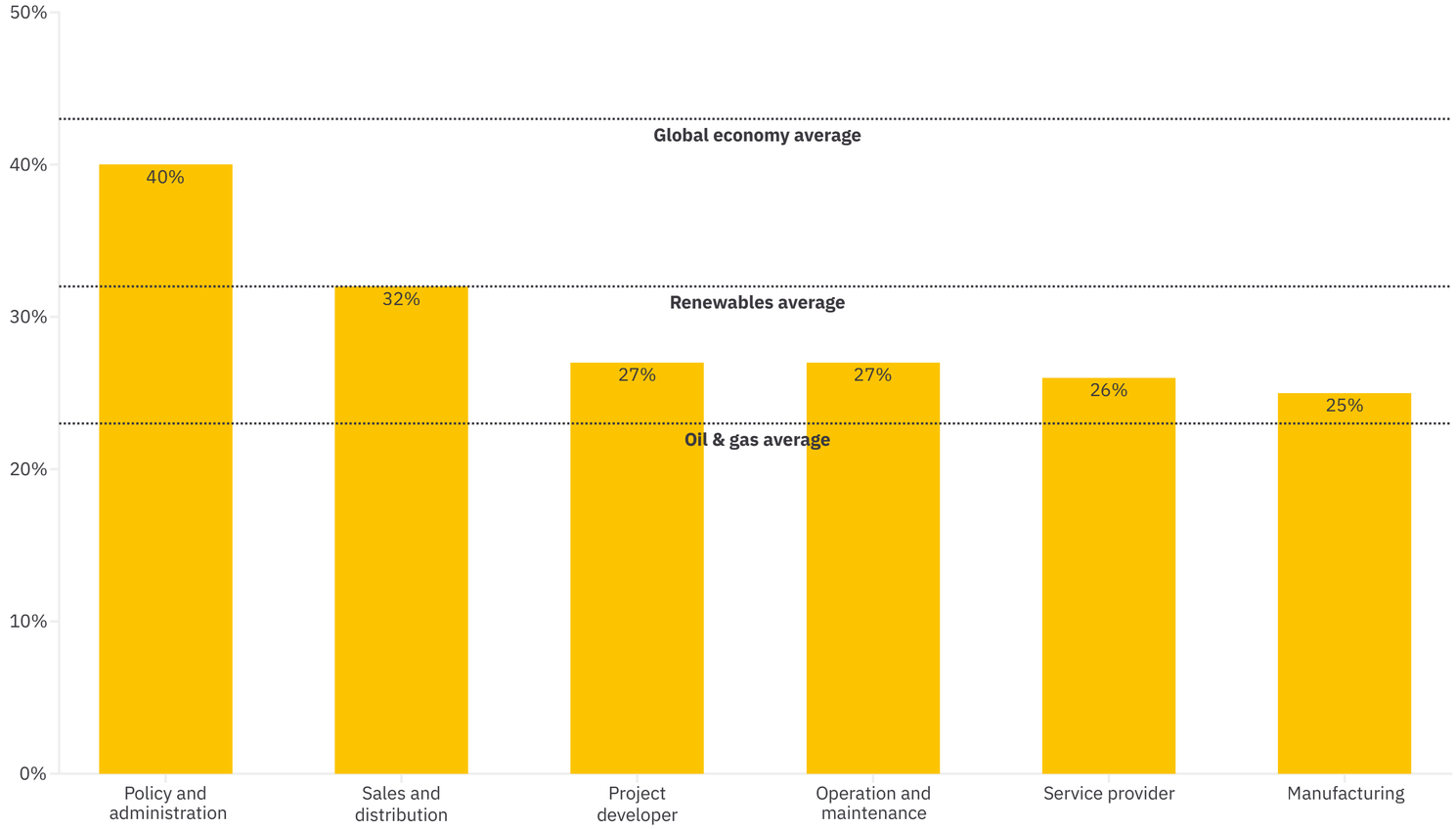
Beyond geographic concentration, workforce diversity remains a persistent structural gap.[90] While renewables are creating jobs at scale, these are unevenly distributed across technologies, value chains, and geographies, both within and across countries, and down to the local and regional levels. **Limited access to training infrastructure, particularly in remote areas**, further widens these gaps, pointing to the need for more diversified, regionally distributed employment opportunities and locally anchored skilling strategies as part of a renewables-based economy. Across energy sectors, women remain underrepresented relative to the broader economy: they account for 32% of renewable energy jobs and just 23% in oil and gas, compared with a global economy average of 43%.[91]

Across the renewable energy value chain, women are most represented in policy and administration roles, holding around 40% of these positions as of 2025, whereas women hold only around a quarter of operation, maintenance and manufacturing jobs.[93] The type of employer also shapes representation in renewables: **women's share is highest in associations and public enterprises, and lowest in private companies**.[94] Policies, education and training opportunities are required to support an increasing share of women in the renewable energy sector, since a renewables-based economy that fails to harness the full potential of women is a transition that falls short of its own ambitions.

FIGURE 29.

Women's Share of Full-Time Employment in Renewable Energy, by Activity, as of 2025[92]

At 32%, women's share of renewable energy jobs exceeds the oil and gas sector average (23%) but falls short of the global economy average (43%); representation is highest in policy and administration

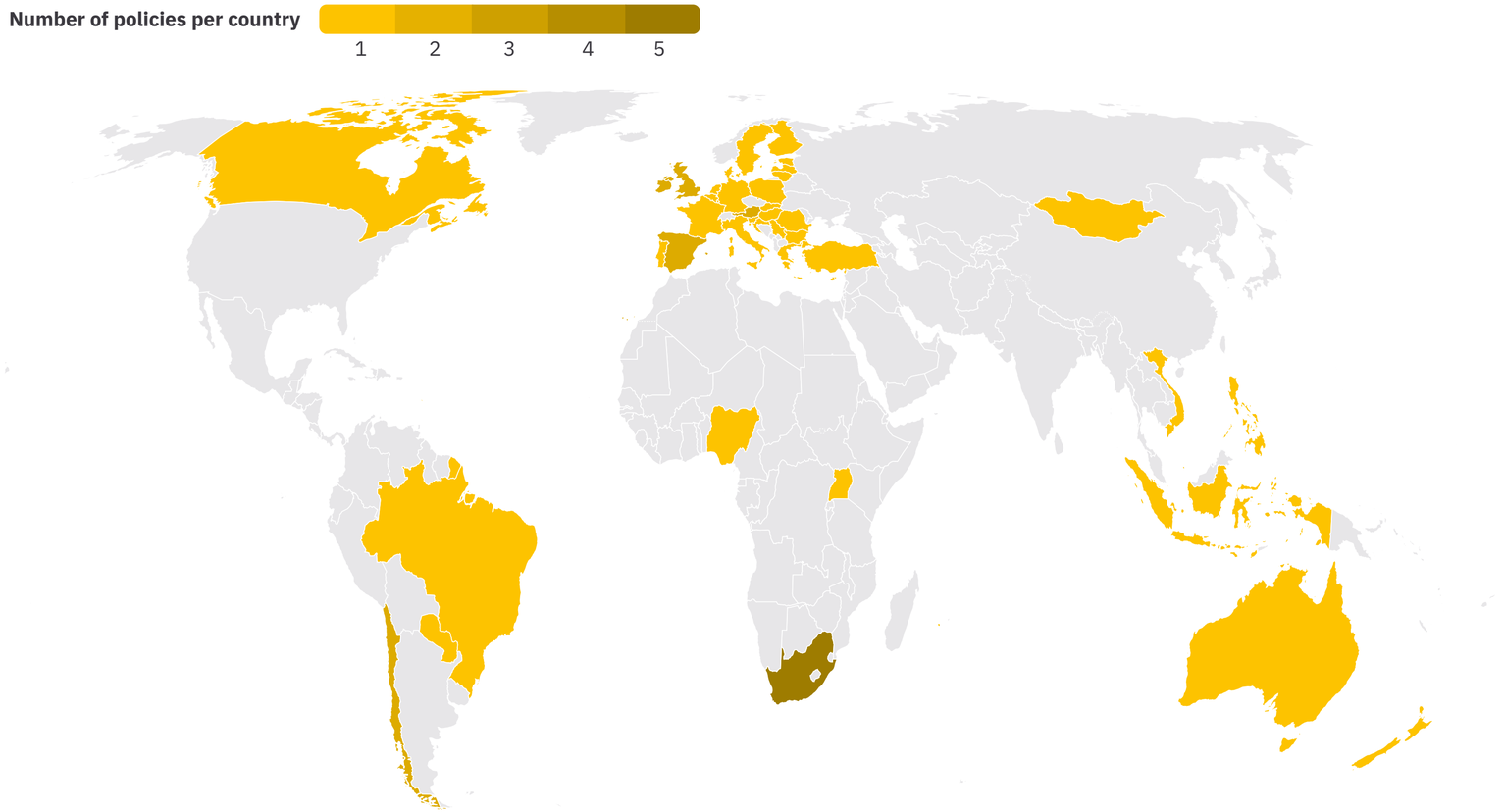


Source: IRENA, 2025

FIGURE 30.

Policies Supporting Reskilling for the Renewables and Energy Transition Sectors, by Country, as of 2026[98]

South Africa stands out globally for its number of energy transition reskilling policies

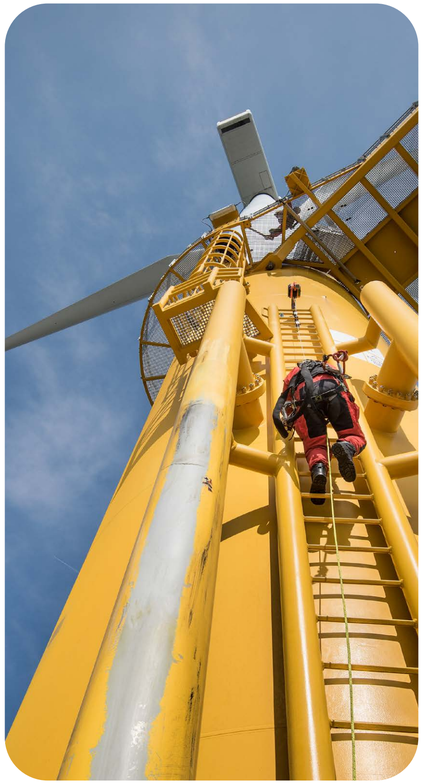


Source: REN21 Policy Database, 2026 •
This map focuses on national-level policies and excludes EU-wide measures, such as the Net-Zero Industry Act and its Net-Zero Industry Academies. It includes Territorial Just Transition Plans because, although part of an EU framework, these are Member State plans required to access the EU Just Transition Fund and to define affected territories, transition needs, actions and governance.

Effective education, training and skilling are essential to building a workforce that is capable of driving the shift to a renewables-based economy. Acute skills shortages risk constraining growth across the entire renewable energy value chain, from manufacturing and installation to operation and maintenance, while the sector's expansion also demands expertise in energy governance, finance, law and community development.[95] Digitalisation and artificial intelligence are further reshaping skill requirements, as renewable energy operations become more automated, making preparation for a simultaneous digital and energy transition increasingly urgent. This requires **co-ordinated workforce development aligned with industry needs** and supported by labour market policies, public investment and industrial strategies to ensure that no worker or region is left behind.

