

The background is a deep blue with a subtle, grainy texture. On the left side, there is a detailed image of an octopus, showing its head and several long, dark tentacles that curve upwards and outwards. The octopus's skin has a mottled, brownish-gold pattern. In the upper right corner, there are several abstract geometric shapes: three thick diagonal bars in teal, orange, and light blue, and four circles in teal, orange, and yellow. The text "RENEWABLES NOW" is centered horizontally across the middle of the image.

RENEWABLES NOW

RENEWABLES 2021 GLOBAL STATUS REPORT

MASTER SLIDE DECK

REN21 Secretariat
secretariat@ren21.net



THE ONLY GLOBAL RENEWABLE ENERGY MULTI-STAKEHOLDER COMMUNITY

GOVERNMENTS

Afghanistan, Austria, Brazil, Denmark,
Dominican Republic, Germany, India,
Mexico, Norway, Republic of Korea, South
Africa, Spain, UAE, USA

NGOs

CAN-I, CLASP, CCA, Club-ER, CC35, Energy
Cities, EHP, FER, Global 100%RE, GFSE,
Greenpeace Intl, GWNET, ICLEI, IEC, ISEP, JVE,
MFC, Power for All, REEEP, REI, RGI, SCI,
SLOCAT, SEforAll, WCRE, WFC, WRI, WWF

SCIENCE & ACADEMIA

AEE INTEC, CEEW, Fundacion Bariloche,
Higher School of Economics (Russia),
IIASA, ISES, NREL, SANEDI, TERI

INTERGOVERNMENTAL ORGANISATIONS

ADB, APERC, ECREEE, EC, GEF, IEA, IRENA, IsDB,
RCREEE, UNDP, UNEP, UNIDO, World Bank

INDUSTRY ASSOCIATIONS

ACORE, AMDA, ALER, ARE, APREN, CREIA, CEC,
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MAKE THE SHIFT TO RENEWABLE ENERGY HAPPEN – NOW!

The only **global community** of renewable energy actors from science, academia, NGOs, governments, and industry.

Our more than **2,000 community members** co-operate collecting information, changing norms and debating.



We build upon a **decentralized intelligence**, ensuring high responsiveness to an ever changing environment.

Our **annual publications** are probably the world's most comprehensive, crowdsourced reports on renewables.

RENEWABLES 2021 GLOBAL STATUS REPORT

COLLABORATIVE ANNUAL REPORTING ON RENEWABLES SINCE 2005

THE REPORT FEATURES:

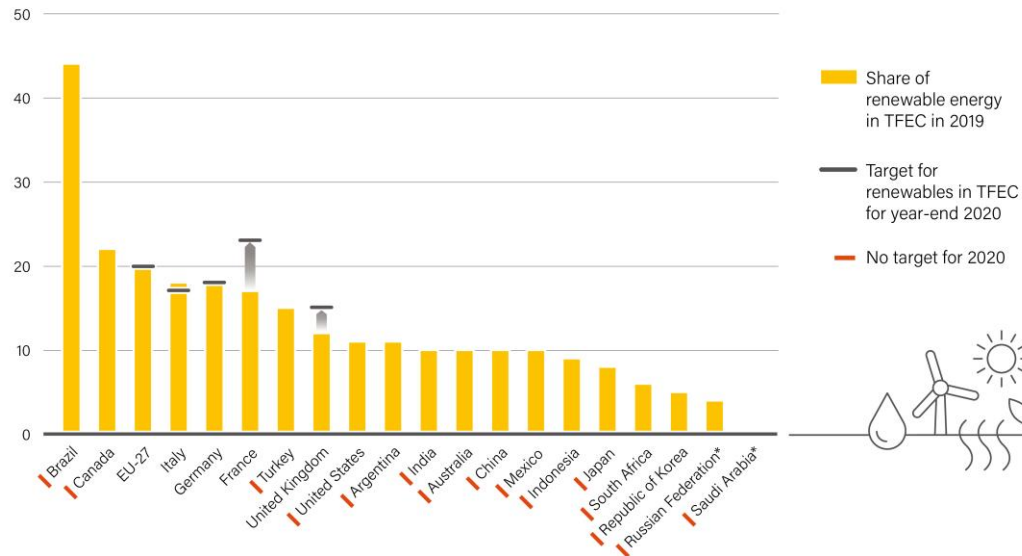
- Global Overview
- Policy Landscape
- Market and Industry Trends
- Distributed Renewables for Energy Access
- Investment Flows
- Energy Systems Integration and Enabling Technologies
- Energy Efficiency, Renewables and Decarbonisation
- Feature: Business Demand for Renewables



G20 COUNTRIES LACK TARGETS FOR RENEWABLES

 **Renewable Energy Shares and Targets**
G20 Countries, 2019 and 2020

Share of renewables in TFEC (%)



Ambition lacking on
**key performance
indicator** of renewable
energy share.

RENEWABLE ENERGY CONTINUED TO GROW IN 2020

- **Total power capacity rose almost 10%**
 - 2,839 GW including hydropower
 - Non-hydropower: 16.6% increase
- **256 GW of renewable power additions**
 - Solar PV: 139 GW; Wind: 93 GW; Hydro: 20 GW
- **Renewable heat demand increased marginally**
- **Biofuel production fell 5% in 2020**

 Renewable Energy Indicators 2020

		2019	2020
INVESTMENT			
New investment (annual) in renewable power and fuels ¹	billion USD	298.4	303.5
POWER			
Renewable power capacity (including hydropower)	GW	2,581	2,838
Renewable power capacity (not including hydropower)	GW	1,430	1,668
Hydropower capacity ²	GW	1,150	1,170
Solar PV capacity ³	GW	621	760
Wind power capacity	GW	650	743
Bio-power capacity	GW	137	145
Geothermal power capacity	GW	14.0	14.1
Concentrating solar thermal power (CSP) capacity	GW	6.1	6.2
Ocean power capacity	GW	0.5	0.5
HEAT			
Modern bio-heat demand (estimated) ⁴	EJ	13.7	13.9
Solar hot water demand (estimated) ⁵	EJ	1.5	1.5
Geothermal direct-use heat demand (estimated) ⁶	PJ	421	462
TRANSPORT			
Ethanol production (annual)	billion litres	115	105
FAME biodiesel production (annual)	billion litres	41	39
HVO biodiesel production (annual)	billion litres	6.5	7.5
POLICIES⁷			
Countries with renewable energy targets	#	172	165
Countries with renewable energy policies	#	161	161
Countries with renewable heating and cooling targets	#	49	19
Countries with renewable transport targets	#	46	35
Countries with renewable electricity targets	#	166	137
Countries with heat regulatory policies	#	22	22
Countries with biofuel blend mandates ⁸	#	65	65
Countries with feed-in policies (existing)	#	83	83
Countries with feed-in policies (cumulative) ⁹	#	113	113
Countries with tendering (held during the year)	#	41	33
Countries with tendering (cumulative) ⁹	#	111	116




WHICH COUNTRIES LED THE WAY IN 2020?



Top Five Countries 2020

Annual Investment / Net Capacity Additions / Production in 2020

Technologies ordered based on total capacity additions in 2020.

	1	2	3	4	5
 Solar PV capacity	China	United States	Vietnam	Japan	Germany
 Wind power capacity	China	United States	Brazil	Netherlands	Spain or Germany
 Hydropower capacity	China	Turkey	Mexico	India	Angola
 Geothermal power capacity	Turkey	United States	Japan	–	–
 Concentrating solar thermal power (CSP) capacity	China	–	–	–	–
 Solar water heating capacity	China	Turkey	India	Brazil	United States
 Ethanol production	United States	Brazil	China	Canada	India
 Biodiesel production	Indonesia	Brazil	United States	Germany	France

As in past years, **China** led many key annual categories for renewable energy in 2020.

RENEWABLE ENERGY LEADERS AT THE END OF 2020

Total Power Capacity or Demand / Output as of End-2020

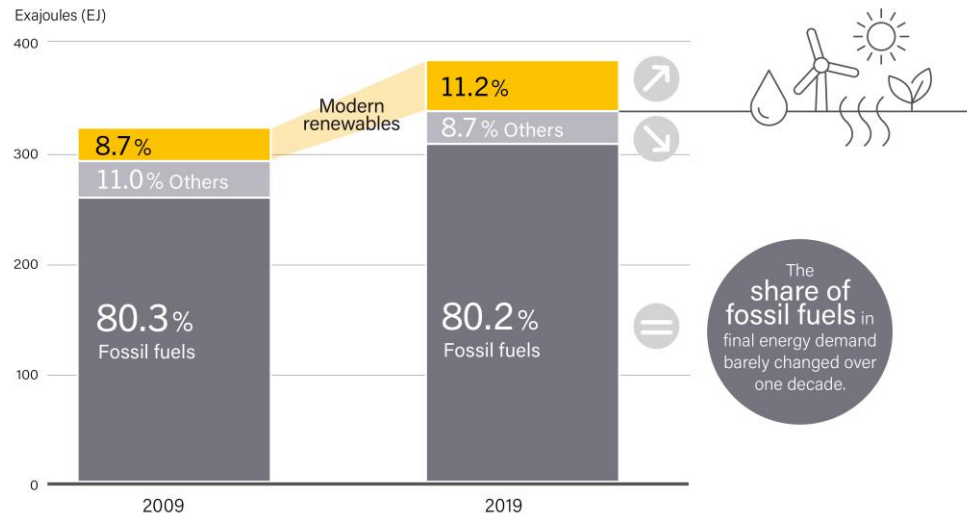
	1	2	3	4	5
POWER					
Renewable power capacity (including hydropower)	China	United States	Brazil	India	Germany
Renewable power capacity (not including hydropower)	China	United States	Germany	India	Japan
Renewable power capacity per capita (not including hydropower) ¹	Iceland	Denmark	Sweden	Germany	Australia
🔥 Bio-power capacity	China	Brazil	United States	Germany	India
🌋 Geothermal power capacity	United States	Indonesia	Philippines	Turkey	New Zealand
💧 Hydropower capacity ²	China	Brazil	Canada	United States	Russian Federation
☀️ Solar PV capacity	China	United States	Japan	Germany	India
☀️ Concentrating solar thermal power (CSP) capacity	Spain	United States	China	Morocco	South Africa
💨 Wind power capacity	China	United States	Germany	India	Spain
HEAT					
🏠 Modern bio-heat demand in buildings	United States	Germany	France	Italy	Sweden
🏭 Modern bio-heat demand in industry	Brazil	India	United States	Finland	Sweden
☀️ Solar water heating collector capacity ²	China	Turkey	India	Brazil	United States
🌋 Geothermal heat output ³	China	Turkey	Iceland	Japan	New Zealand

Some countries changed places during the year, though in many cases **the leaders for total capacity and generation are well-established.**

INCREASING ENERGY DEMAND AND FOSSIL FUEL USE



Estimated Renewable Share of Total Final Energy Consumption
2009 and 2019



Note: Totals may not add up due to rounding. This figure shows a comparison between two years across a 10-year span. The result of the economic recession in 2008 may have temporarily lowered the share of fossil fuels in total final energy consumption in 2009. The share in 2008 was 80.7%.

Source: Based on IEA data.

The world is **burning more fossil fuels** than ever.

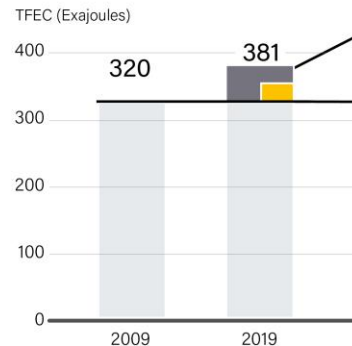
RENEWABLES ARE GROWING FAST... BUT NOT FAST ENOUGH

- Renewables grew two times faster than fossil fuels
- Renewable energy only accounted for 25% of demand growth
- Energy efficiency and renewables are complementary

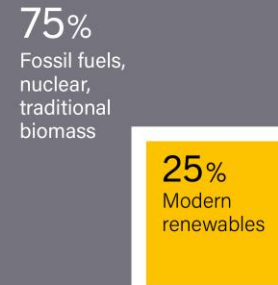


Estimated Growth in Modern Renewables as Share of Total Final Energy Consumption
Between 2009 and 2019

Worldwide the **growth in total final energy demand** continued.



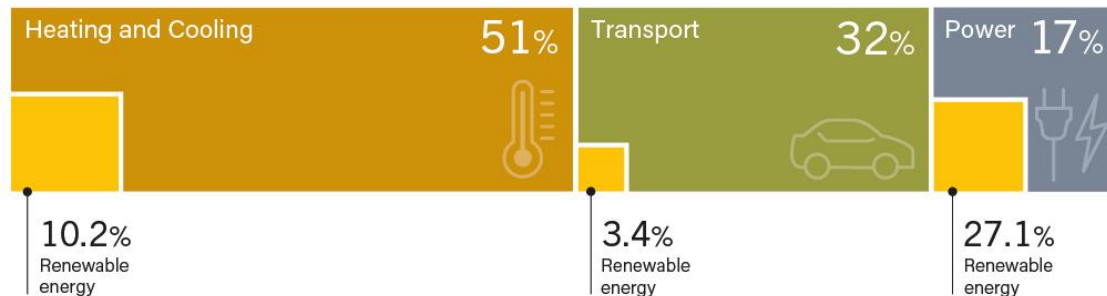
Only one quarter of the increase was covered by renewable energy.



Source: Based on IEA data.

MORE THAN 80% OF ENERGY FOR HEATING & TRANSPORT

 Renewable Energy in Total Final Energy Consumption
by Final Energy Use, 2018



Note: Data should not be compared with previous years because of revisions due to improved or adjusted methodology.

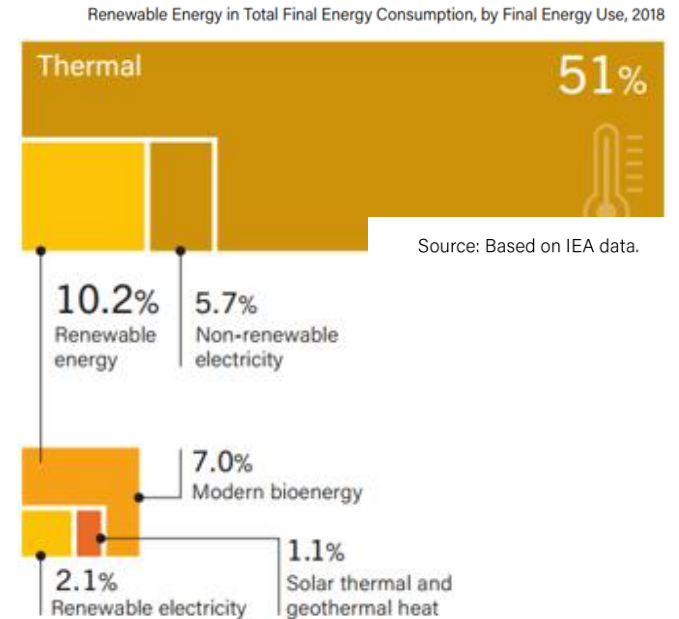
Source: Based on IEA data.

Most focus is on the power sector, but the **greatest urgency** is in heating and transport.

SLOW GROWTH IN RENEWABLE HEATING AND COOLING

KEY BARRIERS

- Sector heavily relying on fossil fuel
 - fossil fuel subsidies – no level playing field
 - Upfront capital cost of RE
- Lack of supportive regulatory framework
 - No new H&C policies since 2017
 - for electrification
- Resource availability
- Investments in supporting infrastructure needed (e.g., district heating and cooling)
- Technological advances needed for high-temperature industrial processes

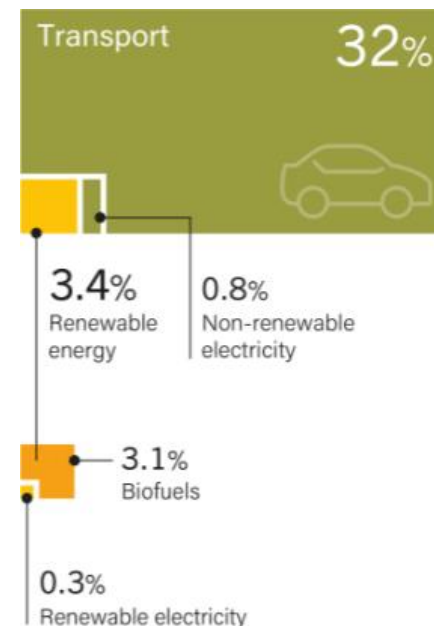


SLOW GROWTH IN RENEWABLE TRANSPORT


KEY BARRIERS

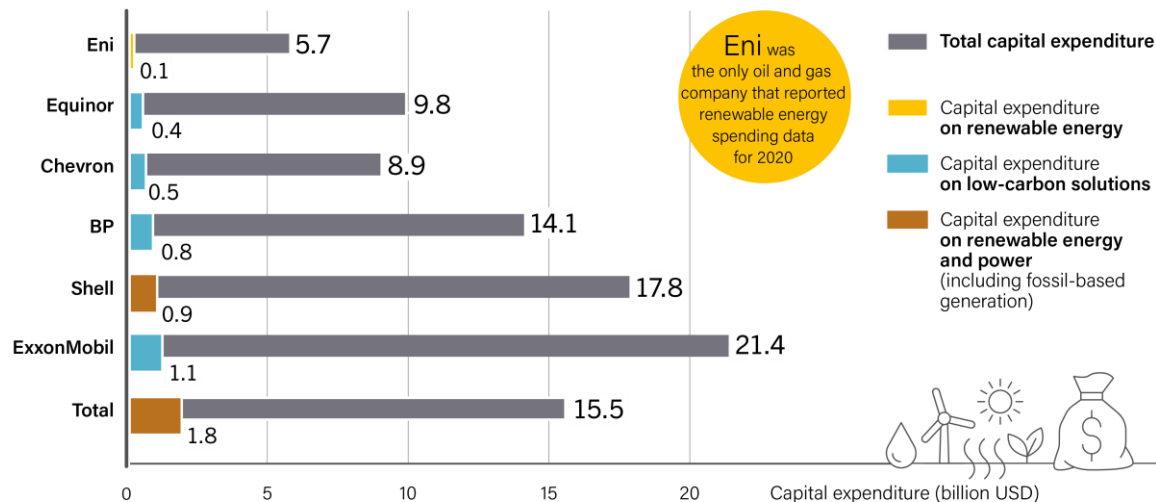
- Sector heavily relying on fossil fuel
 - Fossil fuel subsidies – no level playing field
- Demand increasing faster than other sectors
- Lack of policy support frameworks
 - Holistic strategies missing
 - Direct linking between EVs and renewables is limited
 - Avoid-Shift-Improve often missing renewable energy
- Investment in supporting infrastructure needed (e.g., EV charging)
- Technological advances needed for renewables in advanced biofuels, maritime and aviation sectors

Renewable Energy in Total Final Energy Consumption, by Final Energy Use, 2018



OIL AND GAS SPENDING ON RENEWABLES REMAINS LOW

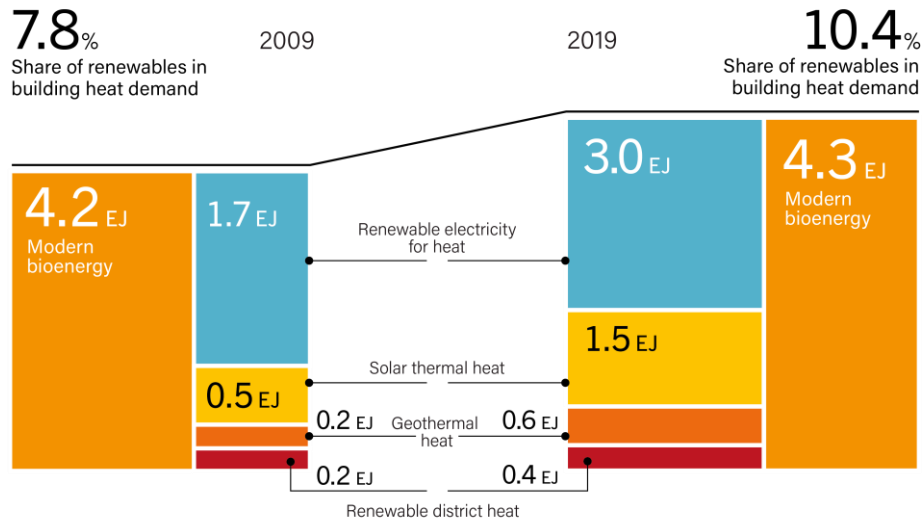
 **Spending on Renewable Energy versus Total Capital Expenditure**
Selected Oil and Gas Companies, 2020



Oil and gas companies do not explicitly report on renewable energy spending in their financial statements.