Particularly in regions with a large fossil fuel workforce, upskilling and reskilling represent an increasingly urgent dimension of workforce development, required across the full renewable energy value chain, from critical mineral mining and refining to downstream manufacturing, installation, operation and maintenance, and end-of-life recycling. As of 2026, a total of **52 policies worldwide supported worker reskilling for a just energy transition, with the majority still at the strategy and roadmap stage**, suggesting that concrete implementation remains limited.[96] Policies are largely concentrated in high-income countries, particularly in Europe, where the EU's Just Transition Fund channels financing to Member States once they present their Territorial Just Transition Plan, which typically identifies coal-dependent regions and outlines targeted investments in worker retraining, economic diversification and the shift towards renewable energy.[97]





52

policies supporting worker reskilling worldwide

An example of a comprehensive roadmap is the **United Kingdom**'s clean energy jobs plan, released in October 2025, which commits to various financial incentives ranging from around USD 27 (GBP 20 million) to aid the transition of North Sea workers to renewable energy sectors, to more than USD 135 (GBP 100 million) for an Engineering Skills Package supporting clean energy occupations.[99]

Among developing countries, **Viet Nam**'s commitments under the Global Coal-to-Clean Power Transition Statement outline training and retraining programmes for workers at coal-fired power plants, livelihood support for affected communities, and co-operation to develop high-quality engineering and technical staff for the renewable energy industry.[100] **South Africa**, meanwhile, offered five reskilling policies as of 2026, including roadmaps such as the Just Energy Transition Implementation Plan 2023-2027, which defines short- and medium-term outcomes across nine defined Portfolios, including the Skills Portfolio.[101]

DATA GAPS:

Job Quality in the Renewables Sector

Although data availability on renewable energy employment has improved in recent years, gaps remain. Headline job figures are increasingly tracked, but far less is known about job quality and how well skills align with evolving industry needs. Evidence on the effectiveness of reskilling efforts is still limited, particularly regarding whether programmes reach fossil fuel workers, respond to labour market demand, and lead to stable, long-term employment. In addition, the links between renewable energy deployment and employment outcomes along the value chain are not systematically captured, and data on inclusiveness across different social and geographic groups remain scarce.

RBE TRACKER

Society and Governance



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countries without universal access use renewables in their policies



Unlike fossil fuels, renewable energy is available everywhere and is inherently more decentralised, fundamentally transforming how energy systems can be governed. This distribution of diversified energy sources across geographies creates the basis for governance that is more local, participatory and resilient. This structural difference creates the conditions to redesign energy governance: making it more local, participatory, and resilient. Realising this potential requires inclusive governance and equitable benefit sharing across all levels, with local governments playing a key role in ensuring that the transition reaches the communities where energy is produced and consumed.

Examining the societal and governance dimensions of the transformation is therefore critical. This includes assessing the conditions under which a renewables-based economy delivers meaningful energy access, affordability, and participation, as well as identifying which enabling policies make the difference. Together, the selected indicators aim to provide a system-level view of how these opportunities can be leveraged to build stronger and more resilient societies.

SOCIETY AND GOVERNANCE

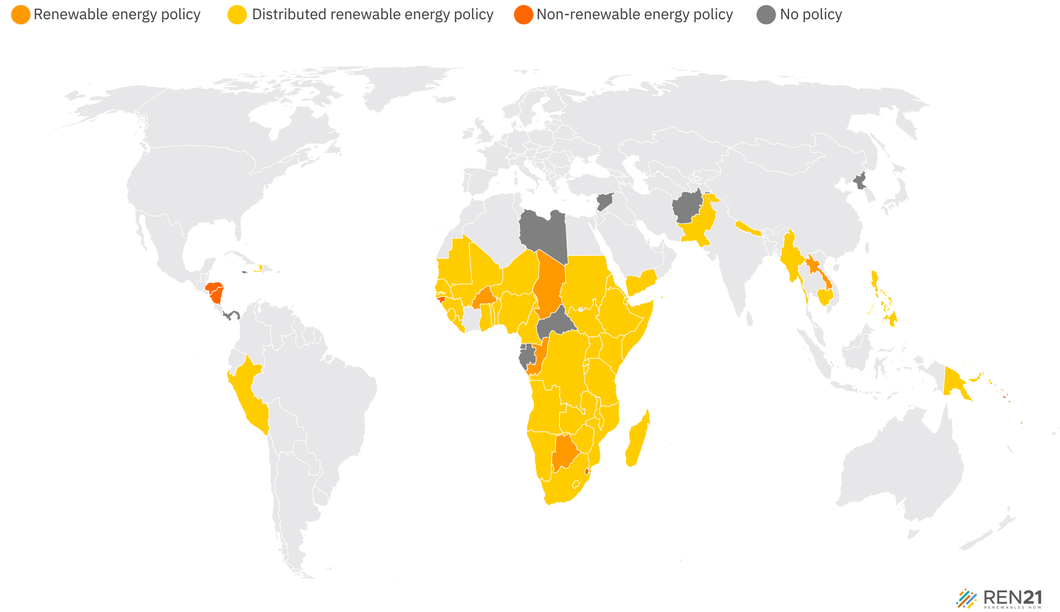
Policies for Energy Access

Purpose: Tracking policies for energy access is essential to assess how countries are using renewables to expand access to energy services, and whether policy frameworks are effectively reaching rural, remote and low-income populations.



FIGURE 31.
Electricity Access Policies in Countries Without Universal Electricity Access, as of 2026[107]

Policies to expand electricity access in countries without universal coverage are centred on renewable energy, particularly distributed solutions



Source: REN21 Policy Database, 2026 •
Note: Distributed renewable energy solutions include decentralised renewables, stand-alone solar systems, and mini-grids/micro-grids. This figure only includes measures implemented to increase electricity access and does not include targets. 'Without universal electricity access' refers to countries where only 98% or less of the population had access to electricity as of 2023.

Access to secure energy services is a foundational driver of economic development and industrialisation. Policy design in this area is therefore critical not only for reducing energy poverty, but also for creating the conditions under which private capital can be mobilised and local economic value generated at scale.

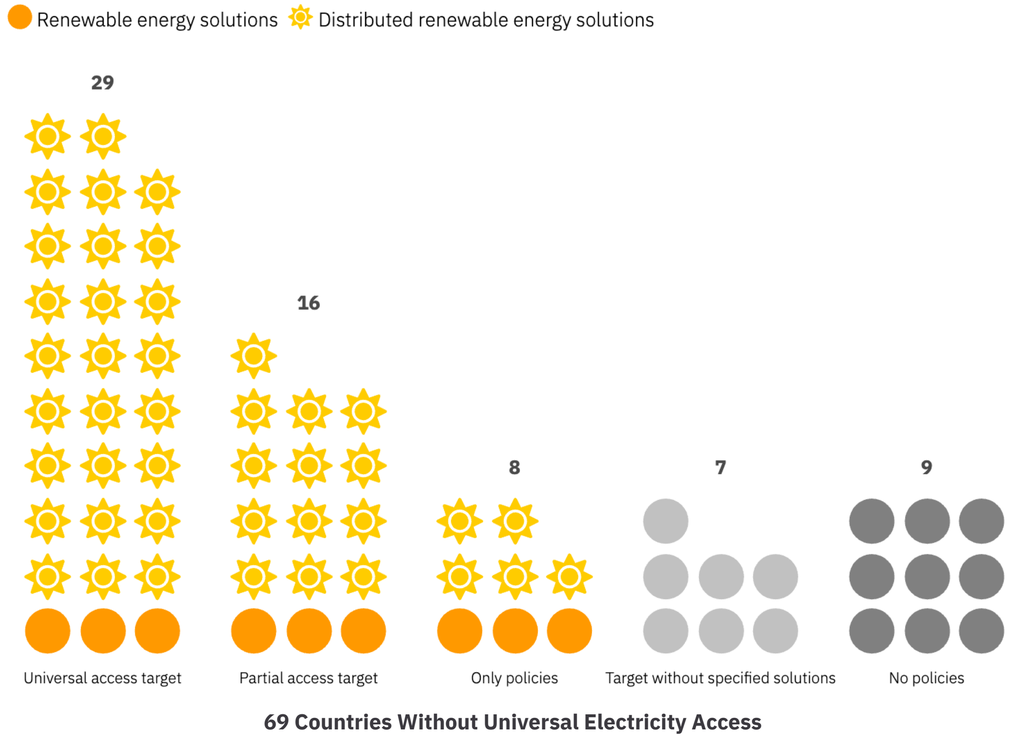
As of 2023, **69 countries worldwide still lacked universal access to electricity**, hindering industrialisation, economic growth and development potential.[102] Among these countries, **53 had incorporated renewable energy solutions into their national energy access policies as** of early 2026, and 46 had set concrete targets to expand electricity access through renewables.[103] In rural and remote areas where grid expansion is not feasible, the primary pathway to meet electricity demand is through **distributed renewable energy solutions**; these are highlighted in more than half of all electricity access policies to date, reflecting their recognition as a critical enabler of broader socio-economic development.[104]

Sub-Saharan Africa is home to 85% of the world's energy-underserved population.[105] Within Africa, countries' National Energy Compacts, published in 2025, identify **solar-based mini-grids or micro-grids and stand-alone solar systems** as critical solutions for expanding access to electricity and clean cooking, with active examples already in place.[106] African countries also promote bioenergy, geothermal energy and small-scale hydropower in line with their geographic and resource conditions.

FIGURE 32.

Electricity Access Targets and Policies with Renewables in Countries Without Universal Electricity Access, as of 2026[108]

Distributed renewable energy solutions are the primary pathway to meet universal electricity access targets



Source: REN21 Policy Database, 2026 •
Note: Distributed renewable energy solutions include stand-alone solar systems, and mini-grids/micro-grids. 'Without universal electricity access' refers to countries where only 98% or less of the population had access to electricity as of 2023.

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Despite ambitious strategies, developing countries face a range of persistent barriers to expanding energy access through renewables. **Financing gaps** remain acute: insufficient public finance, high costs of capital and uneven urban-rural development continue to constrain progress, compounded by delays in permitting, grid infrastructure uncertainty and the absence of harmonised policies across governance levels.[109] **Demand-side uncertainty further complicates investment**, as electricity demand in newly electrified areas does not always grow as projected.[110] **Blended finance and demand-led planning are promising approaches to de-risk smaller-scale projects** such as mini-grids that lack viable business models under conventional financing, and well-designed energy system support policies have been shown to reduce the cost of renewables deployment by around 30% in developing country contexts.[111]

DATA GAPS:

Energy Access Tracking

Data gaps remain significant in tracking energy access. While it encompasses multiple dimensions, electricity access receives comparatively more attention and data coverage than clean cooking. Current approaches often measure whether access exists, but not whether it is reliable, affordable or sufficient for powering socio-economic activities. More comprehensive frameworks such as the Multi-Tier Framework, which evaluates energy service quality across reliability, affordability, safety, and availability, are not yet applied consistently, and globally comparable data remain limited. Data are also insufficiently disaggregated by income, gender and geography, with rural and informal settlements often underrepresented. These gaps hinder evidence-based policy making and limit understanding of whether energy access improvements translate into broader social and economic opportunities.

SOCIETY AND GOVERNANCE

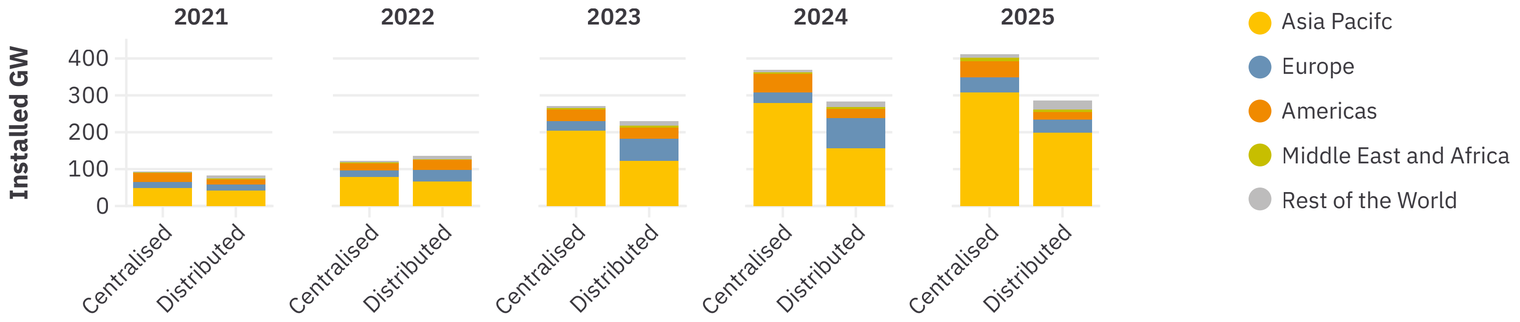
Distributed Renewables and Ownership Structures

Purpose: Tracking distributed renewables and ownership structures is important to assess how renewables are reshaping the governance of energy systems as well as the distribution of their socio-economic benefits.

FIGURE 33.

Newly Installed Solar PV Capacity, by Region, 2021-2025[119]

Centralised solar PV leads in 2025, yet distributed installations represent a substantial global share; Asia Pacific, led by China, dominates global deployment



Source: IEA PVPS, 2026 •
Note: Distributed solar PV includes both decentralised and off-grid solar PV. IEA PVPS regional data covers a selection of countries per region, not all. Middle East and Africa, for example, is based on data from Algeria, Egypt and South Africa. IEA PVPS supplements reported data with expert estimates to account for incomplete reporting, DC/AC measurement differences and registration delays.

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Globally, deployment of **distributed[xv] renewable energy systems** ranges from rooftop solar PV to small-scale wind power and community-owned biogas plants. Among its benefits, the **decentralised deployment** of renewables can **support climate change adaptation and resilience** across agriculture, water, health and other sectors, enhancing resilience to droughts, heatwaves and sea-level rise while creating income opportunities.[112]

Distributed renewables further reshape how energy is consumed, governed and produced, particularly in contrast to centralised fossil fuel power plants, and allow for **local ownership**.[113] The increasing number of renewable energy communities and collective self-consumption has led to rising prosumerism[xvi] and a diverse ownership structure, as seen in Germany, where private individuals owned around 30% of the total renewable energy capacity in 2019.[114]

Where large transmission lines are not economically or geographically viable, **distributed off-grid renewable energy systems** have emerged as the most efficient and cost-reliable solutions to electricity access and local economic development in rural and remote communities.[115] Their rapid growth is reflected in global solar PV data: although centralised systems lead overall solar PV deployment (with 411 GW of installed capacity in 2025, concentrated heavily in the Asia Pacific region), **distributed solar PV, including decentralised and off-grid systems, represents a significant share of global deployment**, reaching 286 GW in 2025.[116]

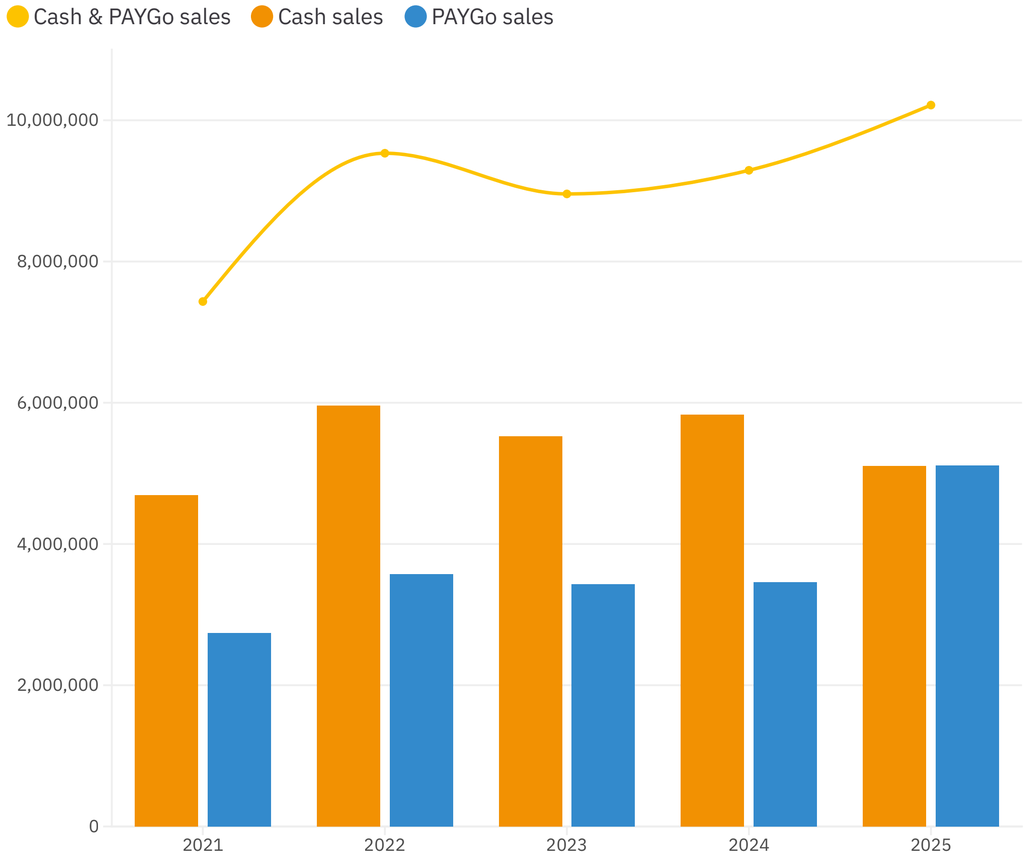
The growth in distributed solar reflects a rising number of self-consumption and prosumer-driven markets as well as increasingly diversified ownership structures in both developed and developing economies.[117] In Australia, Brazil, Japan, South Africa and established Western European rooftop PV markets, distributed installations exceeded centralised additions in 2025, whereas solar PV markets in Saudi Arabia, Spain and the United Arab Emirates remained heavily centralised.[118]

xv Distributed energy resources are small-scale energy systems usually located near sites of energy use, such as rooftop solar panels and battery storage. The term has no single agreed definition and is applied differently depending on context and purpose, with variations in whether it covers resources on both sides of the meter and whether energy efficiency is included. Where connected to the grid, these systems typically link to the distribution rather than the transmission network.

xvi Prosumerism is a model where an entity both produces and consumes energy. This allows prosumers to participate in energy trading by selling any excess energy they generate and purchasing additional energy from the grid when needed.

FIGURE 34.
Global Pay-As-You-Go and Cash Sales of Solar Energy Kits, 2021-2025[125]

PAYGo and cash sales reach near-parity in 2025 as PAYGo hits a record high and cash sales fall to a four-year low



Source: GOGLA, 2026 (personal communication) •
Note: Solar energy kits include lanterns, multi-light systems and solar home systems.

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Off-grid solar products are a key component of distributed solar solutions, providing electricity access and resilience to households and communities beyond the reach of centralised grids, particularly in developing countries where energy access remains limited. Globally, **10.2 million off-grid solar home kits were sold in 2025**, with sub-Saharan Africa leading with more than 9 million kits sold; this reflects the growing recognition of off-grid renewables as a driver of not only energy access but also local value creation and economic resilience.[120]

The way that solar home kits are financed is also shifting. Pay-as-you-go (PAYGo), whereby customers pay for their solar system in small instalments, and cash sales reached near-parity in 2025, with **PAYGo hitting a record high of around 5.1 million sales, and cash sales dropping to a four-year low** (with around 3,600 fewer sales than PAYGo globally).[121]

Despite inflation and currency devaluation across many markets, demand for solar energy kits, and especially PAYGo systems, continued to grow, as lower upfront costs and flexible repayment terms make it an often more accessible option than outright purchase.[122] In the African market, PAYGo has overtaken cash sales for the first time, driven by rising demand for multi-light and small solar home systems (11-20 Wp) increasingly bundled with appliances.[123] However, in conflict-affected areas, where 64% of people who lack electricity access live, PAYGo system costs are still 57% higher, posing a persistent affordability challenge for the most vulnerable populations.[124]



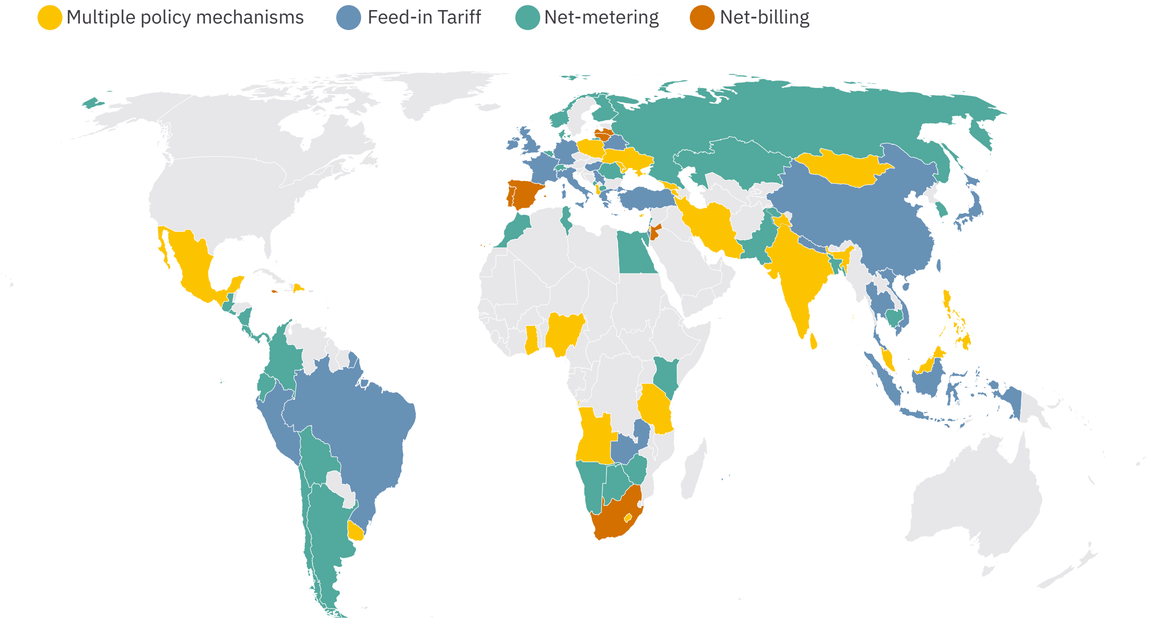
Policies supporting distributed renewable energy generation more broadly are now widespread, with 92 countries implementing at least one financial compensation mechanism such as feed-in tariffs, net metering or net billing as of 2025.[126] Among these, around a quarter of countries combine multiple approaches, using complementary mechanisms to support both distributed renewable energy deployment and system integration.

The evolution of these policies follows a clear trajectory. Feed-in tariffs were primarily introduced in the 2000s and early 2010s, laying the foundation for early growth in renewable energy. Net metering expanded significantly throughout the 2010s, supporting broader uptake, particularly in distributed markets. **Since 2020, there has been a gradual shift towards net billing and hybrid approaches**, reflecting increasing cost-competitiveness of renewables and the need for more system-oriented policy design. This progression signals a maturing of distributed renewable energy markets, where policy is moving from incentivising deployment to balancing integration, system value and cost efficiency. Yet, complementary measures such as targeted subsidies and community solar schemes remain important to ensure that the benefits of distributed renewables are broadly shared.