RENEWABLE HEAT IS GRADUALLY GROWING IN BUILDINGS

 **Renewable Energy Contribution to Heating in Buildings**
by Technology, 2009 and 2019



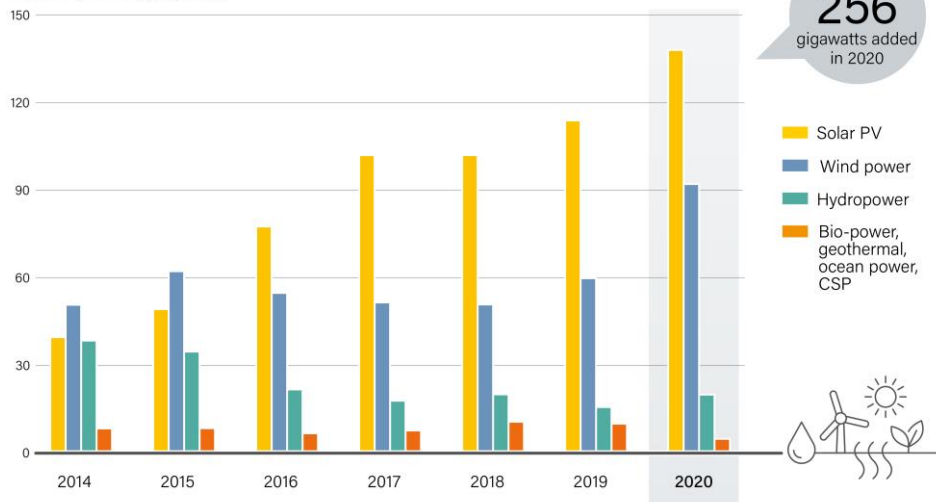
The share of renewable heating and cooling in buildings grew from 7.8% in 2009 to **more than 10% in 2019.**

Source: Based on IEA data.

MORE THAN 250 GW OF RENEWABLE POWER ADDED

 **Annual Additions of Renewable Power Capacity**
by Technology and Total, 2014-2020

Additions by technology (Gigawatts)



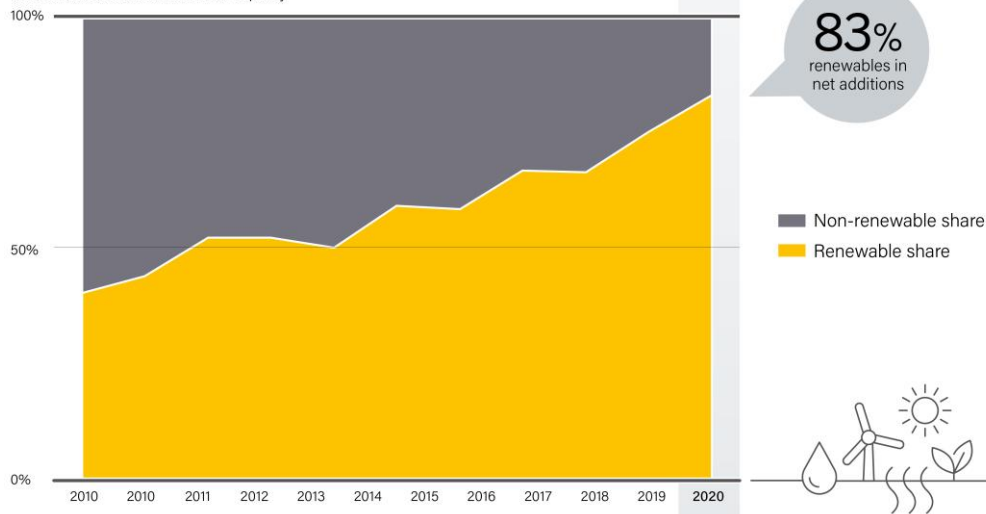
Note: Solar PV capacity data are provided in direct current (DC). Data are not comparable against technology contributions to electricity generation.

New renewable power capacity hit a **record increase** globally.

MORE RENEWABLE POWER ADDED THAN FOSSIL FUEL & NUCLEAR


 Shares of Net Annual Additions in Power Generating Capacity
2010-2020

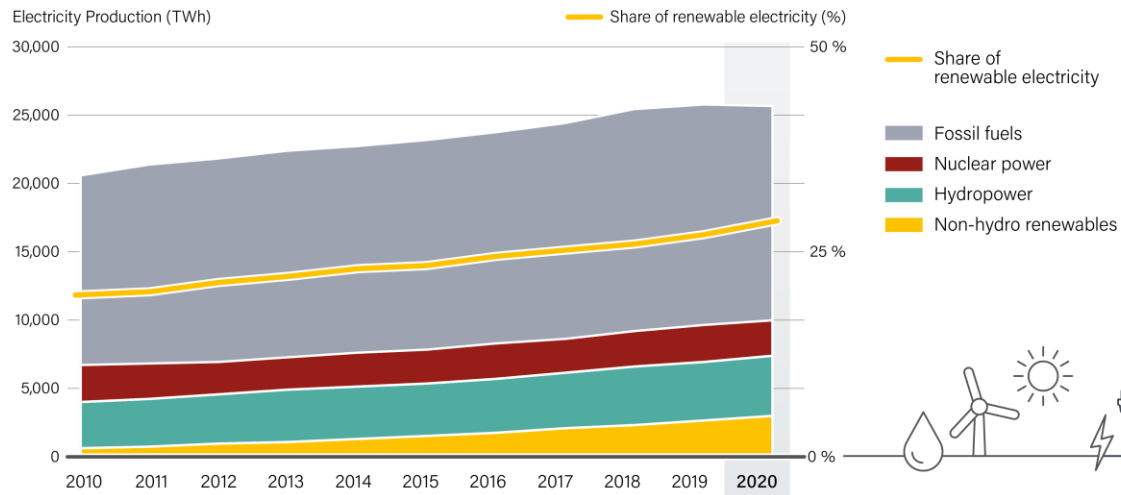
Share in Additions to Global Power Capacity



Renewable power generation capacity additions remain ahead for **the sixth year in a row.**

ALMOST 30% OF GLOBAL ELECTRICITY IS NOW RENEWABLE

 **Global Electricity Production by Source, and Share of Renewables**
2010-2020



Source: Ember.

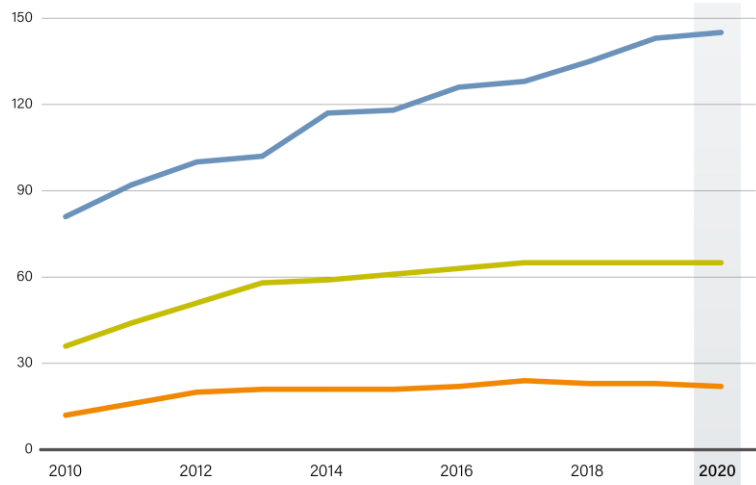
The share of renewables in electricity generation is **rising in many countries around the world.**

POWER SECTOR RECEIVES MOST POLICY ATTENTION

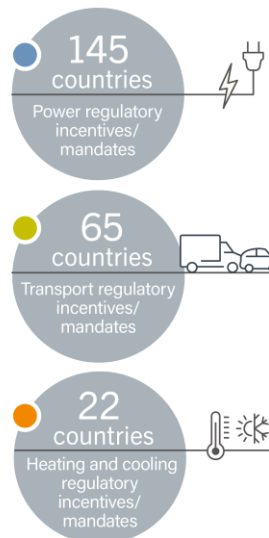


Number of Countries with Renewable Energy Regulatory Policies
2010–2020

Number of Countries



Source: REN21 Policy Database.

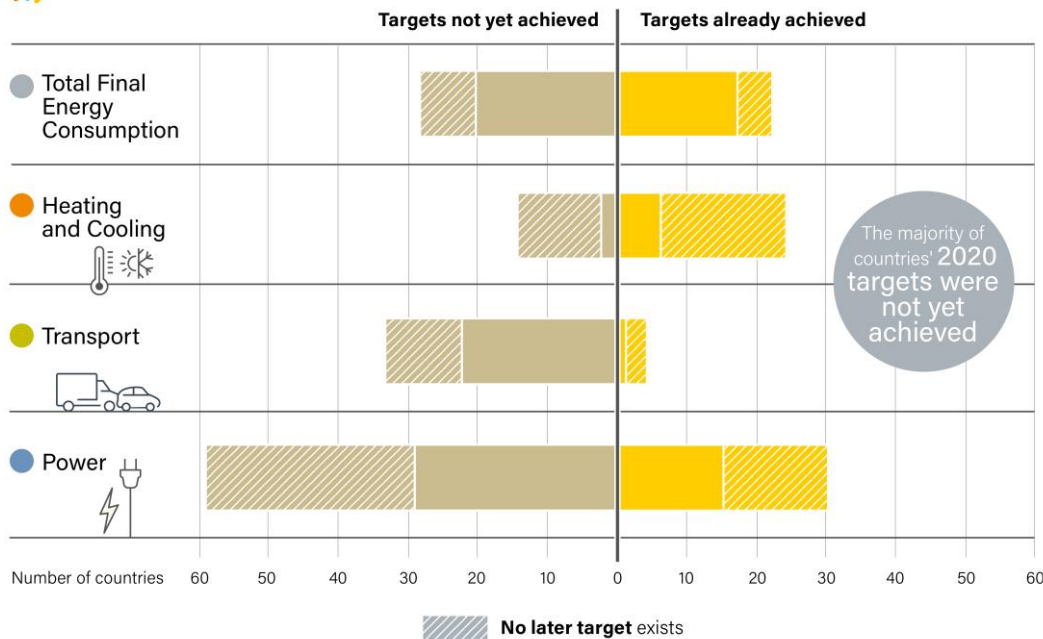


Policies and targets for **renewables in power** remain more ambitious and more numerous than those for other sectors.

TARGETS NOT ACHIEVED OR FOLLOWED UP



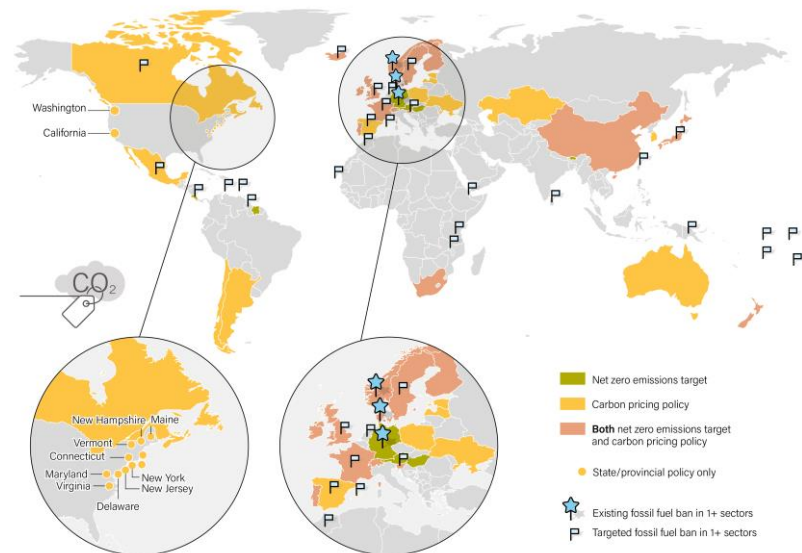
Status of Countries in Meeting Their 2020 Renewable Energy Targets and Setting New Ones



The number of countries with **targets** fell across all sectors.

CLIMATE POLICIES AROUND THE WORLD


 **Countries with Selected Climate Change Policies**
Early 2021

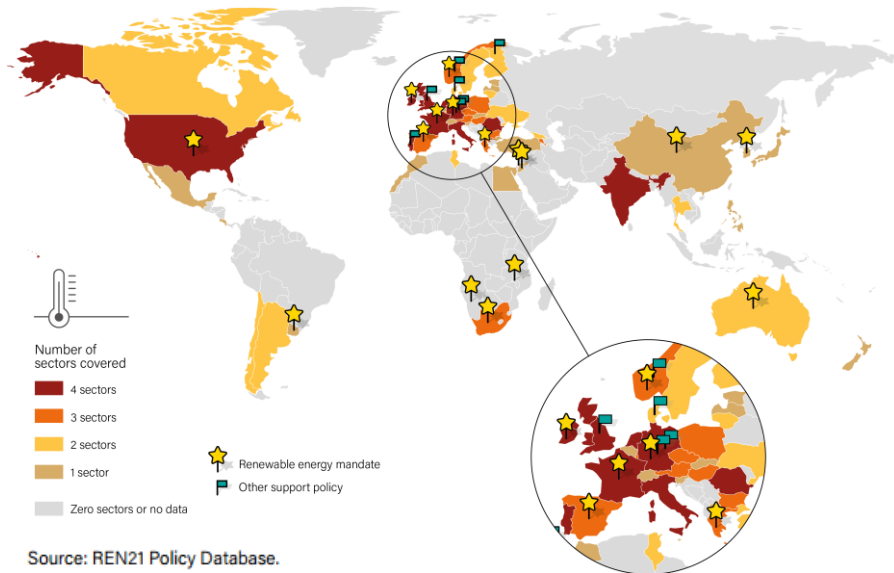


Source: Based on World Bank, Energy Climate Intelligence Unit, IEA Global Electric Vehicle Outlook and REN21 Policy Database.

Carbon pricing initiatives covered only around **22% of global greenhouse gas emissions** by early 2021.

POLICY SUPPORT LOW IN HEATING AND COOLING SECTOR


 **Sectoral Coverage of National Renewable Heating and Cooling Financial and Regulatory Policies**
as of End-2020

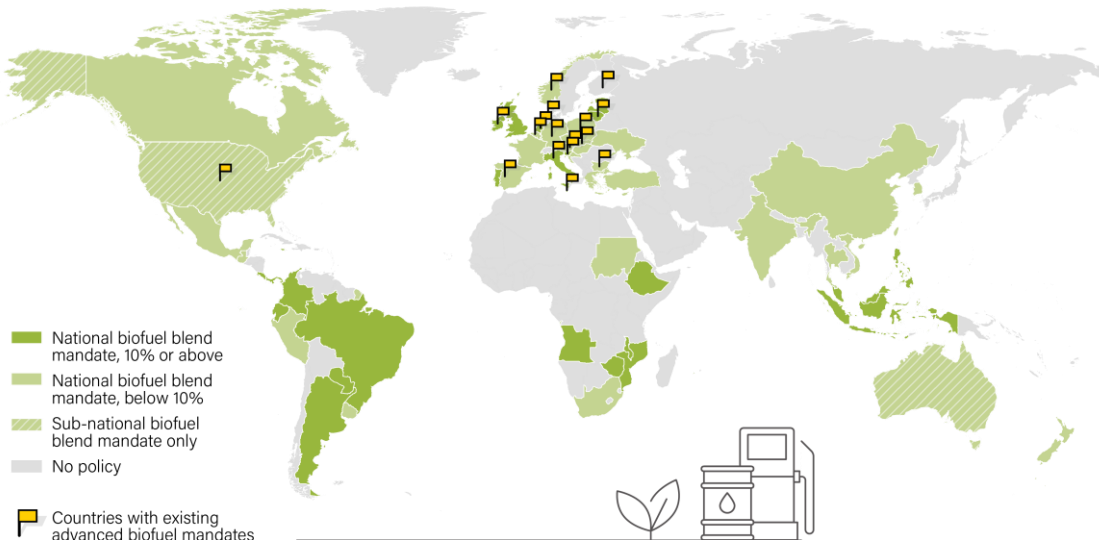


Source: REN21 Policy Database.

Only 10 countries had renewable heat support policies covering all sectors as of end-2020.