FIGURE 35.

Compensation Mechanisms for Distributed Renewable Energy, by Country and Policy Type, as of 2025[127]

A diverse mix of policy approaches is used globally to support distributed renewables, with feed-in tariffs, net metering and net billing reflecting different market designs and stages of system integration



Source: REN21 Policy Database, 2026 •
Note: Net metering typically credits surplus electricity at the full retail rate, offsetting consumption on a one-to-one basis, whereas net billing compensates exports at a lower rate – such as the wholesale or avoided cost – and separates billing for consumption and generation.

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DATA GAPS:

Distributed Renewables and Ownership Structures

Data gaps for distributed renewables remain significant across three dimensions: ownership structures, market coverage, and local value creation. Most countries do not systematically track who owns renewable energy assets, making it difficult to assess whether the transition is diversifying ownership or consolidating it among large utilities and institutional investors. Off-grid and prosumer market data remain fragmented, relying heavily on industry association reporting that rarely captures informal markets. Moreover data on local value creation and resilience outcomes of renewable energy generation are seldom disaggregated by income, gender or geography.

SOCIETY AND GOVERNANCE

Energy Affordability (Consumer-Level)

Purpose: Tracking how renewables can be leveraged to reduce energy costs, prevent price volatility, and ensure reliable energy services for households, as well as identifying barriers and enabling policies, is key to assessing affordability outcomes.



As of 2026, more than **120 million households in high income countries** were spending more than 10% of their income on heating and cooling; this share rises to more than 20% of the lowest-income population when spending on private transport is included.[128] In the **European Union**, 9% of the population was deemed unable to keep their homes warm as of 2024, and in the **United States** around 27% of households reported difficulty paying energy bills or keeping their homes at safe temperatures as of 2020.[129] In 2022, energy expenditure as a share of household income in selected countries ranged from 7% in **Italy** to 3% in the **United States**, where the energy burden accounts for 6% of income for low-income households and 2% for non-low-income households.[130]



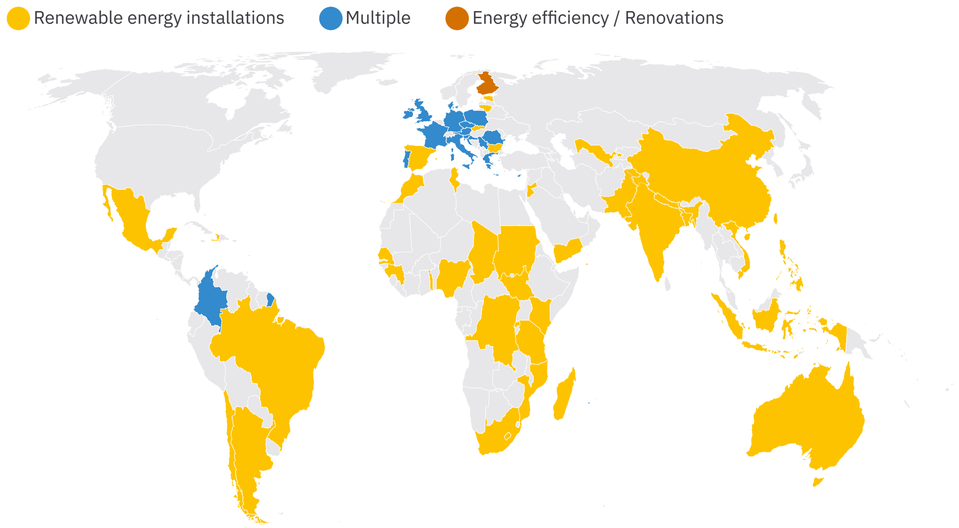
63

countries support affordability through renewables and efficiency

FIGURE 36.

Policies for Household Energy Affordability with Renewables and Energy Efficiency, by Country, as of 2025[133]

Fiscal and financial incentives remain the most common policy instrument to support households purchasing solar PV systems and performing energy efficiency measures



Source: REN21 Policy Database, 2026 •
Note: Policies include household support for renewable energy and energy efficiency. Energy efficiency includes energy savings through renovation and efficient electric appliances. Policies to support household energy affordability that do not target explicitly renewable energy or energy efficiency are not included. US policy tracking may be incomplete or inaccurate; the current federal administration has rolled back elements of the Inflation Reduction Act, and the status of individual policies, whether fully cancelled, partially rescinded, or still being applied, remains uncertain.

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FIGURE 37.

Polices for Household Energy Affordability with Renewables and Energy Efficiency, as of 2025[134]

Fiscal and financial incentives are the main support for households to install renewable energy solutions and perform energy efficiency measures



Source: REN21 Policy Database, 2026 •
Note: Policies include household support for renewable energy and energy efficiency. Energy efficiency includes energy savings through renovation and efficient electric appliances. Policies to support household energy affordability that do not target explicitly renewable energy or energy efficiency are not included.

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DATA GAPS:

Energy Affordability Indicators

Indicators of energy affordability globally are difficult to substantiate, as data are scarce and scattered, and affordability of energy is deeply intertwined with wealth and inequality across countries and regions. Energy prices for end-users are linked to a country's resources and energy technology mix, to global price fluctuations, and to the ownership and governance structure of energy assets, public support and market design.

Moreover, the issue of energy affordability relates to different challenges depending on the context: for example, whether there is a lack of access to energy services (see energy access section), or whether energy services are available, but at prices that low-income households cannot afford.

Affordability challenges can be measured using **indicators designed to track energy poverty**, such as energy expenditures as a share of available income, arrears on utility bills or the inability to keep homes warm or cool. Those indicators also present limitations, such as potential under-reporting.[135] Additionally, global, harmonised data on these indicators are clearly lacking.

As of 2025, **63 countries** had policies for household energy affordability with renewables and energy efficiency measures.[131] Fiscal and financial incentives remained the most common policy instrument to support household renewable energy installations (such as solar PV and solar thermal) and energy-efficient appliances such as heat pumps, as well as to perform building renovations to improve insulation and thermal efficiency. A few countries enacted bans or phase-out timelines for fossil fuel-based heating, sometimes combined with support for electric heating or connection to district heating.[132]

SOCIETY AND GOVERNANCE

Energy Governance in a Renewables-Based Economy

Purpose: Tracking policies on community energy and citizen engagement captures how governance frameworks facilitate participation across energy planning, project development and ownership structures.

The decentralised nature of renewable energy allows citizens, communities, co-operatives and private companies to **own, control and operate energy assets directly**. The transition to a renewables-based economy therefore reshapes not only how energy is produced and consumed, but also how it is governed.

As of March 2026, **114 policies on renewables-based community energy and citizen engagement were in place across 41 countries**, of which 9 policies were adopted in 2025 or early 2026.[136] European countries account for the largest share of policies, reflecting the catalytic role of EU legislation, particularly the Renewable Energy Directive, in mandating Member States to establish enabling frameworks for community energy.[137] This regulatory push remains largely absent in other regions of the world, leaving the vast majority of countries without any community energy or citizen engagement policies.

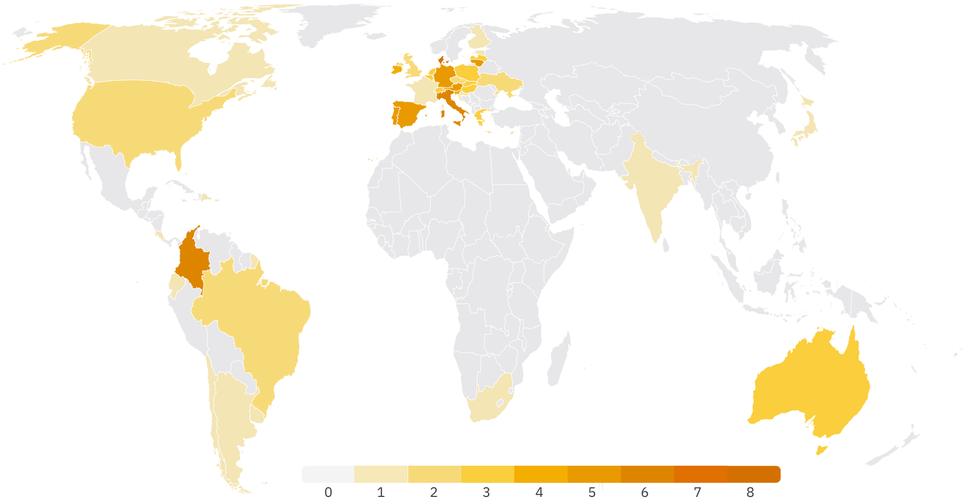
Across countries, policies address two broad dimensions. The largest portion of identified policies focuses on the **development of renewable energy communities**, often defined as locally rooted, member-controlled entities that own and develop renewable energy projects primarily for the environmental, economic or social benefit of their members or surrounding communities.[139] Although most countries have focused on establishing legal and regulatory frameworks for energy communities, a growing number have introduced financial support mechanisms, such as grants, subsidies, tax incentives, feed-in tariffs, and soft loans, to accelerate the development of these communities.[140]

A smaller strand of nine existing policies comprises **citizen engagement in large-scale renewable energy deployment**, through participatory siting processes and local benefit-sharing mechanisms. Denmark has established a comprehensive set of compensation and benefit-sharing mechanisms, including municipal green funds, neighbour bonuses, property value loss compensation, and acquisition options, to foster local acceptance of renewable energy installations.[141] Moving beyond acceptance, policies in Canada encourage the active participation of Indigenous communities, securing their long-term revenue and equity ownership in renewable energy communities.[142]

However, many communities worldwide still lack the institutional, regulatory and financial frameworks needed to meaningfully participate in, or benefit from, the energy transition. Participatory frameworks – such as mandatory stakeholder consultation, standardised benefit-sharing agreements and clear mechanisms that promote co-ownership – are essential to ensure local value retention and citizen participation in energy transitions.

FIGURE 38.
National Citizen Engagement and Community Energy Policies, as of 2026[138]

Regulatory frameworks dominate citizen engagement and community energy policy globally, with fewer countries having financial incentives in place — and Europe accounting for the majority of both



Source: REN21 Policy Database, 2026 •
Note: This map reflects policies that support community energy, citizen engagement, and benefit sharing. For EU countries, this map reflects both independently adopted national policies and national policies transposing EU definitions, enabling frameworks and national support schemes for renewable energy communities, as introduced in the EU's Renewable Energy Directive and the International Electricity Market Directive.

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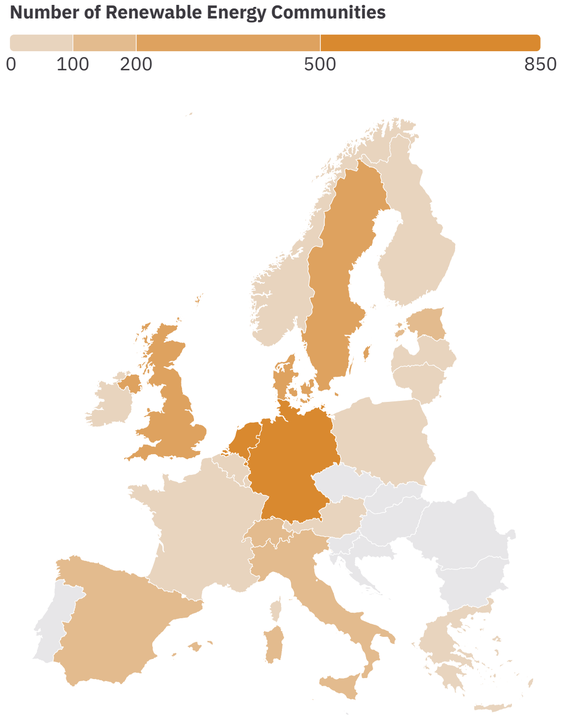
Crucially, **national policy adoption does not automatically translate into progress on the ground**. The number of energy communities offers a first indicator of real-world uptake, but quantitative metrics fail to capture the size, quality, depth of engagement, and long-term financial viability and social impact of individual communities. Consequently, establishing qualitative frameworks to actively monitor and scale up substantive citizen engagement must be treated as a non-negotiable prerequisite for ensuring that community energy drives a fair and democratic renewables-based economy.

Tracking of renewable energy communities globally is important to the renewables-based economy, as **localised ownership models are vital for participatory governance and decentralised energy planning.** Western Europe is home to the greatest share of renewable energy communities. As of 2022, the Netherlands led the region in the total number of initiatives – with 846 legal registrations, or roughly 25% of the identified EU total – driven by a national goal of 50% local ownership of all land-based renewable energy by 2030.[143] Meanwhile, Germany had the highest total installed capacity in these communities. The growth in European renewable energy communities shows **progress and interest** in these initiatives; however, as of 2026 **the EU had reached only 27% of its objective** to have one energy community per large municipality by 2025, with several Member States leading the way.[144]

FIGURE 39.

Legally Registered European Renewable Energy Communities for Energy Production, as of 2022[145]

Western Europe dominates the sector, led by the Netherlands with 846 legal registrations



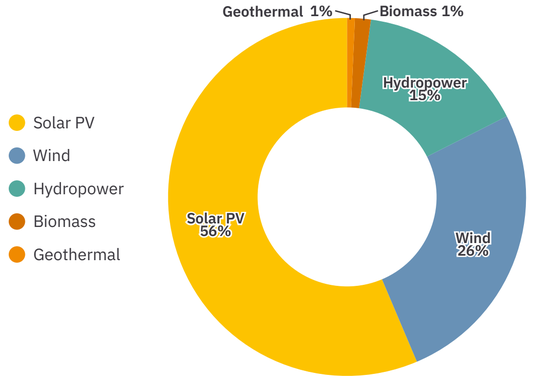
Source: Western Norway University of Applied Sciences, 2022 • Note: Based on HVL ENBP 2022 Inventory data for 2018-2022. Data represent legally registered, EU-compliant Renewable Energy Communities (RECs) with verified legal forms and GLEIF identifiers; they include primary energy production from solar, wind, hydropower, biomass and geothermal sources, and exclude co-generation. These communities represent a narrow subset of the broader energy community landscape.

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FIGURE 40.

European Renewable Energy Communities (REC), by Technology Type, as of 2022[150]

Solar PV represents the most widely adopted technology for local energy generation across European REC



Source: Western Norway University of Applied Sciences, 2022 • Note: Based on HVL ENBP 2022 Inventory data for 2018-2022. Represents the proportional share of each technology within the REC portfolio.

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As of 2022, **solar PV was the dominant technology in renewable energy communities**, accounting for 56% of technologies featured in European projects.[146] This preference for solar is likely due to its **scalability and suitability** for both urban and rural community ownership, **lower upfront investment** requirements and generally **simpler permitting frameworks** for small-scale projects.[147] Wind energy is the second most prevalent technology in European energy communities, accounting for 26% of the total, while hydropower accounts for 15%.[148] The significant share of hydropower suggests that **established energy communities are using large-scale renewable energy technologies** to increase their energy production as they acquire the necessary expertise and investment.[149]

DATA GAPS:

Energy Communities and Citizen Engagement

Data on renewable energy communities and citizen engagement remain fragmented and incomplete. Differences in legal energy community definitions and reporting frameworks limit comparability across countries, while many local, informal or community-led initiatives are not captured in official policy or regulatory datasets. Data on the number of energy communities are largely concentrated in Europe, with fragmented availability in other regions. As a result, tracking progress solely by the number of communities provides only a partial picture.

More robust approaches are needed to capture qualitative dimensions such as social impact, mitigation of energy poverty, and the depth and quality of participation, including how stakeholder input is reflected in decision making. Strengthening alignment between local and national planning processes, alongside improved global tracking of policies, is essential to better understand how community energy contributes to a more inclusive and equitable renewables-based economy.

RBE TRACKER

Environment and Climate





The world is confronting an interconnected triple planetary crisis. Climate change and pollution, driven largely by the extraction and combustion of fossil fuels, are also important drivers of biodiversity loss.[151] By drastically reducing greenhouse gas emissions and other pollutants, renewable energy helps to mitigate climate change and pollution, therefore improving human health and constraining biodiversity loss.[152]

Addressing these crises is not only an ecological imperative, but an economic one. The costs of inaction far exceed those of deploying renewables, and the health, infrastructure and ecosystem damages avoided through the energy transition can represent enormous gains for societies and economies alike.[153] There is a need to track how a renewables-based economy delivers on these benefits, and what regulations and enabling conditions are already contributing or are still needed to fulfil this goal.

This first edition of the RBE Tracker focuses on a set of four indicators: the integration of renewables in national climate plans, energy-related carbon dioxide emissions, circularity, and siting and permitting policies.

ENVIRONMENT AND CLIMATE

Renewables in National Climate Plans

Purpose: Tracking references to renewable energy in climate and environmental policies reveals the extent to which renewables are embedded in broader climate and environmental frameworks as a cross-sectoral solution, spanning mitigation pathways, adaptation planning, air quality strategies, and biodiversity and ecosystem management.



Out of all the Third Nationally Determined Contributions (NDCs)[xvii] that countries submitted to the United Nations by the end of 2025, 99% included measures that address Sustainable Development Goal 7, highlighting the central role of sustainable energy for advancing climate action.[154] Similarly, **around 90% of both the 109 submitted Third NDCs and the 85 submitted National Adaptation Plans (NAPs)[xviii] as of March 2026 refer specifically to renewable energy**.[155] Renewables are recognised primarily for supporting climate change mitigation across sectors (offering opportunities for emission reductions), but also increasingly for climate change adaptation, enhancing resilience to droughts, heatwaves and sea-level rise while creating income opportunities.

By sector, **renewables are most often mentioned alongside agriculture in climate change policies**, accounting for 31.1% of co-mentions in NDCs and 41.4% in NAPs, often in the context of solar irrigation solutions and farming.[156] This reflects both the particular vulnerability of agriculture and food systems to climate change and the potential for renewables to strengthen resilience and adaptation in the sector.[157] Yet, only 31 national renewable energy policies for agriculture were in place by early 2026, indicating a broader lack of alignment across climate and energy policy (→ *see Energy Demand and Electrification section*).

Renewables and healthcare represent the second most common sectoral pairing in NAPs, accounting for 18.2% of all sectoral co-occurrences.[158] In NDCs, the second most frequently co-referenced sectors are **renewables and transport**, appearing together in 28.1% of sectoral co-occurrences and encompassing eight transport-specific renewable energy targets.[159]

xvii Nationally Determined Contributions (NDCs) are national climate action plans submitted by countries under the Paris Agreement, outlining how each country will reduce greenhouse gas emissions and adapt to climate change. Countries are required to update and resubmit their NDCs every five years, with each revision expected to reflect increased ambition. The third generation of NDCs (NDCs 3.0) was due in 2025, with countries setting targets through 2035 and expected to reflect the outcomes of the first Global Stocktake conducted at COP28 in 2023.

xviii National Adaptation Plans (NAPs) are strategic frameworks developed by countries under the United Nations Framework Convention on Climate Change (UNFCCC) to identify medium- and long-term adaptation needs and to develop and implement strategies to address those needs. Established under the Cancún Adaptation Framework in 2010, NAPs are primarily intended for developing countries, although all Parties are encouraged to formulate them. Unlike NDCs, NAPs do not follow a fixed submission cycle but are developed and updated on an ongoing basis as part of countries' broader adaptation planning processes.

On a regional basis, **NDCs in African countries link renewables and agriculture more frequently than NDCs in other regions.** In Europe and Latin America, renewables are most often associated with transport in NDCs, while in Australia, Canada, Mexico, and South Africa, they are tied to industry. In contrast, in their NAPs, most countries, especially climate-vulnerable ones, highlight renewables for agriculture. This growing recognition underscores **renewable energy's role as a crucial adaptation measure**, particularly in developing countries and small-island states, by helping decentralise and strengthen energy system resilience.

DATA GAPS:

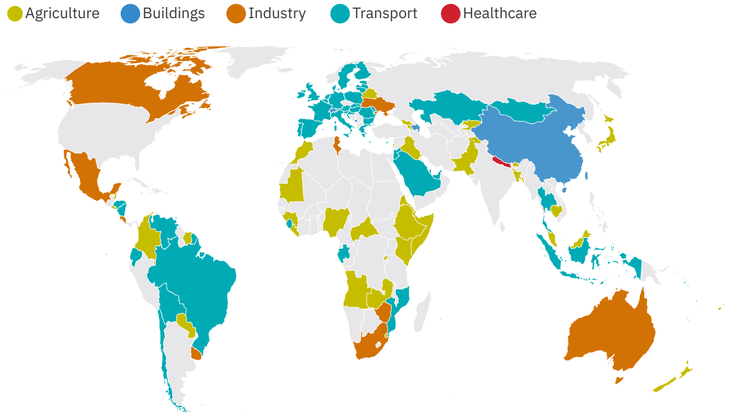
Renewable Energy Integration Across Policy Frameworks

When assessing how renewables are integrated across broader policy frameworks, significant data gaps remain. Current analysis focuses primarily on renewable energy integration in climate strategies, whereas policies related to biodiversity, land use and disaster risk reduction are not yet systematically covered. Beyond expanding the scope, there is a need for more qualitative assessment of how renewables are embedded in these strategies, including their specific roles in mitigation, adaptation and ecosystem management. Existing tracking also remains largely limited to national-level policies, overlooking sub-national and local planning where implementation often occurs. In addition, differences in terminology, inconsistent reporting formats and limited transparency in policy documents hinder comparability across countries.

FIGURE 41.

Primary Sector Linked to Renewables in Third NDCs, as of 2026[160]

African countries most often mention renewables together with agriculture, while in Europe and the Americas, they are more frequently linked to transport and industry

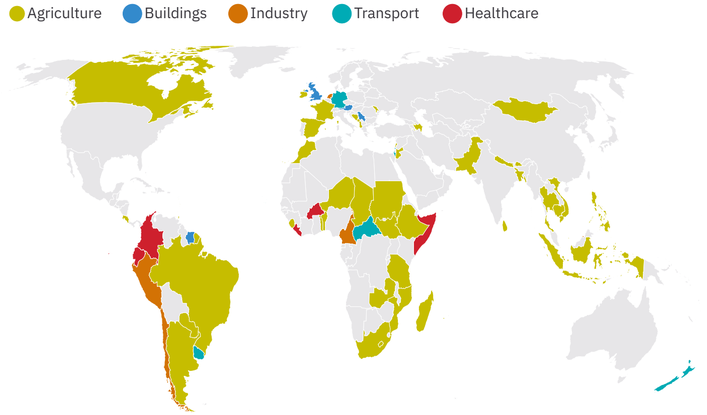


Source: UNFCCC, 2026 •
Note: All Third NDCs submitted as of March 2026 were analysed using multilingual keywords to identify sentences where renewables and key sectors are mentioned together. The main sector shown reflects the most frequent co-occurrence in each document and indicates presence in the document, not necessarily policy strength. To qualify as a new submission in the third round of NDCs, an NDC must define its contribution with a 2035 time frame.