POLICY SUPPORT REMAINS STATIC FOR TRANSPORT


 **National and Sub-National Renewable Transport Mandates**
End-2020

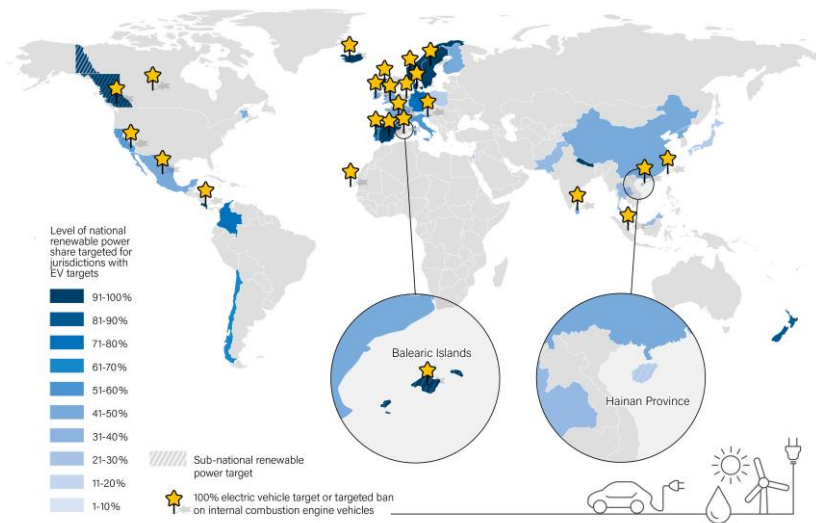


Source: REN21 Policy Database.

Biofuel blending mandates remain the most widely adopted renewable energy support policy in the transport sector.

ONLY SEVERAL COUNTRIES HAVE TARGETS FOR EVS AND RENEWABLES


 **Targets for Renewable Power and Electric Vehicles**
as of End-2020



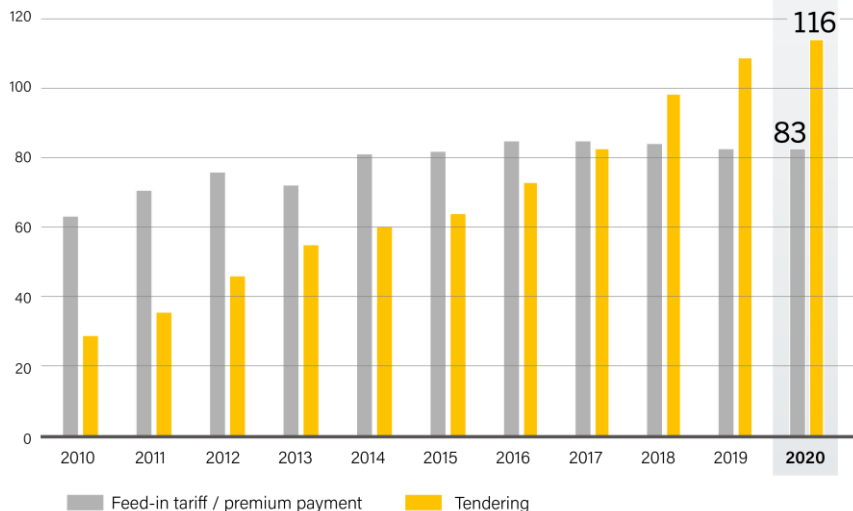
Source: REN21 Policy Database.

Only 8 countries with targeted bans on internal combustion engine vehicles have 100% renewable power targets

THE RISE OF RENEWABLE POWER AUCTIONS CONTINUED

 **Renewable Energy Feed-in Tariffs and Tenders**
2010-2020

Number of countries




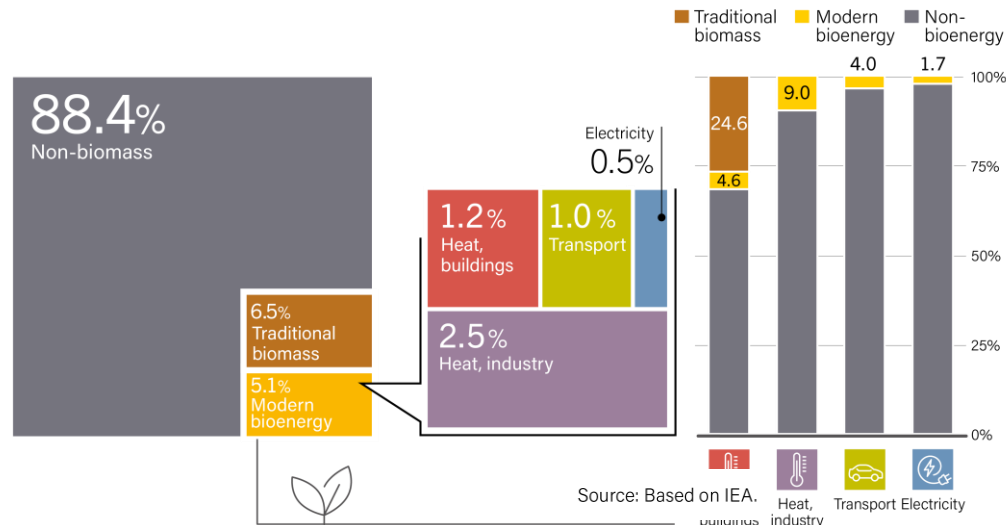
The shift towards competitive auctions and tenders continued in 2020.



116 countries had used auctions or tendering as of end-2020, up from 111 total countries in 2019.


BIOENERGY CONTRIBUTES MOST TO RENEWABLE SUPPLY

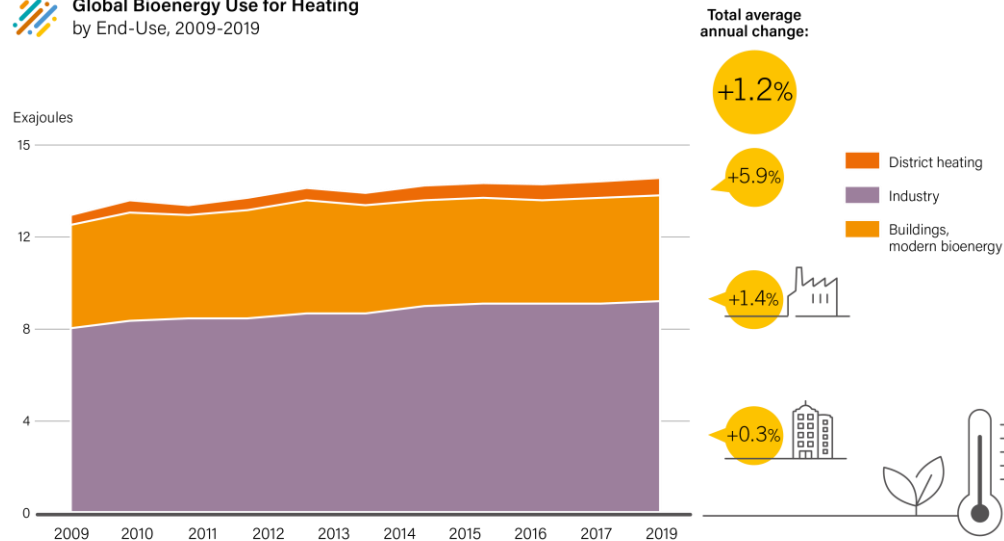
 **Estimated Shares of Bioenergy in Total Final Energy Consumption**
Overall and by End-Use Sector, 2019



Modern bioenergy supplies energy for heating, transport and electricity end-uses.

USE OF MODERN BIOENERGY IS INCREASING SLOWLY

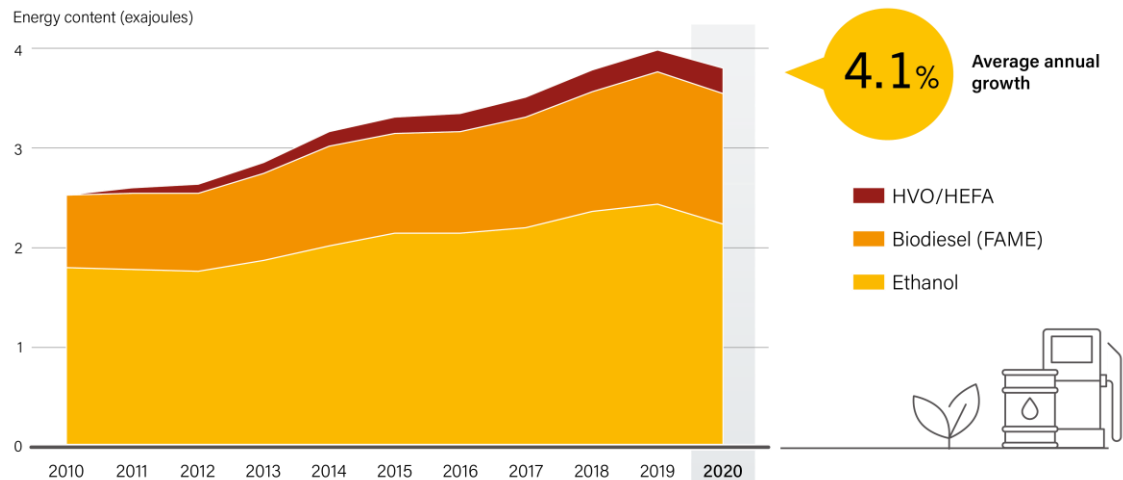
 **Global Bioenergy Use for Heating**
by End-Use, 2009-2019



Bio-heat is used in **buildings and industry**, and often supplied by district energy networks.

BIOFUELS PRODUCTION DECREASED IN 2020

 **Global Production of Ethanol, Biodiesel and HVO/HEFA Fuel**
by Energy Content, 2010-2020

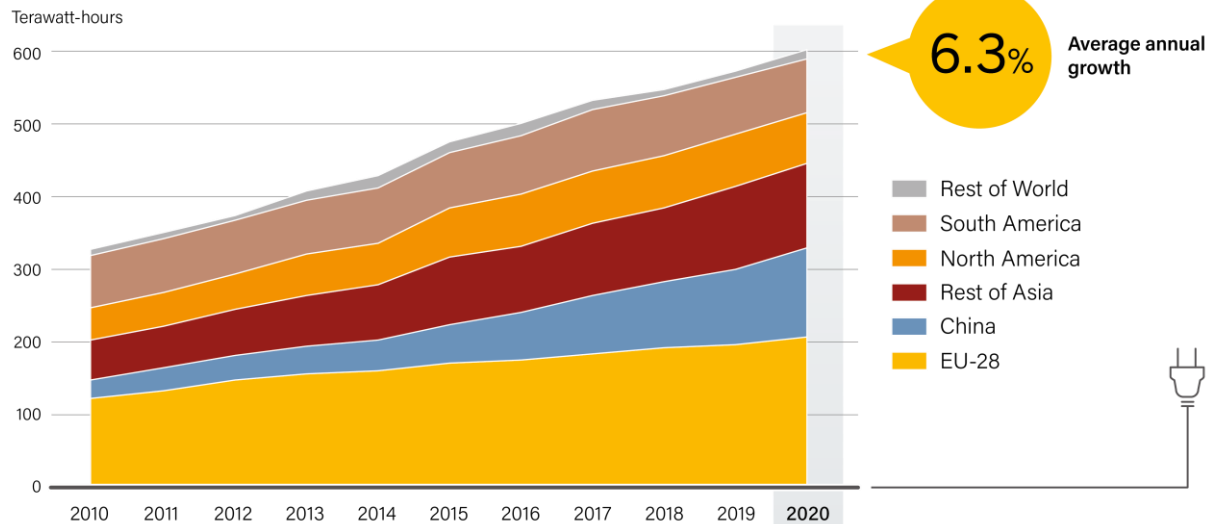


Note: HVO = hydrotreated vegetable oil; HEFA = hydrotreated esters and fatty acids; FAME = fatty acid methyl esters

The **United States** remained the leading biofuels producer, with a 51% share, despite declines in US production of both ethanol and biodiesel.


BIOELECTRICITY PRODUCTION HAS GROWN RAPIDLY

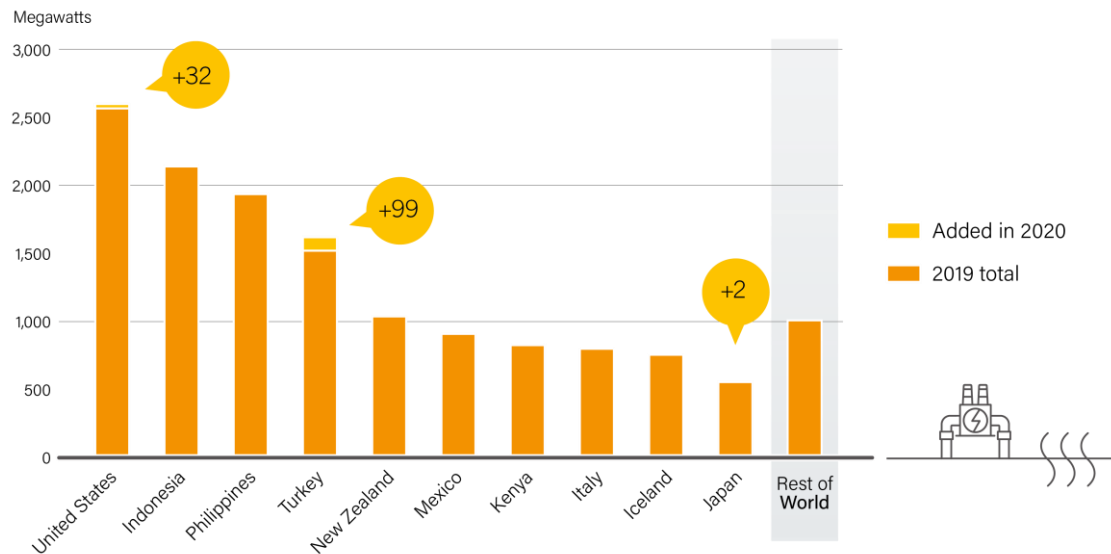
 **Global Bioelectricity Generation**
by Region, 2010-2020



Bioelectricity generation increased **6.4% from 2019**, with the majority of gains in China.


NEW GEOTHERMAL POWER INSTALLATIONS IN 2020

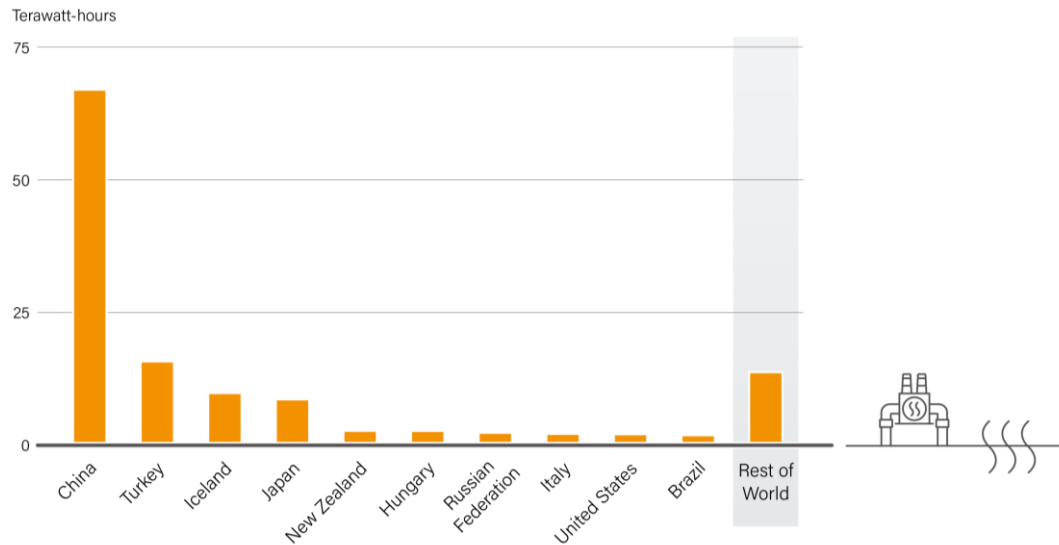
 **Geothermal Power Capacity and Additions**
Top 10 Countries and Rest of World, 2020



USA and Indonesia have been the most active geothermal power markets in recent years.


CHINA LED GEOTHERMAL DIRECT USE IN 2020

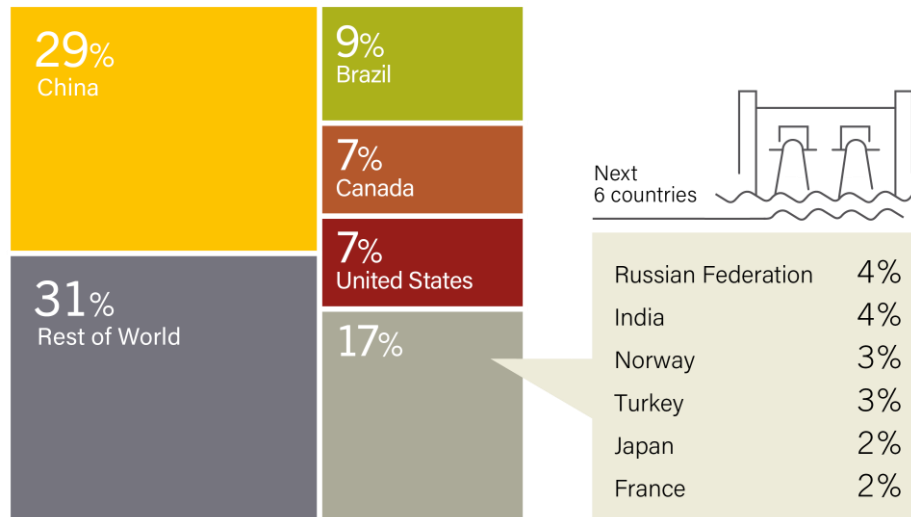
 **Geothermal Direct Use, Estimates for Top 10 Countries and Rest of World, 2020**



China, Turkey, Iceland and Japan together represented roughly **75% of the global total** geothermal direct use in 2020.