FIGURE 42.

Primary Sector Linked to Renewables in National Adaptation Plans, as of 2026[161]

Climate-vulnerable countries across different regions most frequently co-mention renewables and agriculture in their NAPs



Source: UNFCCC, 2026 •
Note: All NAPs submitted as of March 2026 were analysed using multilingual keywords to identify sentences where renewables and key sectors are mentioned together. The main sector shown reflects the most frequent co-occurrence in each document and indicates presence in the document, not necessarily policy strength.



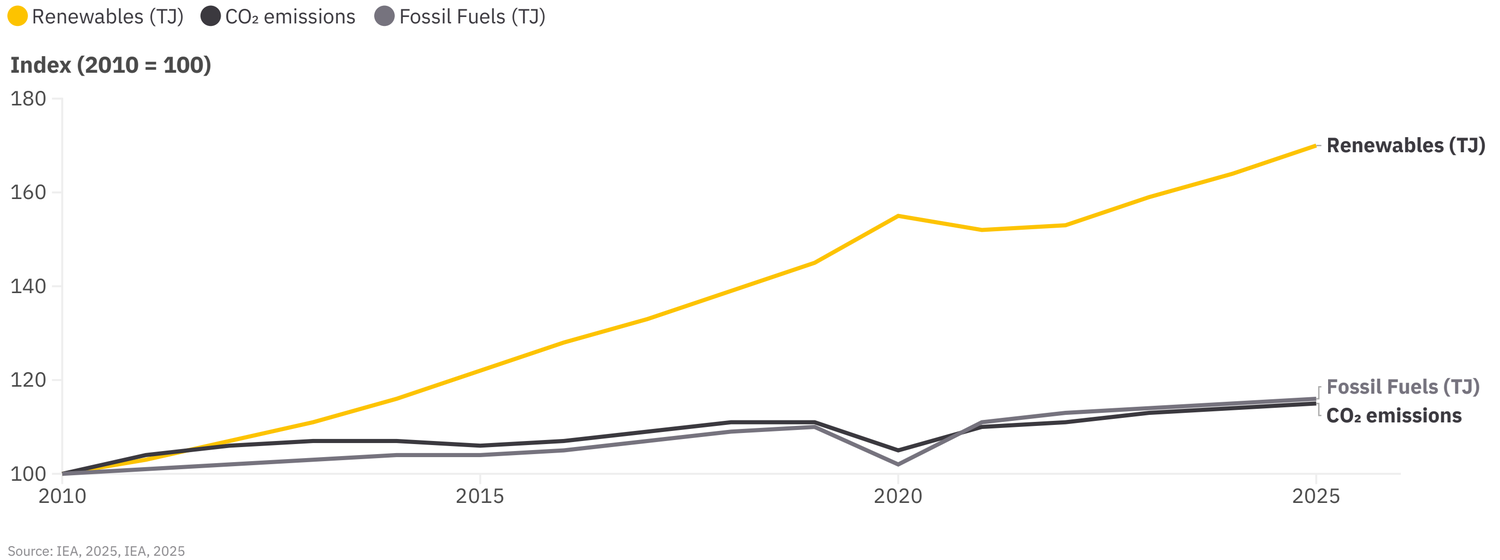
ENVIRONMENT AND CLIMATE

Energy-Related Emissions

Purpose: Tracking trends in energy-related carbon dioxide emissions is critical to assess the extent to which renewable energy expansion is translating into sustained emission reductions.

FIGURE 43.
Renewables Consumption, Fossil Fuel Consumption and Energy-Related CO_2 Emissions, 2010-2025[162]

Rapid renewable energy growth has not yet reversed rising fossil fuel use and global CO_2 emissions

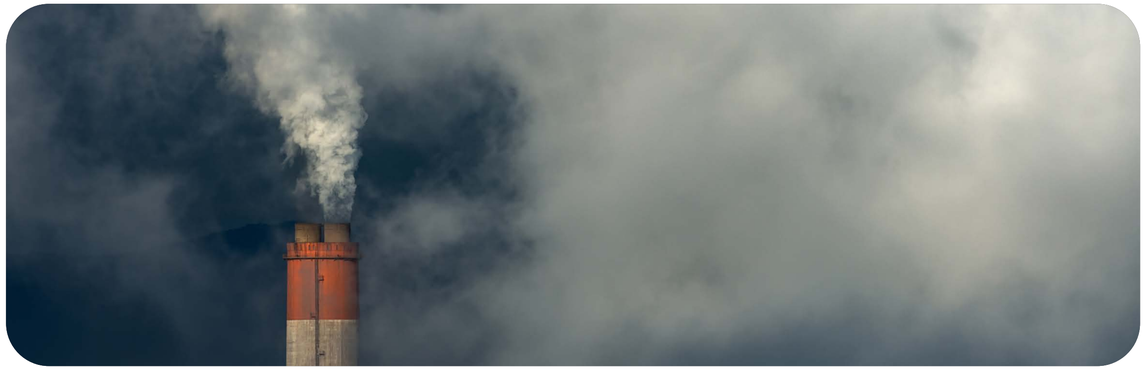


Source: IEA, 2025, IEA, 2025

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Since 2010, the share of modern renewables in total final energy consumption has increased around 70%, reflecting steady deployment across power, heat and transport. Over the same period, global carbon dioxide emissions have risen around 15%, with only a temporary drop in 2020. This divergence highlights a structural gap: although renewable energy is expanding rapidly, much of this growth is occurring alongside rising overall energy demand, rather than fully displacing fossil fuels at scale.

At the same time, the additional energy supplied by renewables has helped meet growing electricity and energy needs that would otherwise likely have been covered by fossil fuels or other non-renewable sources. Renewables deployment has proven effective at reducing greenhouse gas emissions. In China, power-sector CO_2 emissions fell 1.5% in 2025, driven by renewable energy growth rather than weak demand, as solar output surged 43% and wind 14%. In India, emissions from the power sector declined 3.8% over the same year, driven by a drop in coal power generation and record additions of 38 GW of solar and 6.3 GW of wind.[163] Even so, globally, continued growth in energy demand, persistent fossil fuel use in end-use sectors and slow system-wide integration of renewable energy are limiting the overall impact of renewables on emission reductions. Closing this gap will require not only accelerating deployment but ensuring that renewable energy directly displaces fossil fuel use across the entire energy system.



ENVIRONMENT AND CLIMATE

Circularity

Purpose: Tracking circularity practices around the materials used in renewable energy technologies is essential to assess how these practices address resource constraints, improve material efficiency and reduce raw material extraction, while generating value by keeping materials in use.



For most materials used in renewable energy and enabling technologies, recycling faces structural economic barriers

Unlike fossil fuel-based energy systems, which require the continuous extraction and combustion of polluting fuels, most renewable energy technologies operate without fuel inputs once they are deployed.

However, building the infrastructure and enabling technologies for renewables – from solar panels and wind turbines to batteries and transmission grids – requires significant quantities of materials. Some of these materials are already in wide use, such as copper and aluminium, while others are only recently being used at scale, such as lithium and rare earth elements.[164]

Circularity practices – such as **designing for re-use, repurposing and recycling** across the full life cycle of renewable energy technologies – maximise resource efficiency and reduce the extraction of finite raw materials. When well implemented and regulated, these practices generate tangible economic returns, create value and jobs, and increase the resilience of supply chains and material sovereignty – representing an emerging component of the renewables-based economy.[165] Bioenergy, when grounded in the cascading principle[xix], ensuring sustainable agricultural practices and avoiding deforestation, can offer an additional circularity pathway by valorising organic residues across successive uses before final energy recovery.[166]

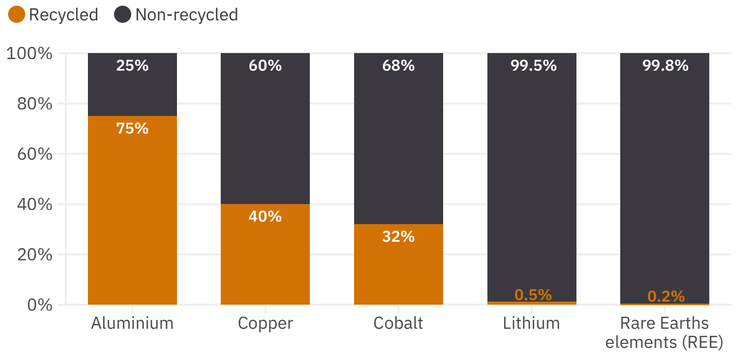
Key circularity metrics include **recycling rates** of materials used in renewable energy technologies, which reveal how effectively resources are kept in circulation, as well as **policies that address the end-of-life** of renewable energy components, including collection schemes, extended producer responsibility, and mandated re-use or repurposing obligations. The monetary **value** created through circular loops such as recovered materials, avoided procurement costs and secondary market revenues can help in quantifying the economic case for circularity.

xix The **cascading principle** (or cascading use principle) refers to the sequential use of materials and resources in ways that maximise their value and lifespan before final recovery or disposal. In a circular economy context, materials are first used for their highest-value applications, then re-used, repaired, remanufactured, or recycled into lower-value applications, with energy recovery considered only as a last step. (IUCN)

End-of-life recycling rates for materials used in renewable energy technologies vary sharply. Metals that have historically been used in large volumes, such as copper and aluminium, have achieved medium to high recycling rates, supported by established waste management infrastructure and regulation.[167] In contrast, for materials that are being newly used at scale – such as lithium, cobalt and rare earth elements – the recycling of end-of-life products remains nascent.[168] In many instances, recycled inputs remain scarce simply because most renewable energy infrastructure and enabling technologies have not yet reached their end-of-life.[169]

FIGURE 44.
Recycling Rates of Selected Metals and Minerals, Across all Sectors, as of 2021[170]

Established metal industries such as aluminium achieve higher recycling rates



Note: Recycling rates refer to the percentage of the metals that are actually recycled, not their potential recyclability
Source: IEA, 2021, International Aluminium Institute, International Copper Association, 2022

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For most materials used in renewable energy and enabling technologies, recycling faces structural economic barriers. For example, in the United States, the cost of recycling solar panels exceeds that of landfilling, as well as the cost of bulk materials.[171] There is a need for policy frameworks that incentivise recycling and make it competitive with primary extraction.[172]

In a sample of 22 countries studied by the International Energy Agency, **policy measures** implemented during 2022-2024 included: strategic plans setting **recycling targets**; **extended producer responsibility** schemes requiring manufacturers to implement **end-of-life collection and recycling**; financial incentives to stimulate recycling **investment**; and cross-border **trade regulations** governing scrap and waste flows.[173] Some policies also included regulatory mandates such as minimum recycled content targets, collection rate requirements and landfill bans.[174]

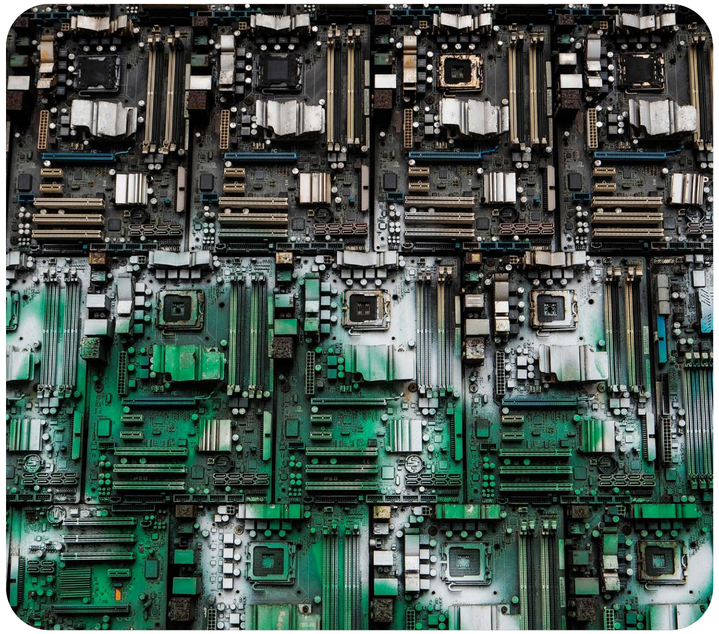
Circularity in the renewable energy industry is usually covered by broader waste management policies that do not solely target renewables. For example, regulations aimed at managing waste from electrical and electronic equipment (WEEE), including extended producer responsibility (EPR) schemes, usually cover the end-of-life of batteries and solar PV panels.

Further action is needed to establish a comprehensive global database that enables the tracking of policies for circularity applying specifically to renewable energy industries.

DATA GAPS:
Waste Disposal, Recovery and Recycling, Monetary Value

There is no coherent global tracking of circularity of the materials used in renewable energy and enabling technologies. For some minerals, such as lithium, cobalt and rare earths, reliable time-series data on secondary supply are rarely publicly available, and systematic data on recycling capacity and recovered volumes are absent in most regions outside the United States and EU.[175]

Data on the monetary value of circularity practices in the renewable energy industry are mostly unavailable, inconsistent and difficult to cross-check. Market reports from various recycling industries (copper, aluminium, lithium) vary widely in their value assessments. Furthermore, most available data do not provide a breakdown by end-use, making it impossible to identify what portion applies to renewable energy infrastructure.[176]



ENVIRONMENT AND CLIMATE

Renewable Energy Siting, Permitting and Sustainability Requirements

Purpose: Tracking the siting, permitting and sustainability requirements for renewable energy projects, including attention to land-use change, is critical to assess how regulatory frameworks ensure that renewables deployment aligns with biodiversity conservation and nature-positive principles.



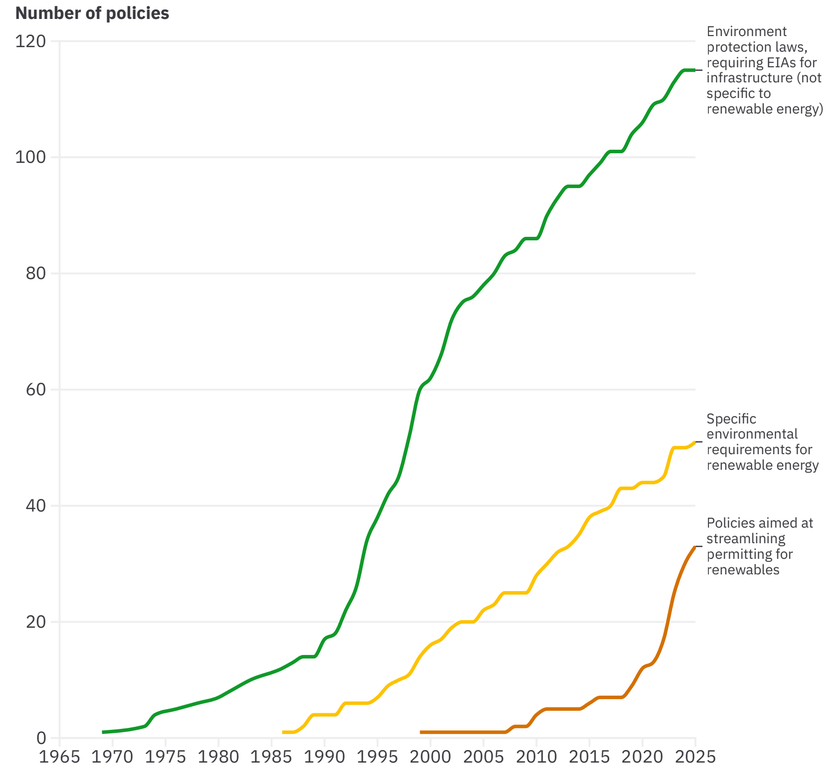
Currently, the siting, permitting and sustainability requirements of renewable energy projects are governed primarily by broader environmental and infrastructure laws. **Environmental impact assessments** (EIAs) serve as a primary tool for evaluating potential impacts and informing approval decisions.

Policies that specifically address the sustainability requirements of renewables have evolved alongside technological deployment and have become more common in recent years. They aim to ensure that renewable energy deployment does not compete with other land uses (such as agriculture and forests) and to prevent potential negative impacts on local biodiversity (land, air, water) and local communities. Policy examples include protected biodiversity areas, restrictions on bioenergy feedstocks to prevent deforestation, maximum agricultural land-use change guidance for agrivoltaics, distance of wind turbines from dwellings and mandatory consultations with local communities.[177]

In response to the climate emergency and recurring energy crises, new policies increasingly aim to streamline regulations and accelerate the expansion of renewable energy. These include, for example, policies defining **acceleration areas** or establishing **simplified procedures** for permitting processes, which can be coupled with nature-positive or net biodiversity gain requirements.[178]

FIGURE 45.
Policies Regulating Renewable Energy Siting and Permitting, 1965-2025[179]

Renewables siting and permitting are mostly governed by wider infrastructure regulations



Source: REN21 Policy Database, 2026 •
Note: From a sample of 199 policies in 132 countries, across all continents.

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Table of Indicators

SECTION	INDICATOR	DESCRIPTION	PURPOSE
Energy Systems and Energy Security	Renewable Energy Share in Total Final Energy Consumption	Measures the percentage of renewables in total final energy consumption (TFEC) globally and by country.	Assesses whether the energy transition is driving system-wide transformation beyond electricity generation.
	Renewable and Non-Renewable Energy Consumption	Measures the proportion of total final energy consumption (TFEC) derived from renewable and non-renewable sources across distinct end-use sectors like electricity, heat and fuels.	Evaluates system-wide progress by measuring the shift towards renewables in critical end-use sectors such as heating, cooling and transport.
	Shares of Electricity and Modern Renewables in Total Final Energy Consumption	Measures the levels and relationship of both electricity and modern renewables as a percentage of total final energy consumption (TFEC) across economies.	Analyses the relationship between these two dimensions to determine whether electrification and renewable integration are progressing in parallel or if they are misaligned.
	Electricity Share in Total Final Energy Consumption	Measures the percentage of total final energy consumption (TFEC) accounted for by electricity globally and across individual countries.	Evaluates electrification progress across regions to gauge the baseline for a renewables-based economy transformation.
	Renewable Energy Share in Electricity Generation	Tracks the percentage of electricity generation derived from renewable sources by country and region.	Assesses the foundation for broader energy system transformation by tracking progress where decarbonisation is currently leading.
	Global Pay-as-you-go and Cash Sales of Solar Energy Kits	Tracks the total volume of off-grid solar energy kits sold globally by financing method (pay-as-you-go versus cash), and the market shift towards flexible repayment models.	Assesses how renewables reshape energy governance and socio-economic benefits by monitoring their deployment and ownership structures.
	Global Energy Importers and Exporters	Tracks the percentage of total final energy consumption (TFEC) met by net energy imports by country, and the concentration of net exports.	Measures energy import dependence to assess exposure to external supply risks and broader structural dependencies across energy systems.
	Global Renewable Power Capacity and Annual Additions	Measures installed capacity and new additions (in gigawatts) of renewable power generation, broken down by technology (solar PV, hydropower, wind, other).	Tracks the deployment of renewable generation across the energy system by highlighting the technologies shaping the transition.
	Electricity Curtailment and Variable Renewable Energy Share	Measures the percentage of variable renewable energy (VRE) generation that is curtailed relative to the VRE share of electricity generation across economies.	Reflects growing challenges in balancing supply and demand, showing how effectively energy systems are planned, managed, and aligned with electrification.
	Global Annual Investment in Power Grids	Tracks annual global spending (in USD billions) on power grids and energy storage infrastructure across regions.	Evaluates if investment in enabling infrastructure and system flexibility is keeping pace with renewable deployment.
	Energy Storage (Stationary) Global Installed Capacity	Tracks the global installed capacity (in gigawatts) of energy storage, broken down by pumped storage, grid-scale BESS, and distributed BESS.	Provides a comprehensive view to ensure that energy storage systems can accommodate rising shares of variable renewable energy.
	Share of Electricity in Total Final Energy Consumption	Measures the percentage of electricity and non-electricity in total final energy consumption (TFEC), and specifically in agriculture, buildings, industry and transport.	Assesses how far electricity is displacing fossil fuels in end-use sectors while identifying where policy support is still needed.
	Global Electric Car Sales	Tracks global electric car sales volumes and market shares by region.	Assesses how renewable electricity is extending into the transport sector through accelerating electric mobility deployment.
	Global Production of Liquid Biofuels	Measures the annual production volume (in billion litres) of liquid biofuels (biodiesel, biojet fuel, bioethanol, renewable diesel).	Tracks growth driven by policy mandates, blending requirements, and rising demand for low-emission transport fuels.
	Heat Pump Sales	Tracks annual heat pump sales (in gigawatts) in China, the United States and Europe.	Tracks the role of heat pumps in decarbonising heating and cooling while highlighting the influence of policy frameworks and market conditions.

Table of Indicators (CONTINUED)