HYDROPOWER CAPACITY INCREASED 24% IN 2020

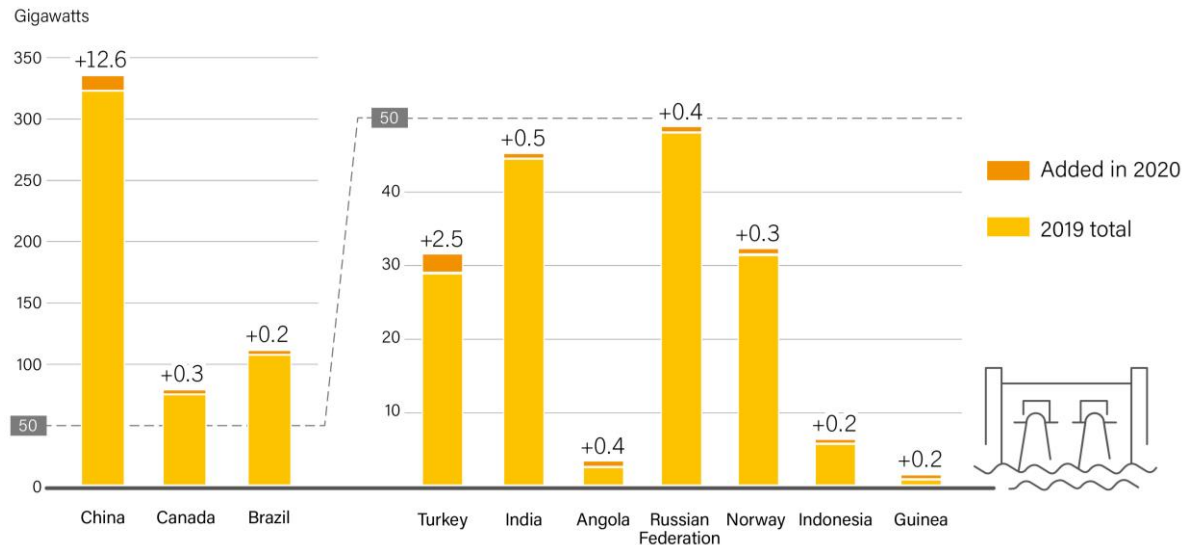
 **Hydropower Global Capacity, Shares of Top 10 Countries**
and Rest of World, 2020



An estimated **19.4 GW** was added in 2020, representing a 24% increase in capacity additions from 2019.


HYDROPOWER CAPACITY ADDITIONS DRIVEN BY CHINA

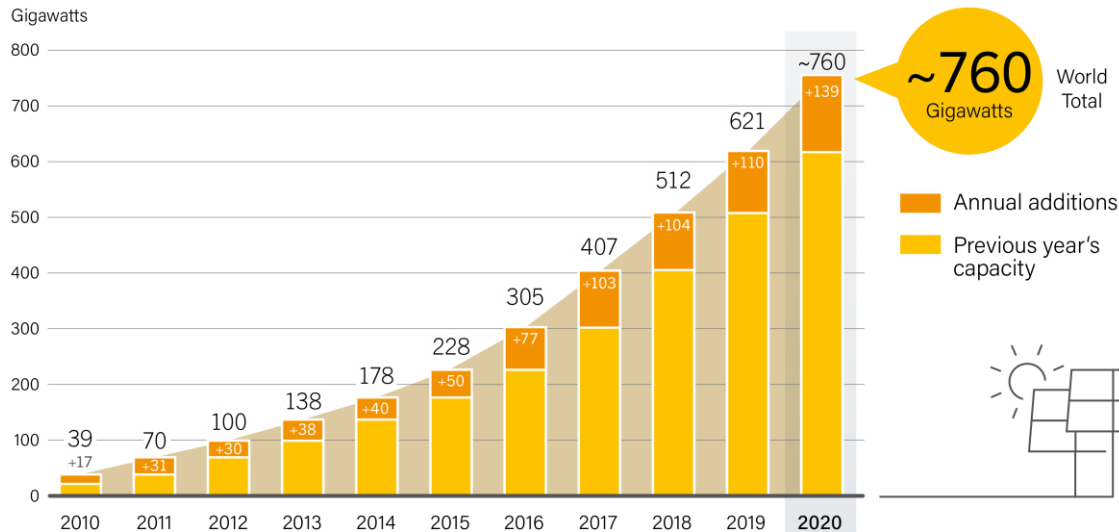
 **Hydropower Capacity and Additions**
Top 10 Countries for Capacity Added, 2020



China installed the most new capacity in 2020, followed by Turkey, India, Angola and the Russian Federation.

SOLAR PV CAPACITY ADDITIONS REACHED 139 GW


 **Solar PV Global Capacity and Annual Additions**
2010-2020

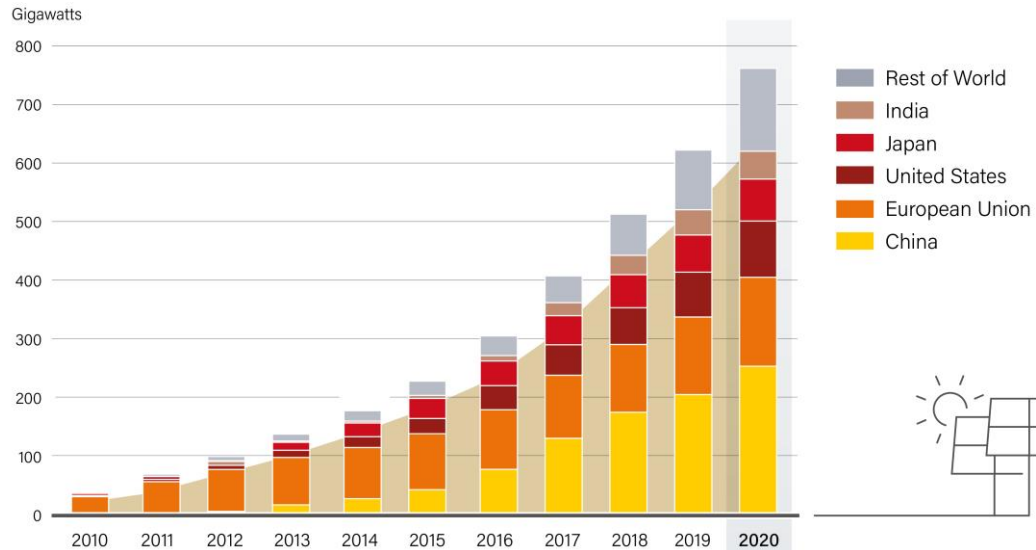


Source: Becquerel Institute and IEA PVPS.

By the end of 2020, at least **15 countries** had enough capacity in operation to meet **at least 5% of their** electricity demand with solar PV.

SOLAR PV SPREADING TO NEW PARTS OF THE WORLD

 **Solar PV Global Capacity, by Country and Region**
2010-2020



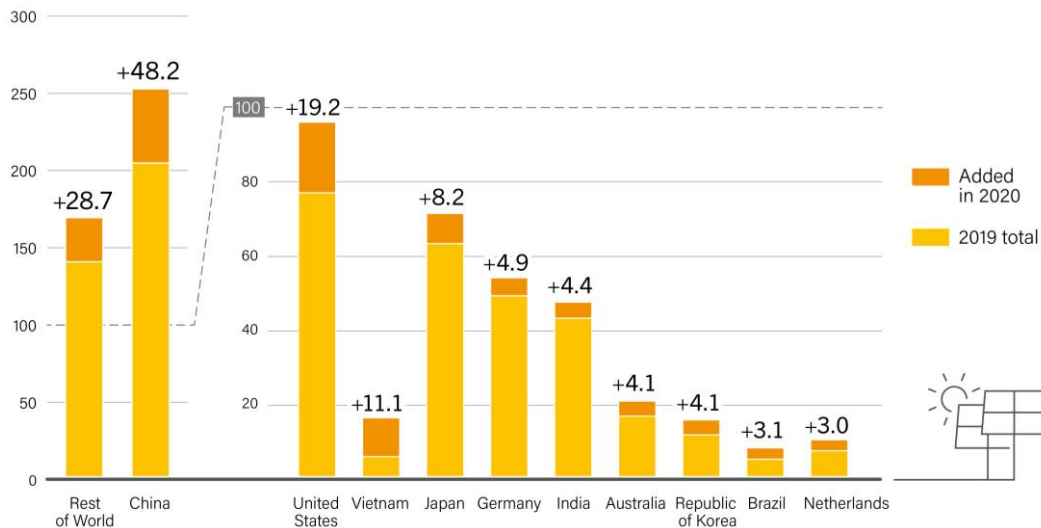
For the eighth consecutive year, Asia eclipsed all other regions for new installations, **accounting for almost 60% of global additions.**

CHINA REMAINS LEADER IN SOLAR PV



Solar PV Capacity and Additions
Top 10 Countries for Capacity Added, 2020

Gigawatts



Following two years of decline, **China's market increased 60%** – driven largely by pending changes to the country's FIT structure

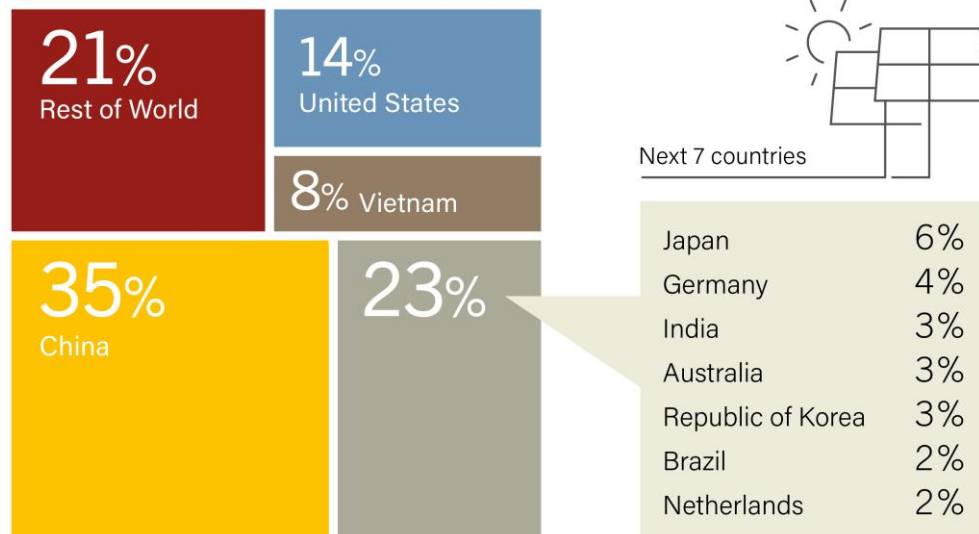


ASIA LEADS SOLAR PV MARKETS YET AGAIN




Solar PV Global Capacity Additions

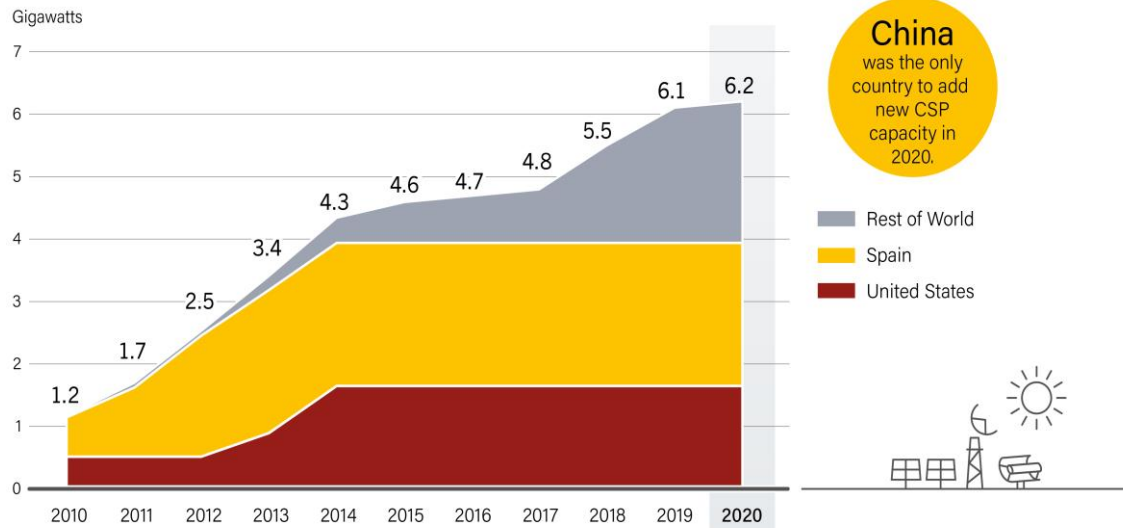
Shares of Top 10 Countries and Rest of World, 2020



Asia accounted for almost 60% of global additions, despite declines in the region's top three markets (China, India and Japan).

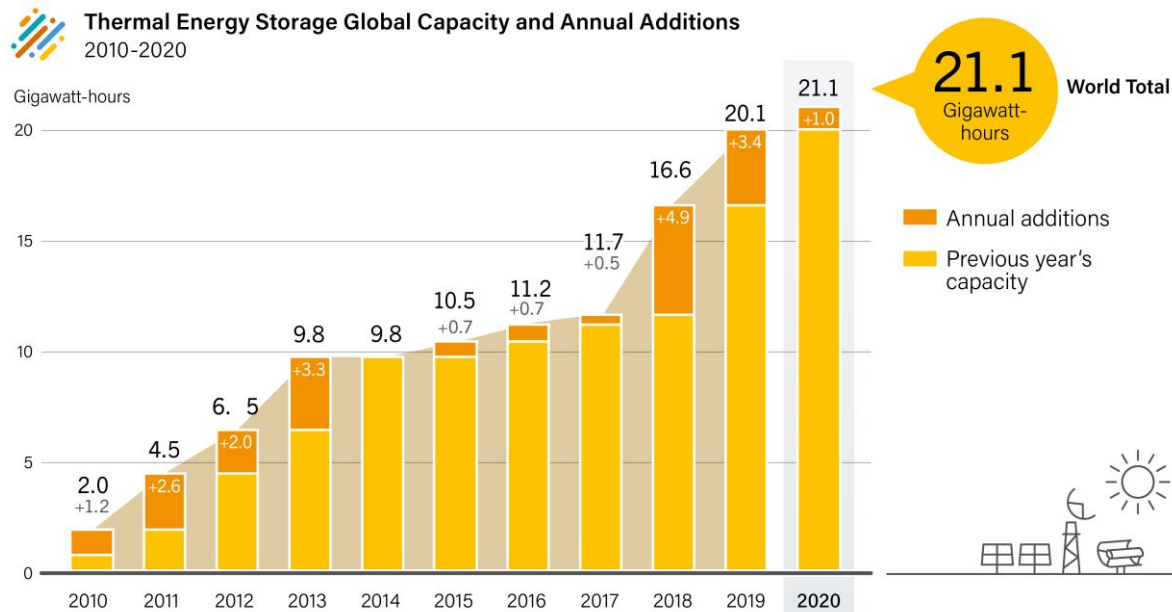
NEW CSP ADDITIONS EXCLUSIVELY IN CHINA

 **Concentrating Solar Thermal Power Global Capacity**
by Country and Region, 2010-2020



Global CSP capacity grew **1.6% in 2020**, with a single 100 MW project coming online in China.

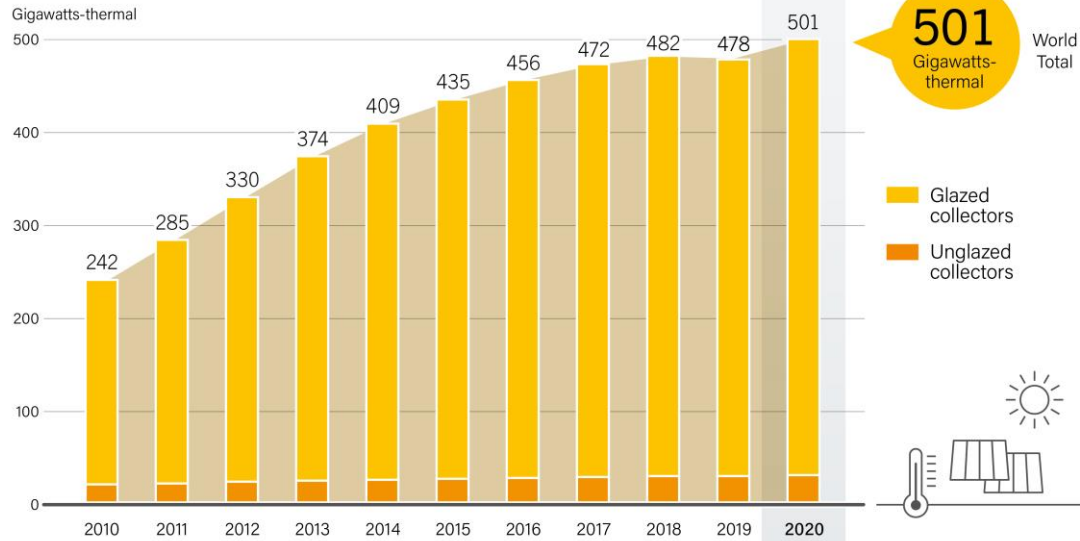
NEARLY ALL CSP PLANTS USE THERMAL ENERGY STORAGE



22 of the 24 CSP plants completed globally since the end of 2014 have incorporated thermal energy storage.

INSTALLED SOLAR WATER HEATING CAPACITY INCREASED

 **Solar Water Heating Collectors Global Capacity**
2010-2020

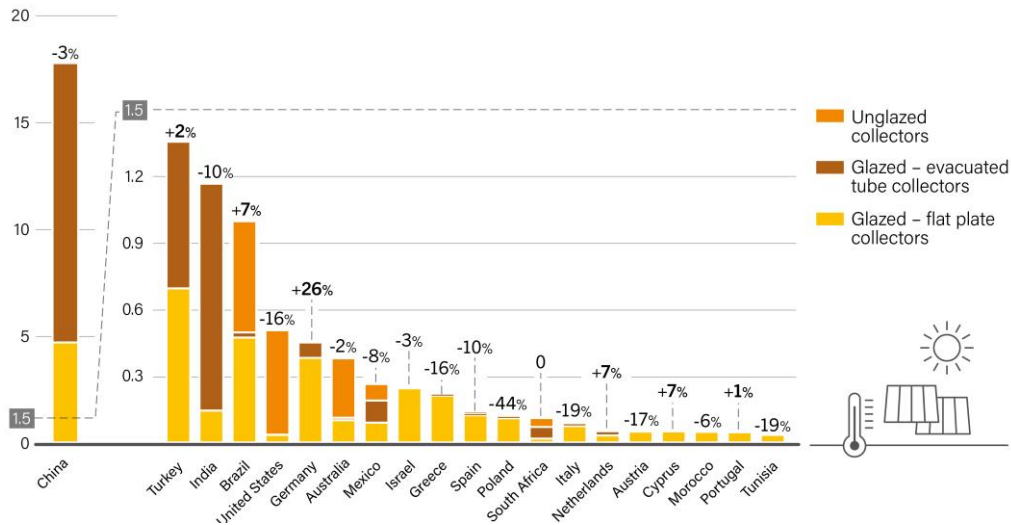


Global operating solar thermal capacity **increased 5%** from 2019.

CHINA DOMINATED SOLAR WATER HEATING COLLECTOR SALES

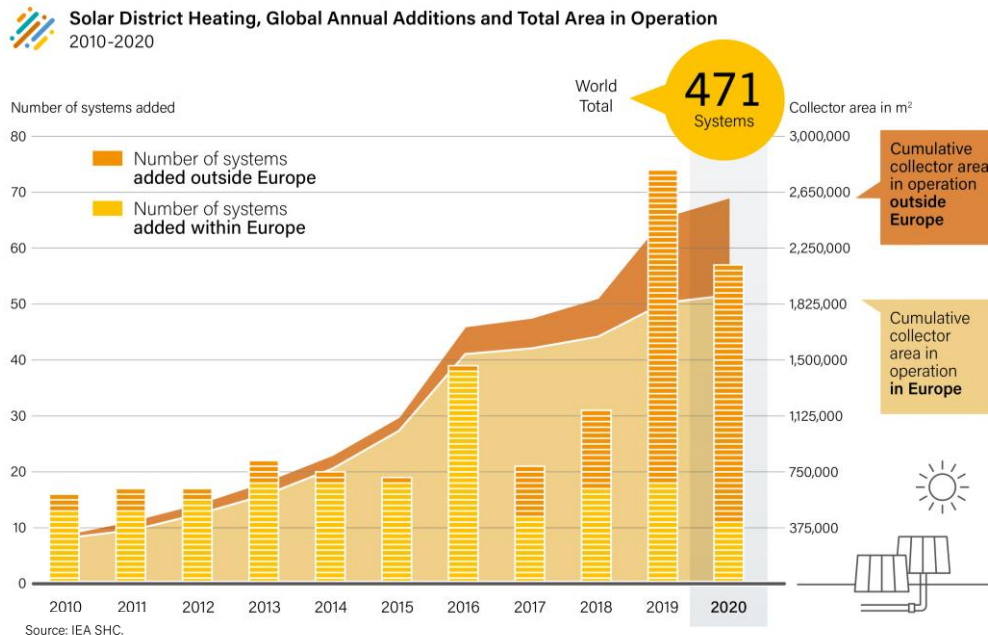
 **Solar Water Heating Collector Additions**
Top 20 Countries for Capacity Added, 2020

Gigawatts-thermal



China accounted for 71% of new global sales in solar water heating collectors, followed by Turkey and India.

LARGE INCREASE IN SOLAR DISTRICT HEATING SYSTEMS

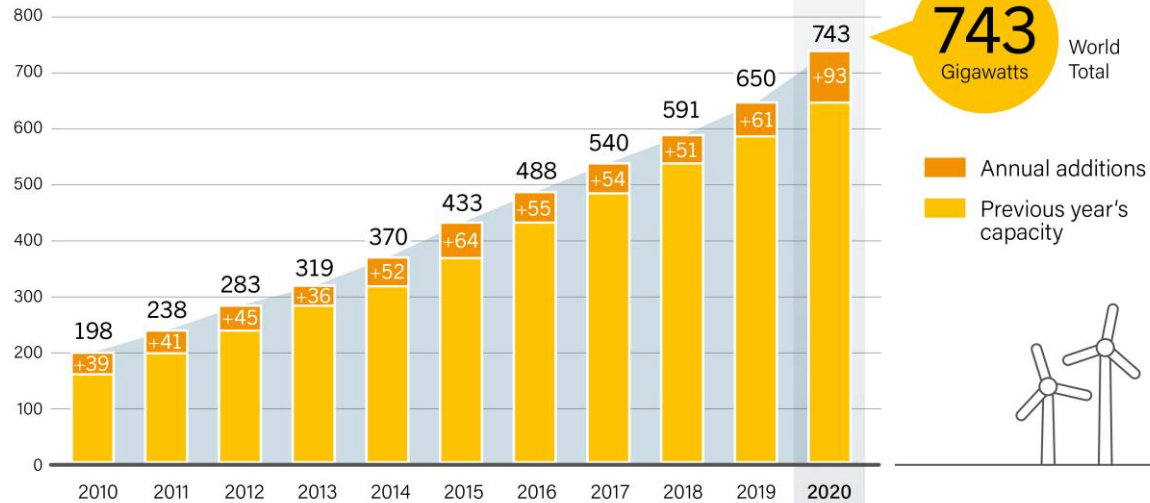


Leading markets for solar district heating were **Brazil, China and Turkey.**

RECORD-BREAKING WIND POWER CAPACITY ADDED

 **Wind Power Global Capacity and Annual Additions**
2010-2020


Gigawatts

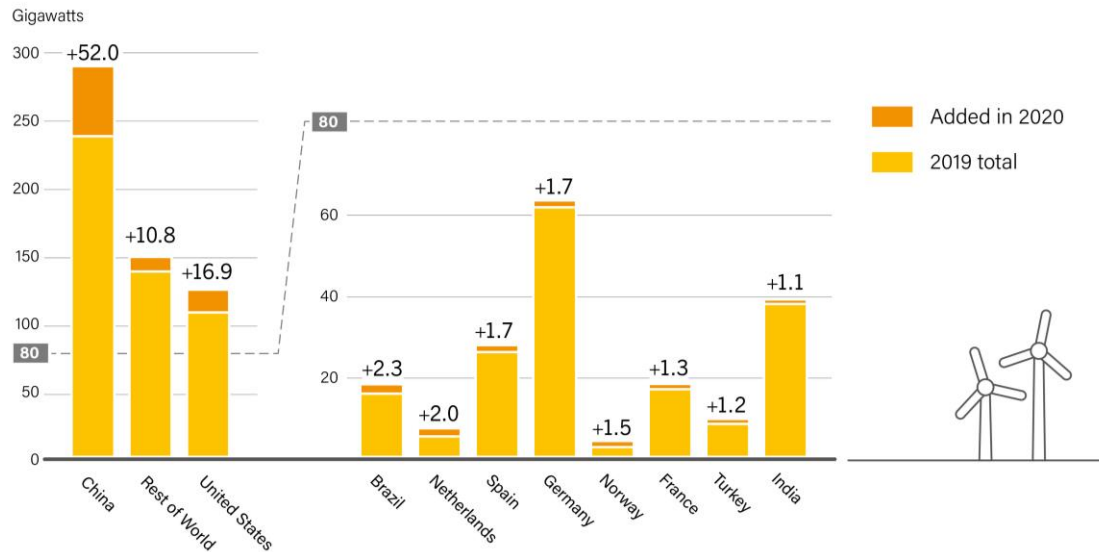


Source: GWEC.

At 93 GW added, the global wind power market was **45% higher** than its previous high in 2015.

MORE THAN HALF OF NEW WIND POWER CAPACITY IN ASIA

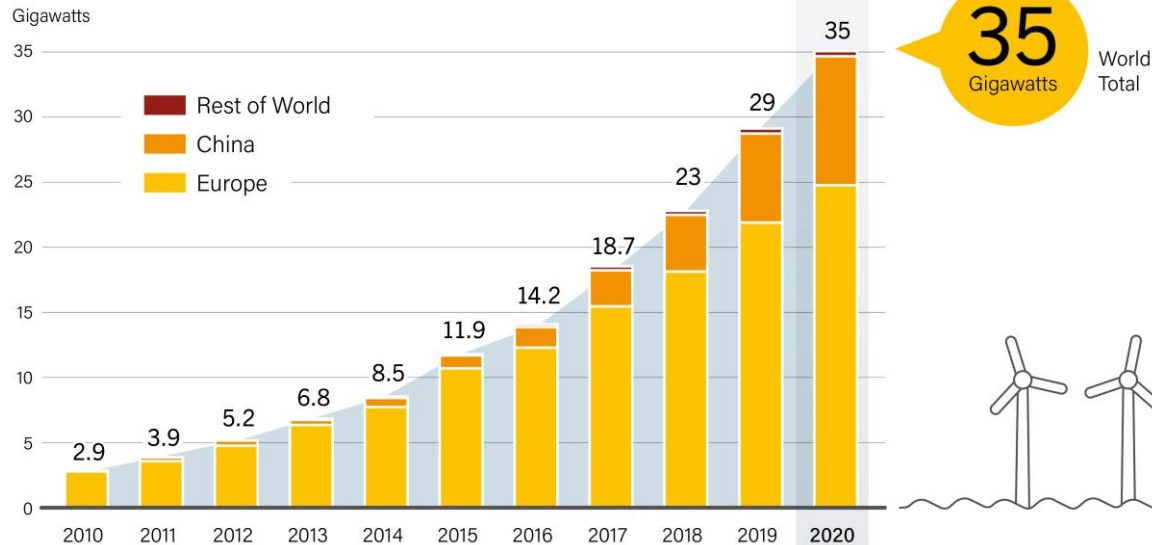
 **Wind Power Capacity and Additions**
Top 10 Countries for Capacity Added, 2020



China had its **biggest year yet for new installations at 52 GW**, doubling its capacity added in 2019.

OFFSHORE WIND MARKET KEPT GROWING

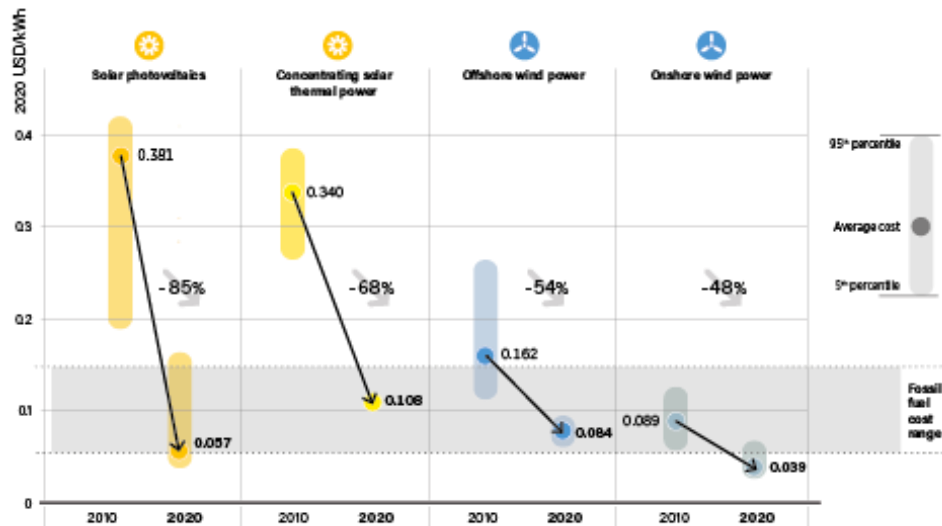
 **Wind Power Offshore Global Capacity**
by Region, 2010-2020



Offshore wind power accounted for a record **6.5% of wind power additions** in 2020, down from 10% in 2019.

RENEWABLE POWER COSTS KEEP FALLING

 Global Levelised Costs of Electricity from Newly Commissioned Utility-scale Renewable Power Generation Technologies, 2010 and 2020

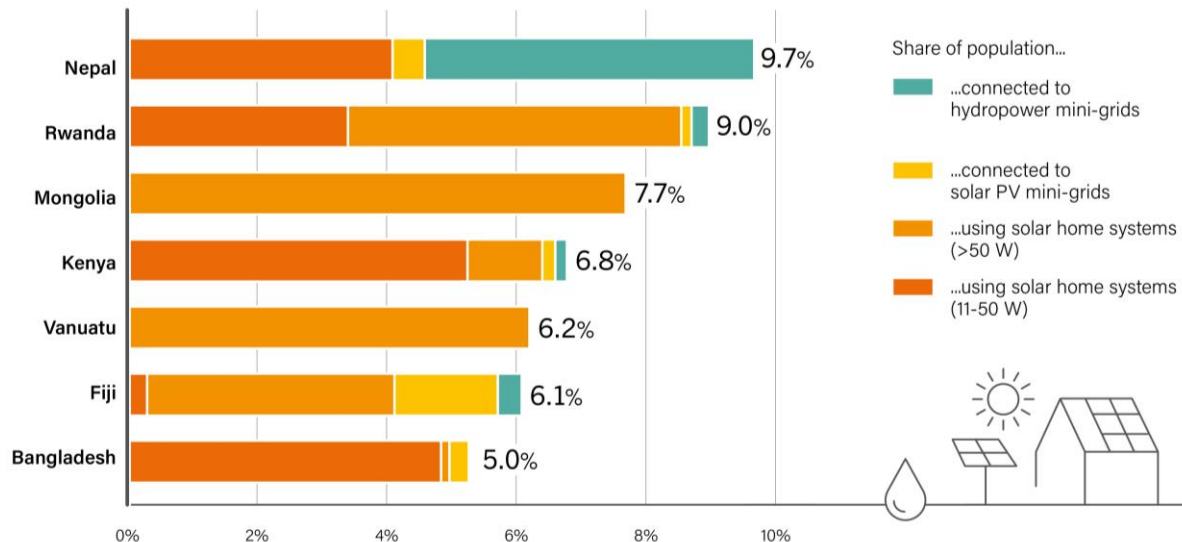


Source: IRENA.

Costs for solar PV and CSP as well as onshore and offshore wind have **fallen sharply over the past decade.**


DISTRIBUTED RENEWABLES: KEY SOLUTIONS TO PROVIDE ENERGY ACCESS

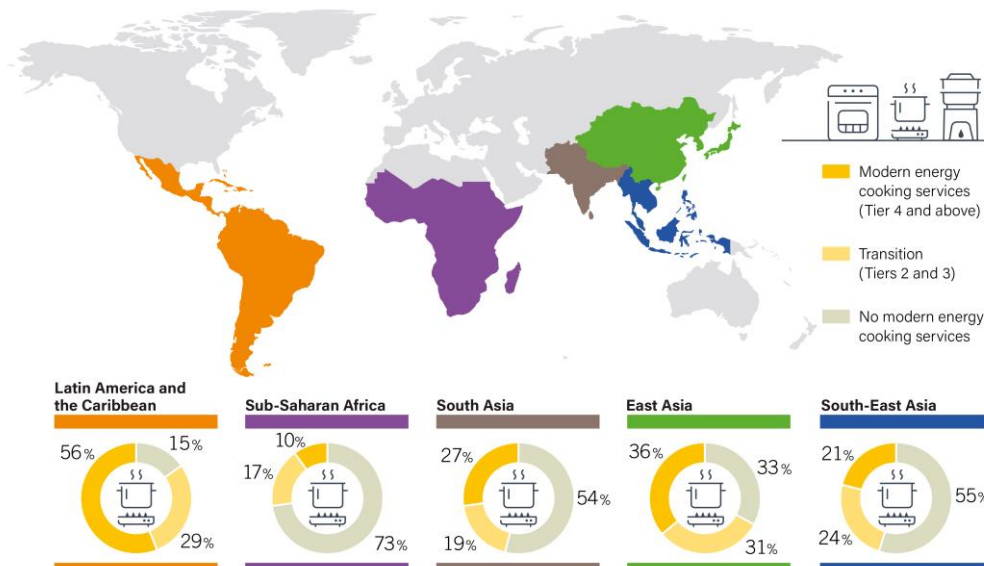
 **Top 7 Countries with the Highest Electricity Access Rate from Distributed Renewable Energy Solutions**
2019



Distributed renewables for energy access **provide electricity to between 5% and 10% of the population** in several developing countries.

PROGRESS IN CLEAN COOKING REMAINS SLOW

 Population with Access to Modern Energy Cooking Services
by Region, 2020

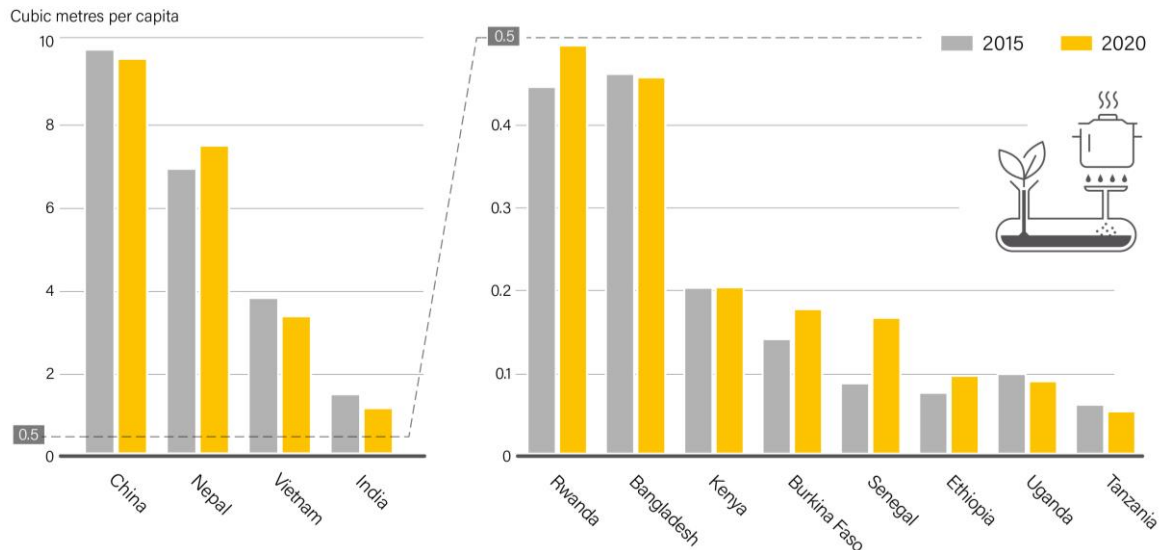


Source: ESMAP.

Despite recent progress, China and India **still** account for nearly half of the global population without access.