	INDICATOR	DESCRIPTION	PURPOSE
	Global Heat Consumption	Tracks the share of global heat consumption supplied by renewable electricity, modern bioenergy, solar heat, geothermal, traditional biomass and non-renewables.	Highlights the importance of accelerating renewable energy uptake across buildings and industry to support efficient system development.
	Renewable Energy Share Targets	Tracks renewable energy targets alongside countries long-term, cross-sectoral energy plans.	Assesses whether countries are aligning policy ambitions, infrastructure development, and sectoral transformation with the energy transition.
	Countries with Renewable Energy Targets	Tracks the number of countries with targets for renewable energy expressed as a share of total final energy consumption (TFEC), power, fuels and heat.	Reveals how deeply renewables are being embedded in policy ambitions and identifies where heat and fuels remain overlooked.
	Policies for the Uptake of Renewables in Energy Demand Sectors	Tracks national policies targeting renewable energy integration in agriculture, buildings, industry and transport.	Offers a practical lens to assess where policy ambitions are being translated into implementation and where gaps remain.
	Countries with Policies for the Uptake of Renewables in Energy Demand Sectors	Tracks the number of countries with renewable-uptake policies in agriculture, industry, buildings and transport.	Reveals which demand sectors are receiving the most policy attention and which remain comparatively neglected.
Economy	Policies for the Uptake of Renewables in Energy Demand Sectors (Policy Instrument, Demand Sector and Application)	Maps policies by instrument type (fiscal/financial, regulation/mandate, target, strategy/roadmap, guideline), by demand sector and by technology applied.	Assesses how policy instruments are structured to support renewable integration across end-use sectors and applications.
	Renewable Energy Manufacturing Capacity and Pipeline	Measures the existing and pipeline manufacturing capacity for solar PV, wind, batteries and heat pumps by region.	Evaluates how countries are building industrial capabilities, localised manufacturing capacity, value creation, and supply chains.
	Cumulative Renewable Energy Manufacturing Policies	Tracks the cumulative number of policies supporting renewable energy manufacturing, by region.	Highlights a growing global focus on clean energy manufacturing while revealing disparities in policy scale and regional participation.
	Fiscal and Financial Policies for Renewable Energy	Tracks countries with fiscal or financial support measures for renewable energy.	Assesses how public finance and policy frameworks are shaping investment environments and the pace of the transition.
	Countries with Fiscal and Financial Renewable Energy Policies	Tracks countries adopting each fiscal/financial instrument (net metering, feed-in tariffs, public grants, public subsidies, tenders, tax exemptions, loans, etc.).	Reveals which policy instruments are most widely adopted and how comprehensive countries' policy mixes are across deployment barriers.
	Fossil Fuel versus Renewable Energy Subsidies	Compares public financial support for renewable energy against fossil fuel subsidies (in USD billions) globally and across economies.	Indicates whether support for incumbent energy sources undermines a level playing field and slows the pace of the transition.
	Global Investment in Renewables and Low-Emission Technologies	Tracks global and sector-specific capital allocation among renewable power, electrified transport, grids, and other low-emission technologies to assess the alignment of investment trends with the transition to renewables-based economies.	Tracks investment in renewable energy and enabling technologies to assess how capital is being allocated across the transition.
	Global Renewable Energy Employment	Tracks global renewable energy jobs across solar PV, bioenergy, hydropower, wind energy, solar heating and cooling, and other.	Indicates whether the transition is creating durable jobs and highlights structural concentration across technologies and regions.
	Women's Share of Full-Time Employment in Renewable Energy	Tracks the percentage of women employed full-time in renewable energy across policy and administration, sales, project development, operation and maintenance, service provision and manufacturing.	Assesses gender equity and demonstrates whether economies are harnessing the full potential of female employment.
	Policies Supporting Reskilling for the Renewables and Energy Transition Sectors	Tracks the number of policies (roadmaps, financial incentives, training) supporting worker reskilling for the energy transition.	Evaluates whether workforce development is keeping pace with industry needs to ensure an equitable transition.

Table of Indicators (CONTINUED)

	INDICATOR	DESCRIPTION	PURPOSE
Society and Governance	Electricity Access Policies in Countries Without Universal Electricity Access	Tracks countries without universal electricity access by their access targets and policies (no policy, target without specified solutions, only policies, partial access target, universal access target) with renewable solutions.	Demonstrates how renewables expand access to energy services and evaluates if policies effectively reach rural, remote, and low-income populations.
	Electricity Access Policies in Countries Without Universal Electricity Access (Map)	Maps electricity access policies (no policy, non-renewable energy policy, renewable energy policy, decentralised renewable energy policy) in the countries lacking universal access.	Reveals the extent to which decentralised renewables are recognised as the primary pathway to expand electricity access
	Newly Installed Solar PV Capacity (Centralised vs. Distributed)	Measures newly installed solar PV capacity (in gigawatts) split by centralised utility-scale systems versus distributed (decentralised and off-grid) systems across regions.	Sheds light on how effectively the renewables-based economy enables decentralised energy use and shifts ownership structures.
	Compensation Mechanisms for Distributed Renewable Energy	Tracks the mix of policy approaches supporting distributed renewables (feed-in tariffs, net metering, net billing, multiple policy mechanisms) by country.	Reflects different market designs and tracks how policy matures from incentivizing deployment to balancing integration and cost efficiency.
	Policies for Household Energy Affordability with Renewables and Energy Efficiency	Tracks policies aimed at increasing access and affordability with renewables and energy efficiency, by number of policy instruments per country.	Evaluates the enabling conditions and policy frameworks needed to effectively reach vulnerable households and reduce operating costs.
	Policies for Household Energy Affordability with Renewables and Energy Efficiency (Policy Type and Focus)	Maps policies by type (target, strategy/roadmap, regulation/mandate, fiscal/financial, guideline) and policy focus (access, community energy, renewable energy installations, energy efficiency).	Reveals how policy mixes are structured to address access, affordability, energy efficiency, and community energy as interconnected goals.
	National Community Energy and Citizen Engagement Policies	Tracks the number of regulatory frameworks supporting citizen engagement and community energy across countries.	Assesses whether the transition is anchored in shared decision-making, local ownership and equitable benefit-sharing.
	Legally Registered European Renewable Energy Communities for Energy Production	Tracks the number of legally registered, EU-compliant renewable energy communities focused on energy production across European countries.	Provides an indicator of policy adoption and demonstrates the extent to which local ownership models are driving systemic change.
	Shares of Renewables in European Renewable Energy Communities	Tracks the proportional share of technologies (solar, wind, hydro, biomass, geothermal) used within European renewable energy communities.	Reveals which renewable technologies are favoured by established energy communities and signals their structural preferences.
Environment and Climate	Main Sector Linked to Renewables in Countries' Third Nationally Determined Contributions	Tracks the most frequent co-occurrence of renewables with key sectors (buildings, agriculture, industry, transport, healthcare) in submitted Third Nationally Determined Contributions.	Determines whether renewables are embedded as cross-cutting solutions for mitigation across sectors in national climate plans.
	Main Sector Linked to Renewables in Countries' National Adaptation Plans	Tracks the most frequent co-occurrence of renewables with sectors (agriculture, buildings, industry, healthcare, transport) in submitted National Adaptation Plans.	Reveals renewable energy's growing role as a crucial adaptation measure, particularly in climate-vulnerable countries.
	Renewables Consumption, Fossil Fuel Consumption and Energy-Related CO_2 Emissions	Compares the index of modern renewable energy use in total final energy consumption (TFEC) against the index of global carbon dioxide emissions.	Highlights a structural gap by showing whether renewable growth is displacing fossil fuels at scale or merely adding to overall supply.
	Recycling Rates of Selected Metals and Minerals	Tracks end-of-life recycling rates (%) for critical materials used in renewable energy technologies (aluminium, copper, cobalt, lithium, rare earth elements).	Examines how circular practices maximise resource efficiency, reduce finite raw material extraction, and generate value.
	Policies Regulating Renewable Energy Siting and Permitting	Tracks the number of policies governing renewable energy siting and permitting over time, broken down into environment protection laws requiring environmental impact assessments (EIAs), specific environmental requirements for renewable energy, and policies streamlining permitting for renewables.	Assesses how regulatory frameworks enable or constrain sustainable renewable energy deployment.

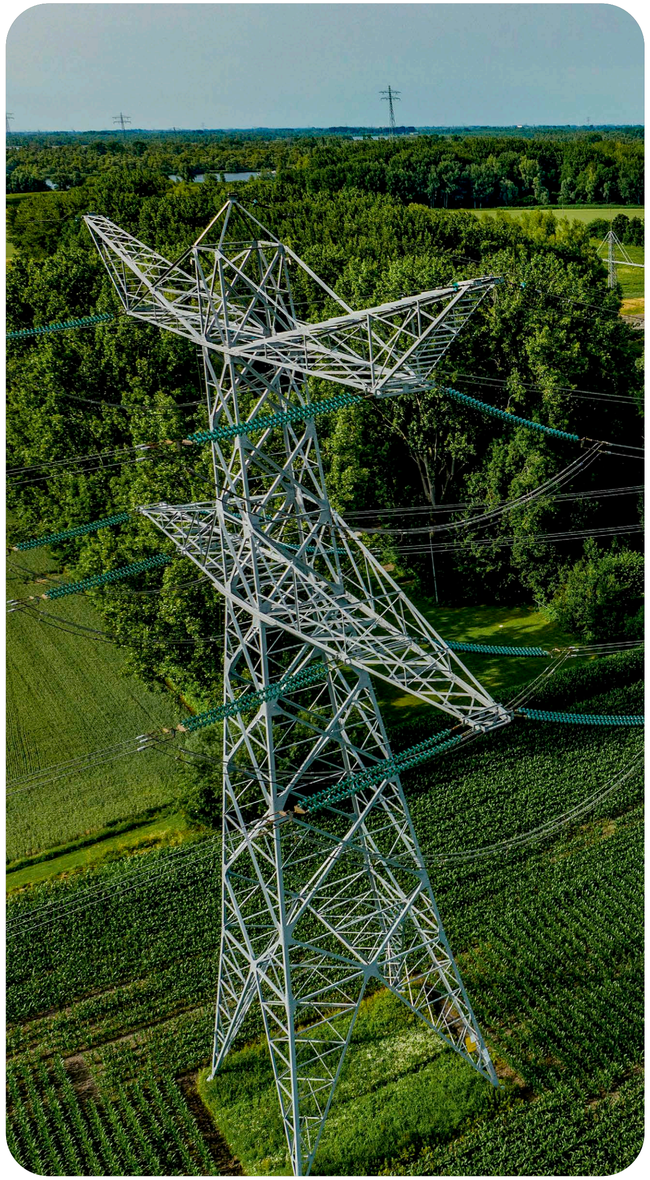


Table of Data Gaps

SECTION	DATA GAPS	PURPOSE OF DATA GAP
Energy Systems and Energy Security	Tracking Material Dependencies in Renewables-Based Economies	Complements traditional energy security indicators and better assesses evolving resource foundations and supply chain resilience.
	System Integration and Flexibility Policies	Assesses how governments are enabling higher shares of renewable energy by supporting its integration across power, heat, and electricity.
	Regional Interconnections	Assesses whether power systems are expanding capacity and enhancing flexibility in parallel with renewable deployment to balance supply and demand.
	Renewable Energy Use in Industry	Evaluates whether the energy transition is driving system-wide transformation, identifies remaining fossil fuel barriers, and determines where policy support is needed for industry.
	Systemic Review of Countries' Energy Plans	Integrates energy planning with wider economic priorities to reduce blind spots and enable more coherent policy making.
Economy	Upstream Supply Chains	Shifts focus from a partial view of manufacturing expansion to a comprehensive understanding of supply chain dynamics, risks, and opportunities.
	Renewables' Contribution to the Economy	Tracks renewable energy as a driver of economy-wide transformation, industrial development, and investment attraction.
	Job Quality in the Renewables Sector	Determines whether renewable energy job growth translates into stable, high-quality, and inclusive employment along the value chain.
Society and Governance	Energy Access Tracking	Assesses whether renewable energy provides reliable, affordable, and sufficient service to translate into broader social and economic opportunities.
	Distributed Renewables and Ownership Structures	Highlights how the benefits of a transition to a renewables-based economy are shared across society.
	Energy Affordability Indicators	Identifies challenges where energy services are priced out of reach and tracks how renewables can reduce exposure to price volatility.
	Energy Communities and Citizen Engagement	Clarifies how community energy contributes to a more inclusive and equitable renewables-based economy beyond simple counts.
Environment and Climate	Renewable Energy Integration Across Policy Frameworks	Identifies gaps where renewables are not yet systematically embedded across the broader policy landscape.
	Waste Disposal, Recovery and Recycling, Monetary Value	Quantifies the economic case for circularity within the renewables-based economy.

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1 Total Final Energy Consumption (TFEC) refers to the energy consumed by end users across all sectors in the form of electricity, heat, and fuels. It differs from Total Primary Energy Supply (TPES), which measures the total energy entering the system before conversion and distribution losses, and from Total Energy Supply (TES), which covers all energy produced in or imported to a country, minus what is exported or stored. TFEC is therefore a narrower but more direct measure of actual energy use in the economy, making it the preferred metric for assessing the penetration of renewables at the point of consumption.

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