BIOGAS FOR COOKING EXPANDS IN NEW MARKETS

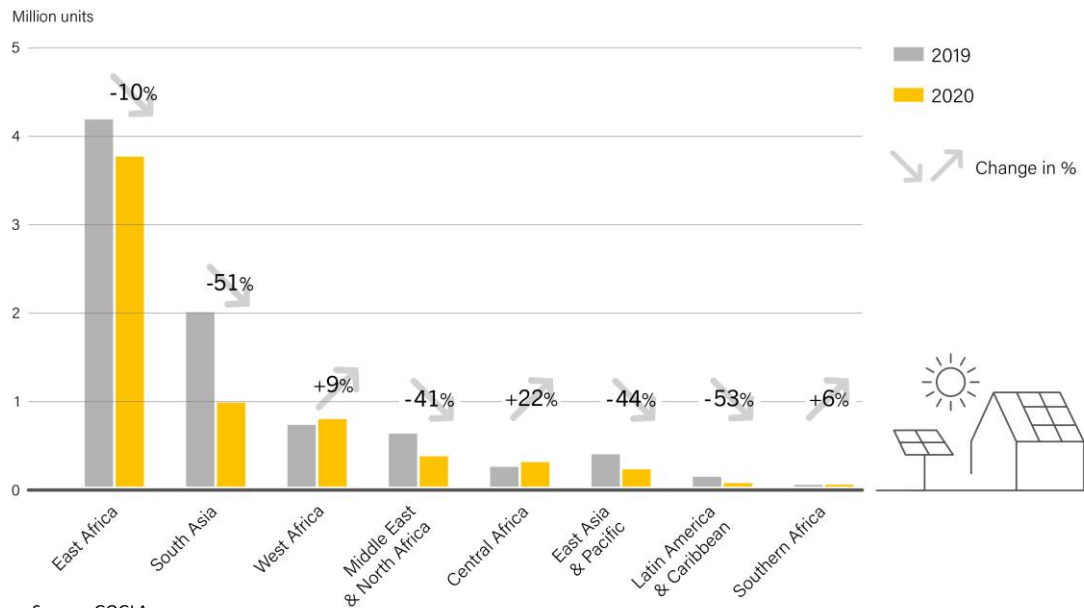

Per Capita Production of Biogas for Cooking
 Selected Countries, 2015 and 2020



The bulk of the biogas production per capita (99.7%) occurs in Asia.

OFF-GRID SALES DISRUPTED DUE TO COVID-19

 **Sales Volumes of Affiliated Off-Grid Solar Systems**
Selected Regions, 2019 and 2020

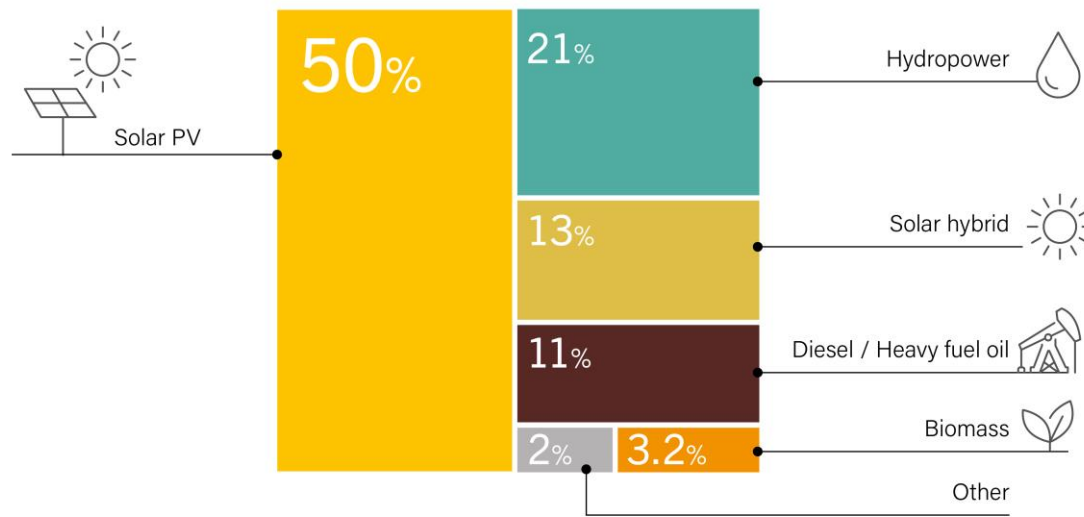


Source: GOGLA.

Sales of off-grid solar systems **fell 22%** compared to 2019, largely due to lockdown-related disruptions.

RENEWABLES-BASED MINI-GRIDS EXPANDING IN ENERGY ACCESS

 Shares of Installed Mini-Grids by Technology
March 2020

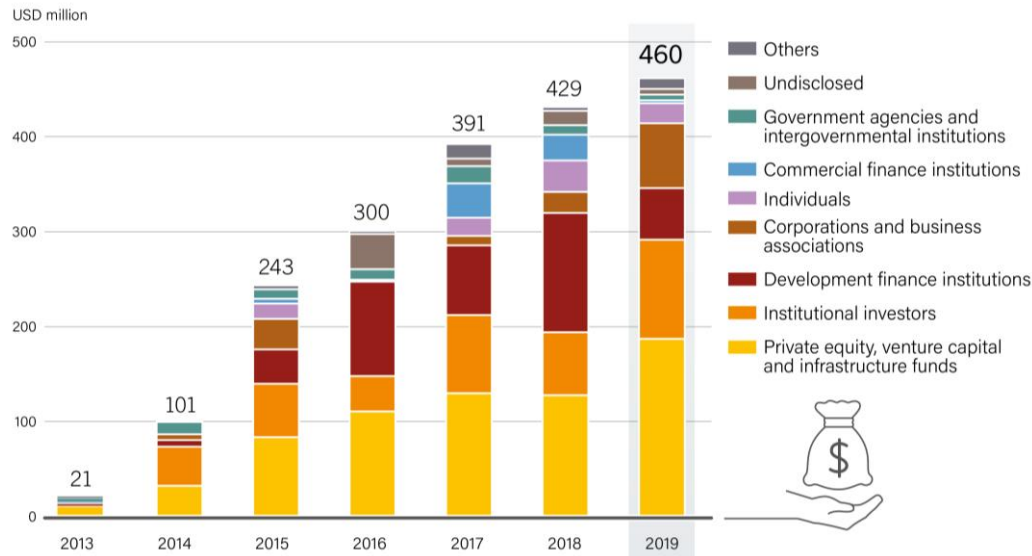


Source: Mini-Grids Partnership.

Solar PV has been the fastest growing mini-grid technology, incorporated **into 55% of mini-grids** in 2019 compared to only 10% in 2009.

TYPE OF INVESTORS IN DREA MARKETS CONTINUED TO SHIFT

 **Annual Commitments to Off-Grid Renewable Energy**
by Type of Investor, 2013-2019

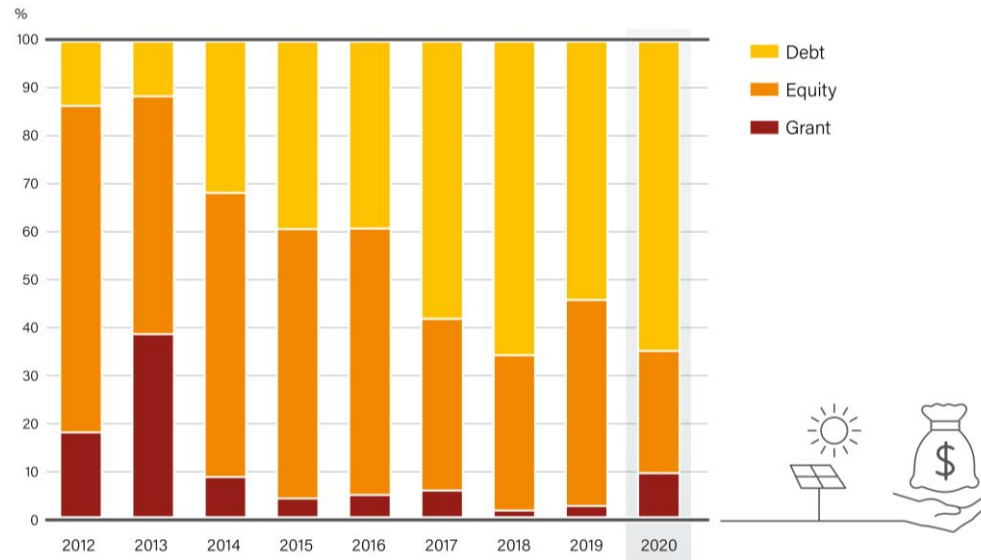


Source: IRENA and CPI.

Corporations **more than tripled** their investment during this period, from USD 22 million in 2018 to USD 68 million in 2019.

EQUITY FINANCING FELL IN OFF-GRID SOLAR SECTOR

 **Shares of Off-Grid Solar Financing**
by Type of Funding, 2012-2020



Source: GOGLA.

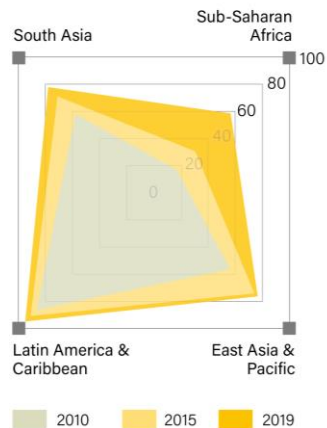
**Equity funding fell 46%,
but this was
compensated by an
increase in both debt
and grant funding.**



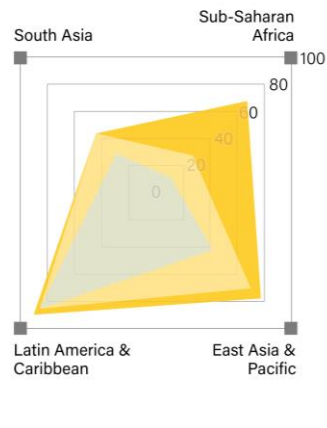
MORE POLICIES FOR RENEWABLES-BASED ELECTRICITY ACCESS

 **Key Improvements in RISE Indicators**
Selected Regions, 2010, 2015 and 2019

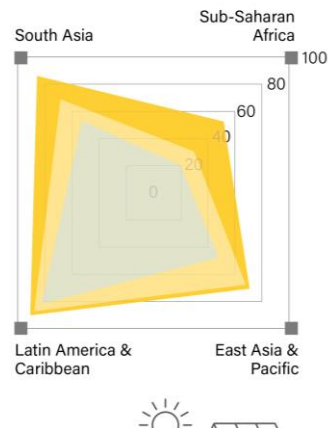
**Inclusion of off-grid solutions
in electricity plan**



Framework for mini-grids



**Framework for stand-alone
solutions**



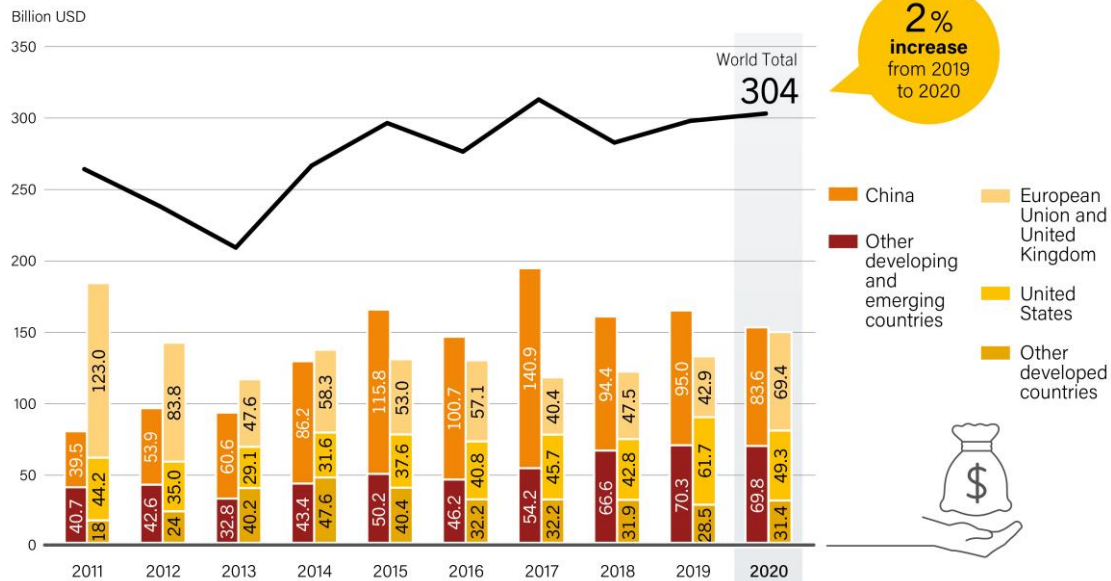
Source: ESMAP.



By 2019, policies to promote mini-grids and stand-alone renewables **had been implemented in many countries.**

INVESTMENT IN RENEWABLES INCREASED SLIGHTLY

 **Global Investment in Renewable Power Capacity**
Developed, Emerging and Developing Countries, 2010-2020

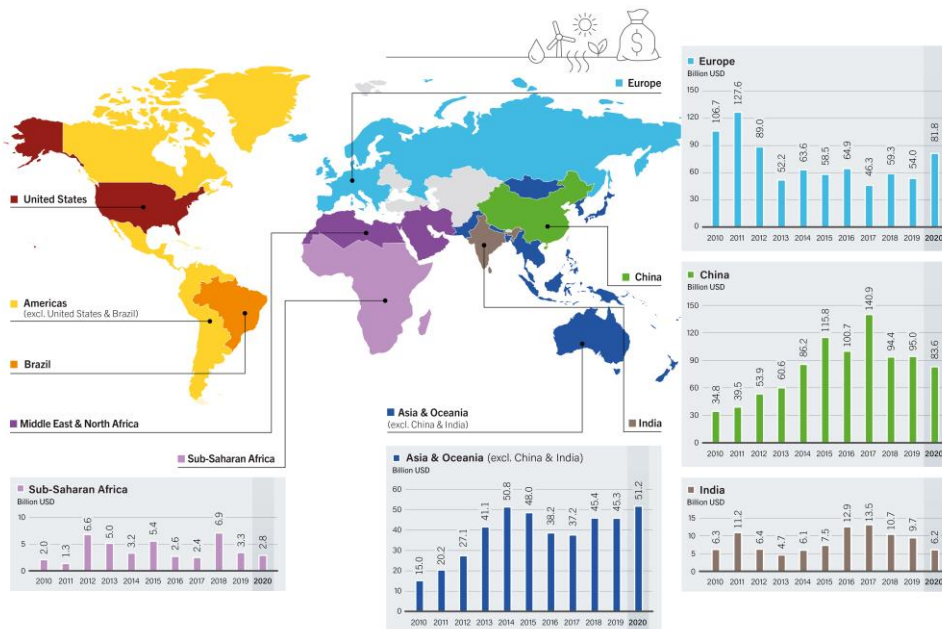
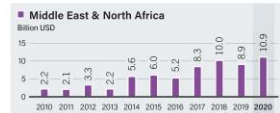
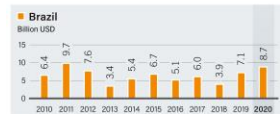
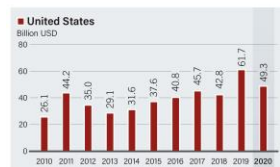


Source: BloombergNEF.

To reach global climate and sustainable development goals, annual **investment in renewables must at least triple by 2030.**

DEVELOPING COUNTRIES INVESTED MORE THAN DEVELOPED ONES

Global Investment in Renewable Energy Capacity
by Country and Region, 2010-2020

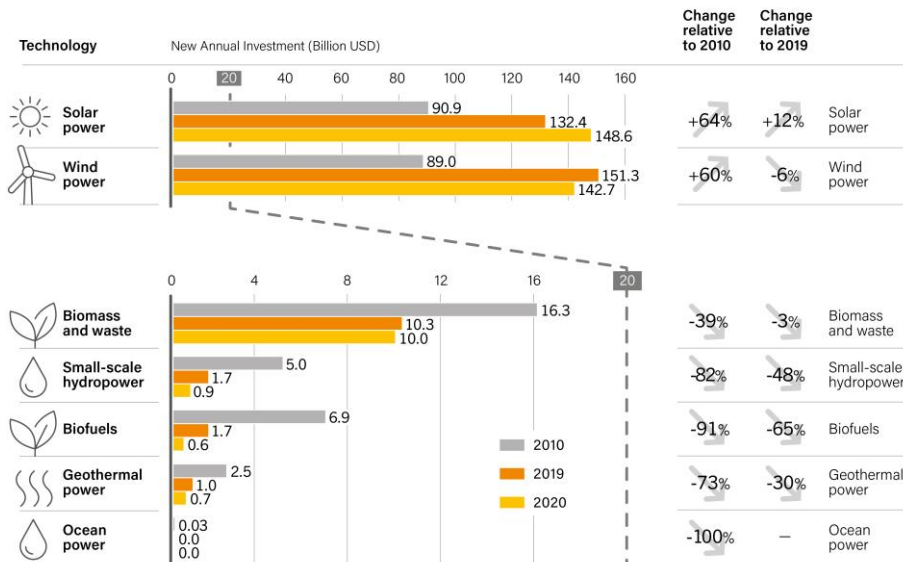


Source: BloombergNEF.

Investments for the year rose **13%** in developed countries and fell **7%** in developing and emerging countries.

INVESTMENT GREW ONLY IN SOLAR PV TECHNOLOGY IN 2020

 **Global Investment in Renewable Energy Capacity**
by Technology, 2010, 2019 and 2020

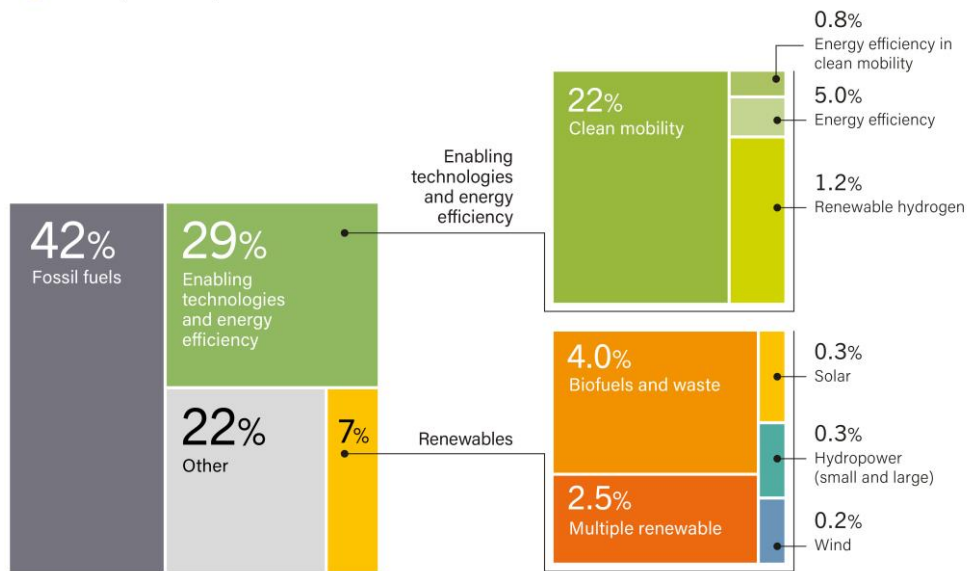


Source: BloombergNEF.

Solar power represented **nearly half of global renewable energy capacity investment in 2020** - up 12% from 2019.

6X MORE RECOVERY FUNDING FOR FOSSIL FUELS

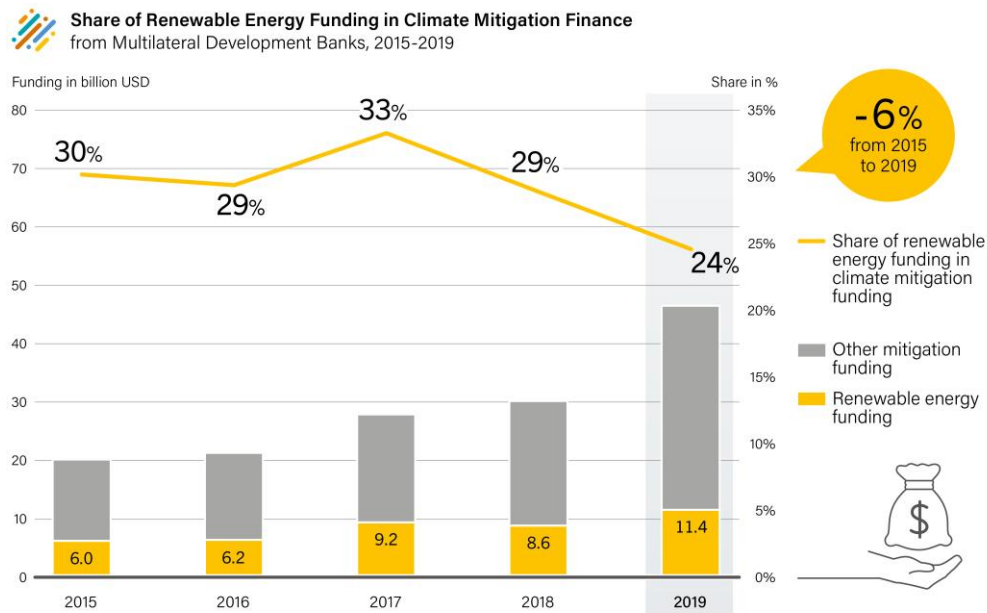
 **Energy Investments in COVID-19 Recovery Packages of 31 Countries**
January 2020 to April 2021



Source: EnergyPolicyTracker.org.

As of early 2021, **only 7%** of COVID recovery spending was allocated to renewables.

INCREASING MDB INVESTMENTS IN RENEWABLES

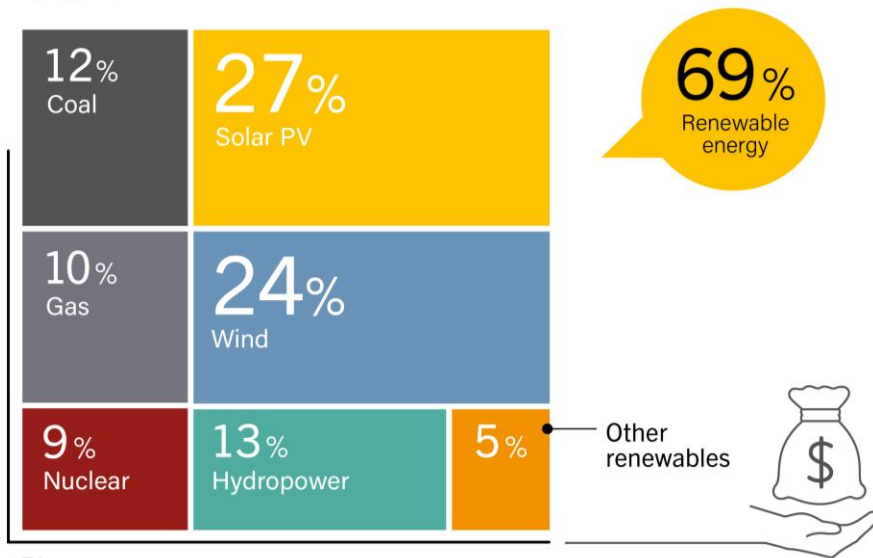


Multilateral development bank investments in renewable energy projects **increased 89%** between 2015 and 2019.

2X MORE INVESTMENT IN NEW RENEWABLE POWER CAPACITY THAN FOSSIL FUEL



Estimated Global Investment in New Power Capacity
by Type, 2020



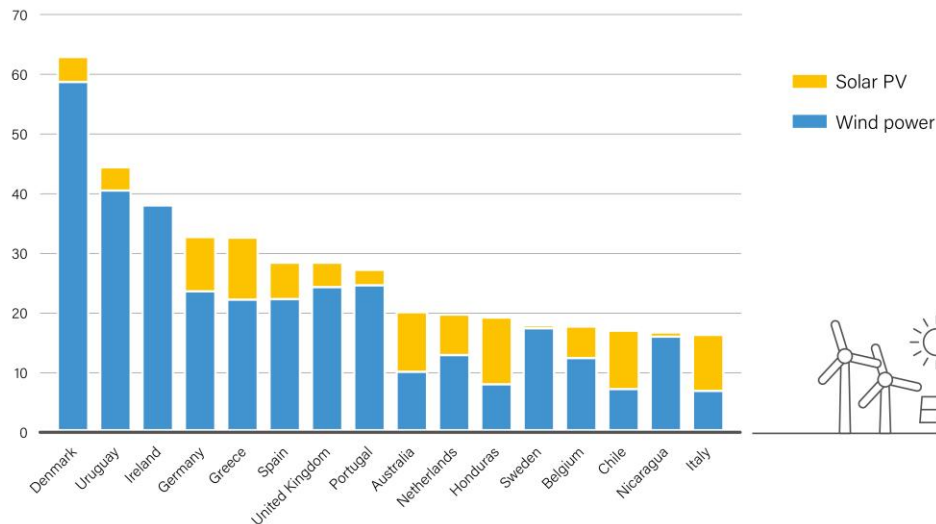
Source: IEA.

Almost **70% of the global investment in new renewable power and fuel capacity went to renewable power plants**, while only 31% went to coal, gas and nuclear plants.

VARIABLE RENEWABLE ELECTRICITY CONTINUED TO RISE

 **Share of Electricity Generation from Variable Renewable Energy**
Top Countries, 2020

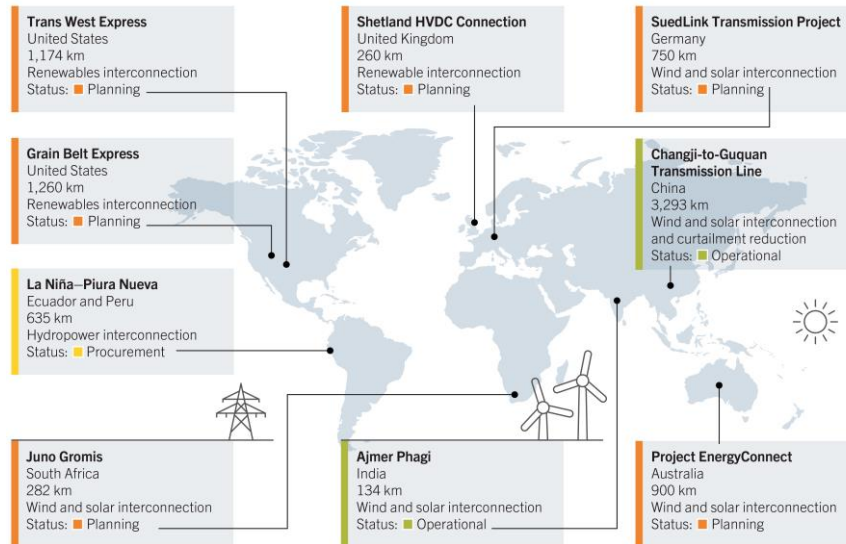
Share of total generation (%)



At least nine countries produced more than 20% of their electricity generation from VRE in 2020

MAJOR TRANSMISSION PROJECTS ADVANCED IN 2020

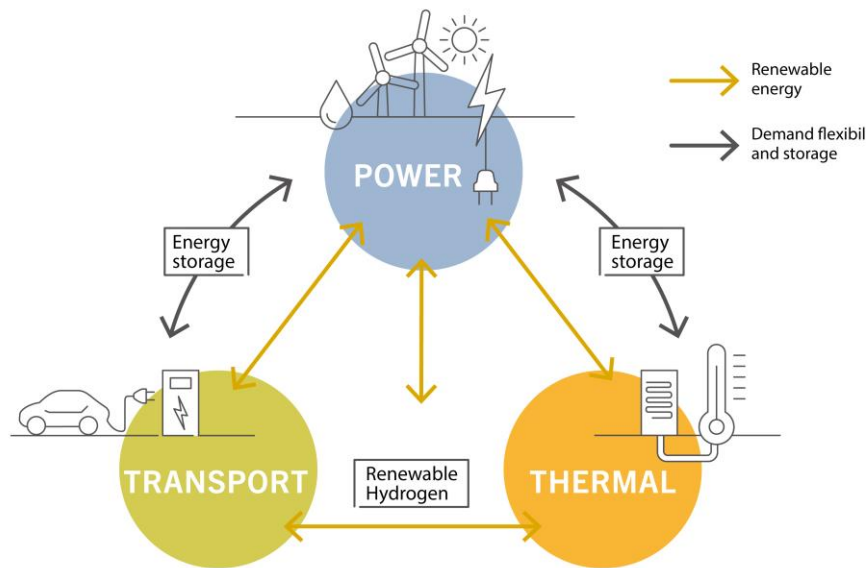
Transmission Projects to Integrate Higher Shares of Renewables



Digital technologies are increasing the usable capacity of existing transmission infrastructure, often a barrier to wider VRE deployment.

SECTOR COUPLING SUPPORTS RENEWABLES INTEGRATION

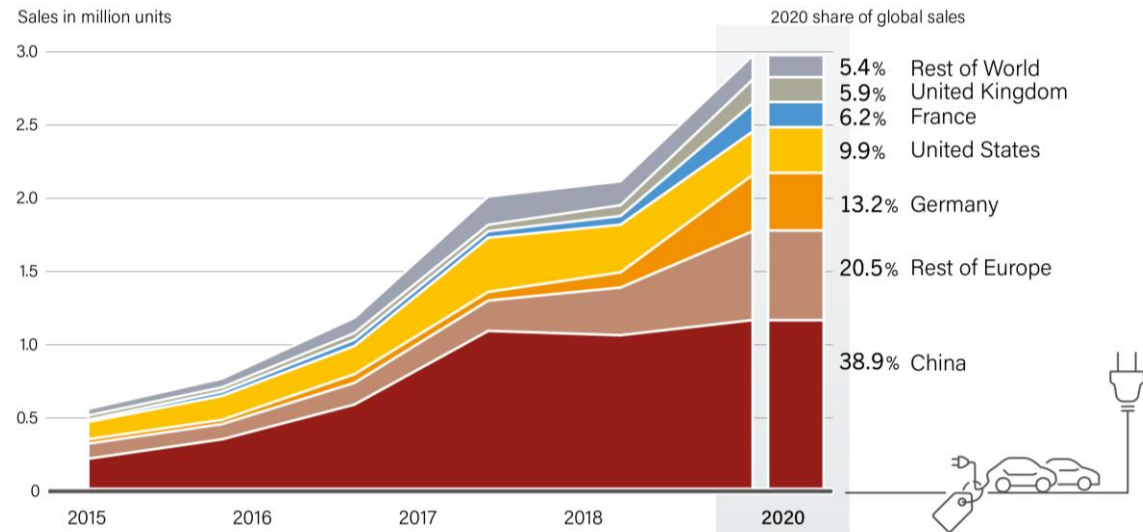
 Coupling of the Power, Thermal and Transport Sectors



End-use technologies supporting the integration of renewables in power systems **experienced increased sales** in 2020 despite the onset of the COVID-19 pandemic.

ELECTRIC CAR SALES INCREASED 41% IN 2020

 **Electric Car Global Sales**
Top Countries and Rest of World, 2015-2020

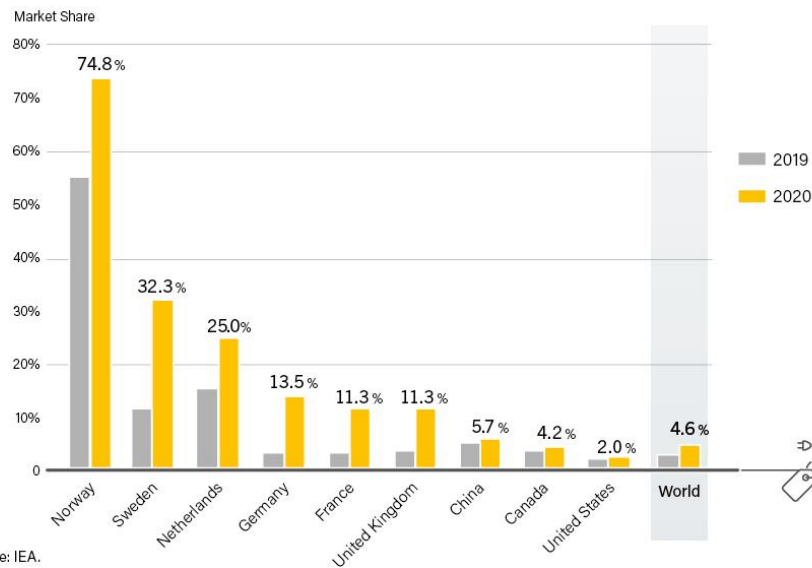


Source: IEA.

Share of electric cars in new car sales reached 4.6%, a record high.

MARKET SHARE OF ELECTRIC CARS IN NEW CAR SALES REACHED 4.6% IN 2020

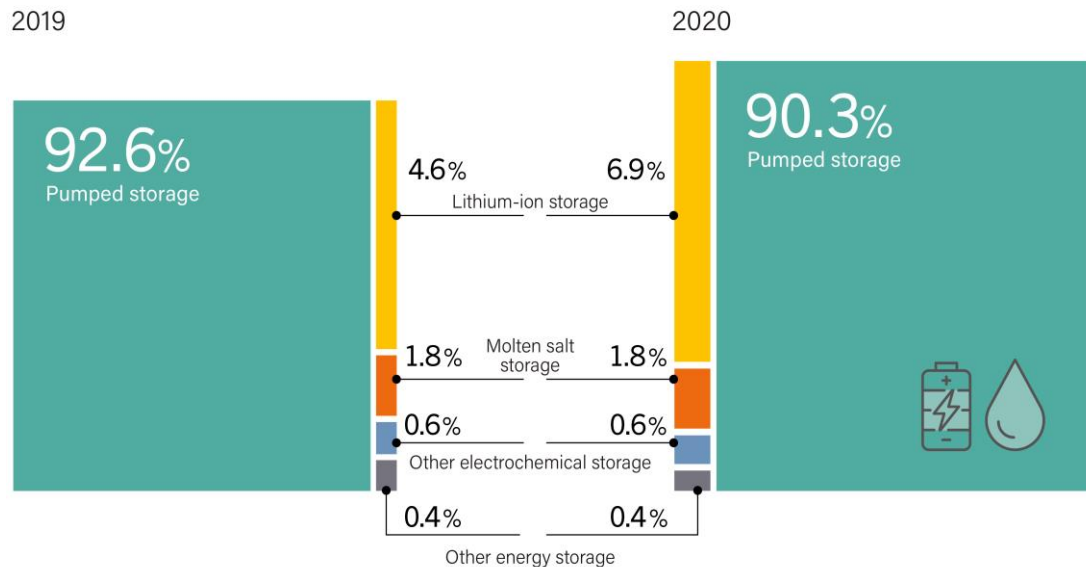
 **Market Share of Electric Cars in Annual Sales**
Top Large Markets and World, 2020



Norway remained the leader in the share of electric cars in overall car sales, at 75%, followed by Iceland (52%), and Sweden (32%).

ENERGY STORAGE MARKET BENEFITED FROM COVID STIMULUS

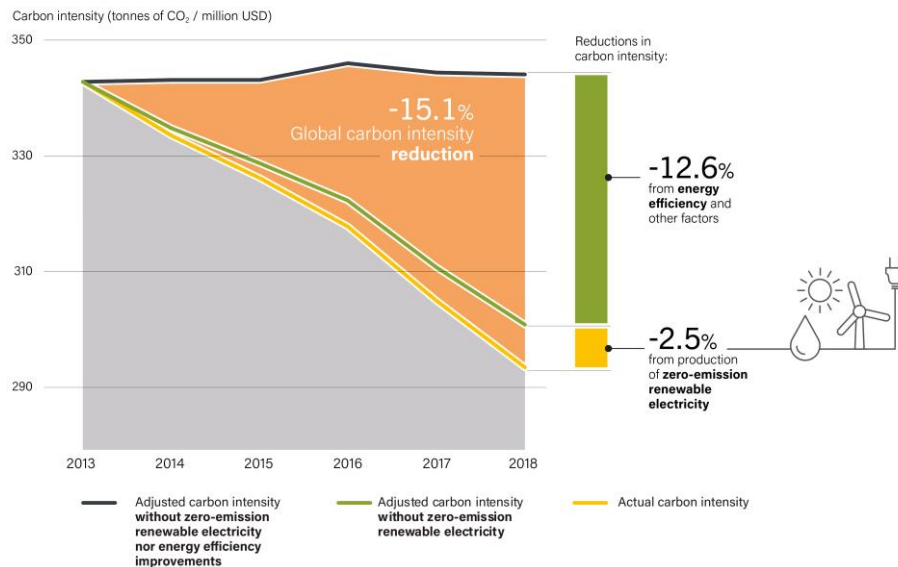
 **Share of Global Energy Storage Installed Capacity**
by Technology, 2019 and 2020



The global operational energy storage capacity reached **191.1 GW in 2020**, reflecting **3.4% growth** year-on-year.

ENERGY EFFICIENCY SLOWS CARBON INTENSITY GROWTH

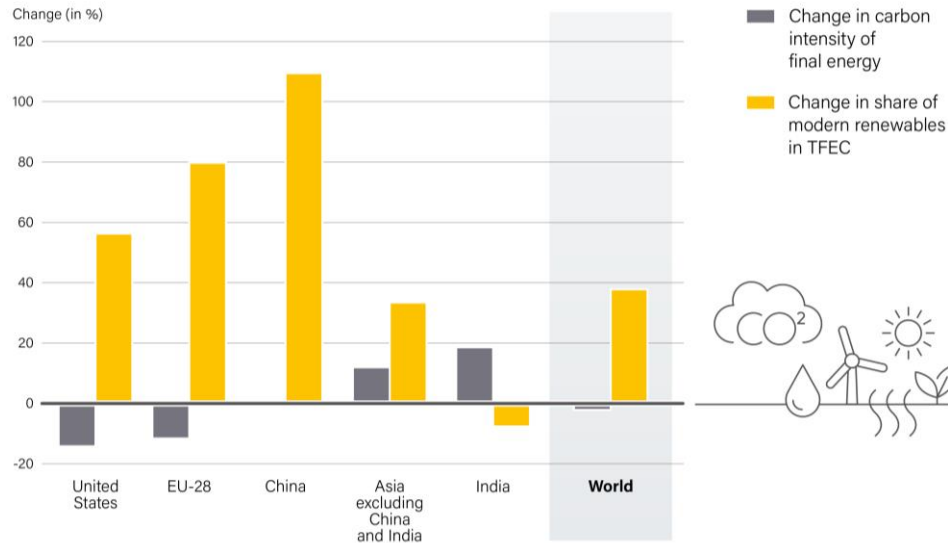
 **Estimated Impact of Renewables and Energy Efficiency on Global Carbon Intensity**
2013-2018



Despite a decline in energy efficiency improvements, there was an **overall decoupling of global economic growth and CO₂ emissions** between 2013 and 2018.

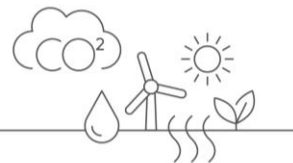
CARBON INTENSITY OF FINAL ENERGY CONSUMPTION IMPROVING

 **Change in Carbon Intensity of Final Energy Consumption and Share of Modern Renewables**
Selected Countries, 2008-2018



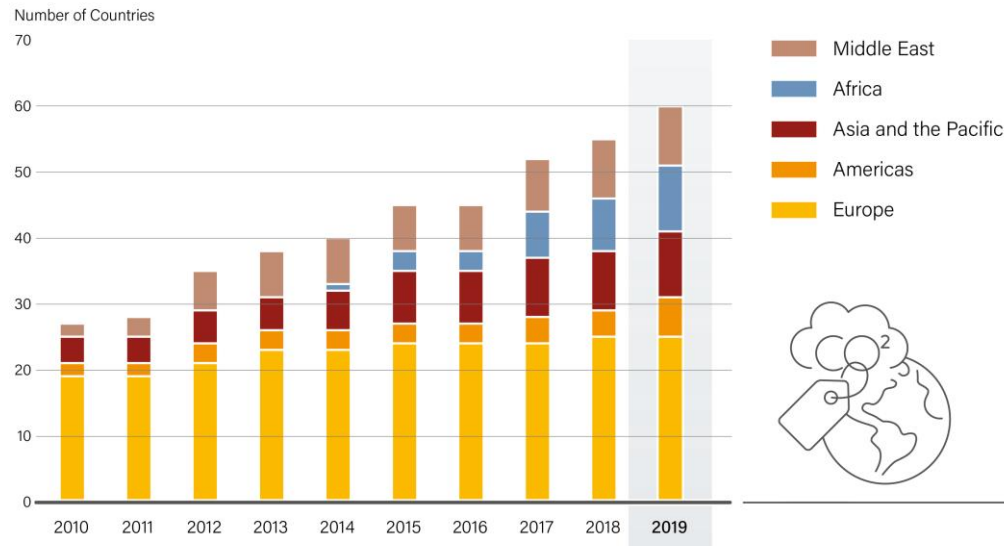
Source: Based on IEA.

Between 2008 and 2018, the global carbon intensity of final energy decreased 2%.



COUNTRIES ARE INCREASINGLY MONITORING EMISSIONS

 **Number of Countries with Carbon Emission Monitoring, Reporting and Verification Policies**
by Region, 2010-2019

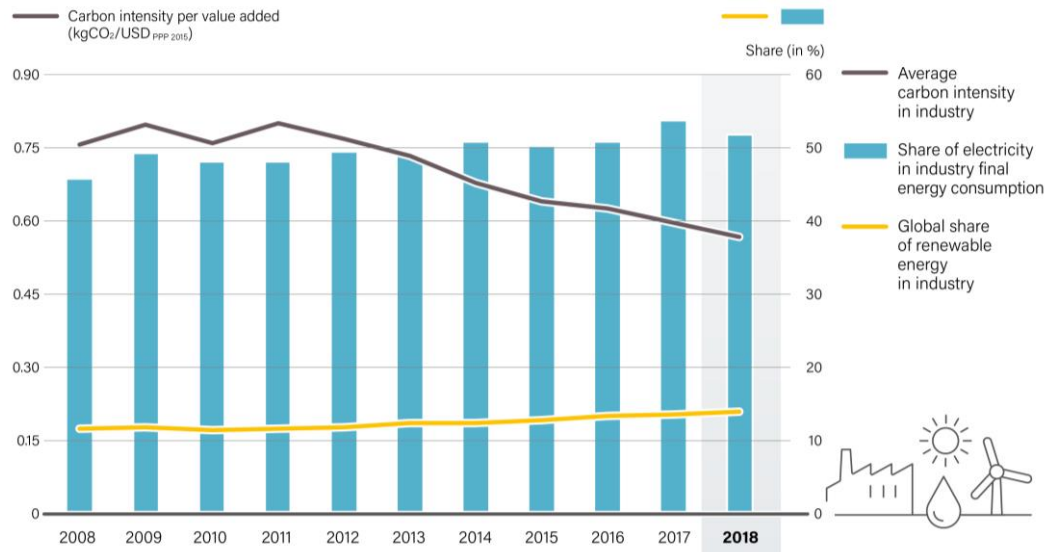


Source: World Bank Group.

Uptake of **monitoring, reporting and verification** has **nearly doubled** over the decade, from 27 countries in 2010 to 60 countries in 2020.


INDUSTRIAL CARBON INTENSITY IMPROVES

 **Carbon Intensity and Share of Electricity in Industry**
Selected Countries, 2008-2018

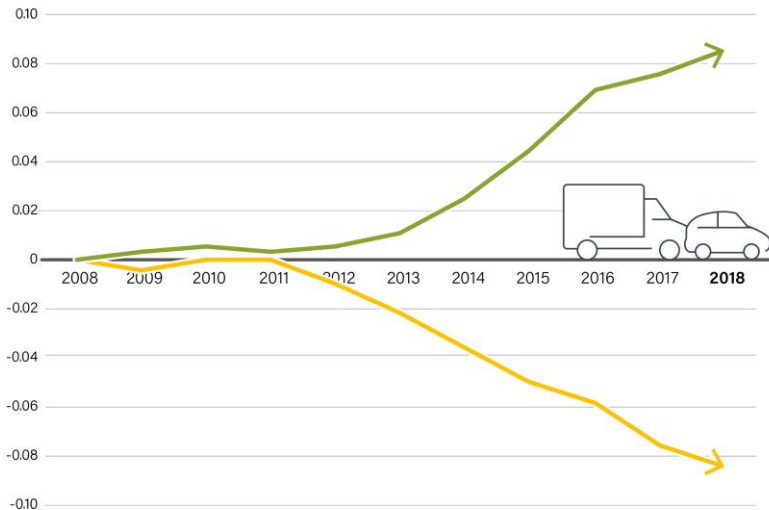


In a selection of OECD countries, **carbon intensity in industry improved 25% between 2008 and 2018**, as the share of electrification increased to 13%

TRANSPORT CARBON INTENSITY IMPROVING SLOWLY

 **Indexed Carbon Intensity and Kilometres Travelled**
Passenger Vehicles in Selected Countries, 2008-2018

Annual growth rate in %



Compound average annual change, 2008-2018

+0.73%
Vehicle kilometres travelled


Cars and light trucks

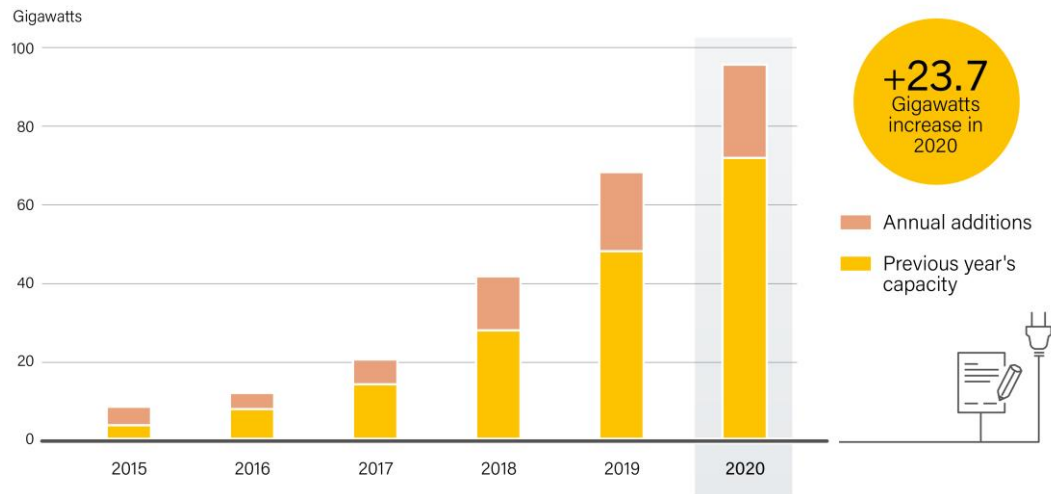
— Vehicle kilometres travelled (billions)
— Carbon intensity per vehicle-kilometre travelled (kgCO₂/vkm)

-0.78%
Carbon intensity per kilometre travelled

In OECD countries, the **carbon intensity of transport improved at an annual rate of 0.64%** between 2008 and 2017.

CORPORATE RENEWABLE PPAS INCREASED

 **Corporate Renewable Energy PPAs**
Global Capacity and Annual Additions, 2015-2020



New renewable
corporate power
purchasing agreements
increased 18% in 2020.

MANY NET ZERO TARGETS ANNOUNCED IN 2020


 **New Net Zero Emission and Carbon-Neutral Targets Set**
by Countries/Regions in 2020

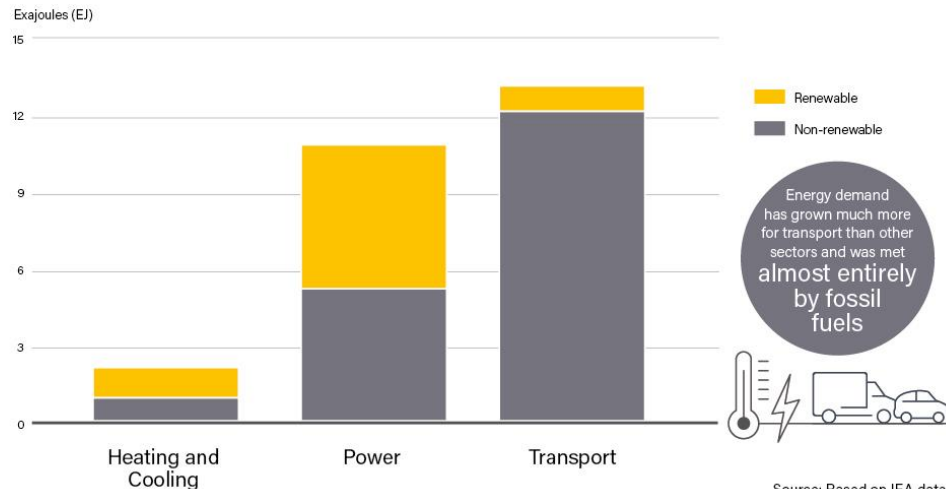
Net zero emission targets				
Country/region	2019 CO ₂ emissions (kilotonnes)	2019 CO ₂ emissions (% of world total)	Target year	Legal status
EU-27	2,939,069	7.73%	2050	Proposed
Austria	72,363	0.19%	2040 ¹	In law/policy document
Canada	584,846	1.54%	2050	Proposed
Hungary	53,183	0.14%	2050	In law/policy document
Jamaica	7,442	0.02%	2050	Pledge
Lao PDR	6,783	0.02%	2050	Pledge
Maldives	913	<0.001%	2030 ²	Pledge
Mauritius	4,332	0.01%	2070	Pledge
Nepal	15,019	0.04%	2050	NDC
United Kingdom	364,906	0.96%	2050 ³	In law/policy document
The Vatican	N/A	N/A	2050	Pledge

Carbon-neutral targets				
Country/region	2019 CO ₂ emissions (kilotonnes)	2019 CO ₂ emissions (% of world total)	Target year	Legal status
Argentina	199,414	0.52%	2050	NDC
Barbados	3,827	0.01%	2030	In law/policy document ⁴
China	11,535,200	30.34%	2060	Pledge
Japan	1,153,717	3.03%	2050	Pledge
Kazakhstan	277,365	0.73%	2060 ⁵	Pledge
Korea, Republic of	651,870	1.71%	2050	NDC
Malawi	1,616	<0.001%	2050	Pledge
Nauru	N/A	N/A	2050	Pledge
Slovenia	15,365	0.04%	2050	National plan/strategy
South Africa	494,862	1.30%	2050 ⁶	National plan/strategy

Only about one-fifth of all announced national net zero targets are actually **in law** or have been achieved.

RENEWABLES SHARES IN ENERGY DEMAND GROWTH

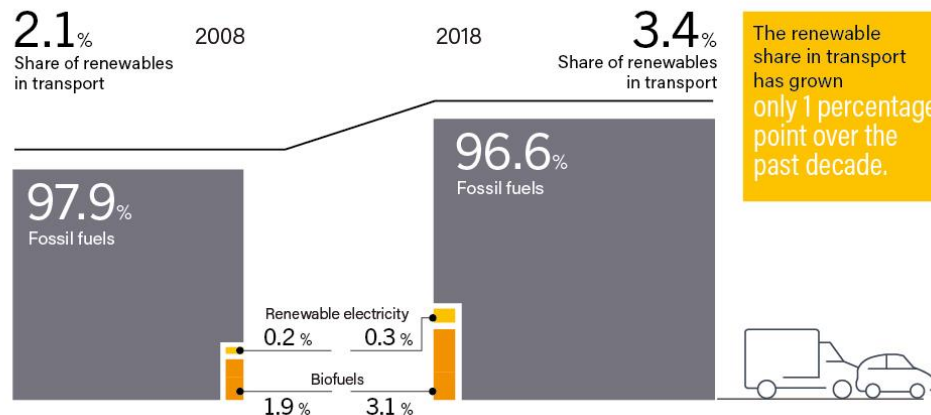
 Renewable Contribution to Energy Demand Growth, by Sector
2013-2018



Renewables represented the largest share of energy demand growth in the **power sector**.

RENEWABLES IN TRANSPORT GREW SLOWLY

 Share of Renewable Energy in Transport
2008 and 2018




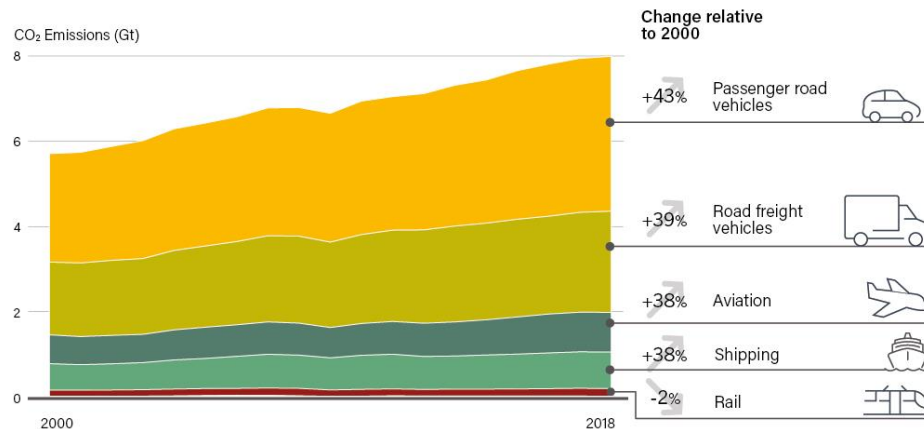
Note: Fossil fuels includes non-renewable electricity, which accounted for 0.82% in 2008 and 0.85% in 2018.

Source: Based on IEA data.

The share of renewable energy in transport grew slowly **from 2.1% in 2008 to 3.4% in 2018.**

TRANSPORT RELATED EMISSIONS ON THE RISE

 Global CO₂ Emissions from the Transport Sector, by Mode
2000-2018



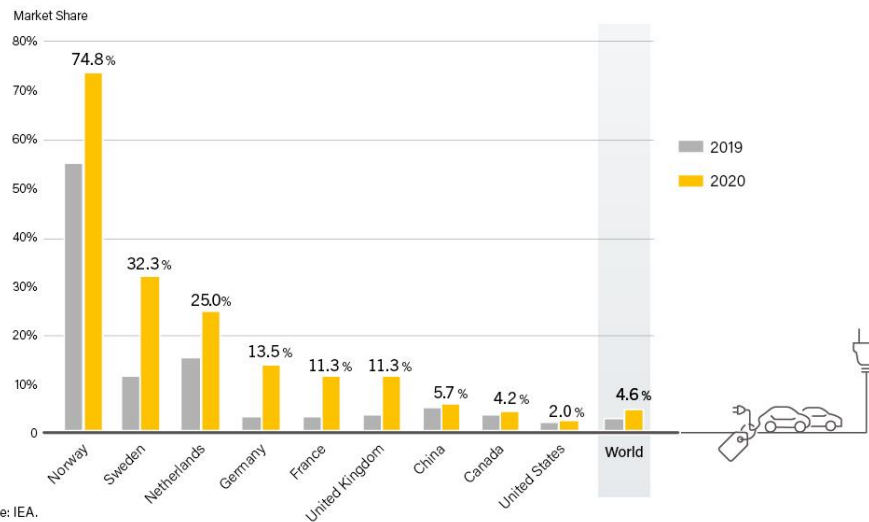
Note: Other pipeline and non-specified transport increased 28% during this period.

Source: SLOCAT and IEA.

Global CO₂ emissions **rose over the decade** in all transport sectors **except rail**, where it dropped by 2%.

MARKET SHARE OF ELECTRIC CARS INCREASED

 **Market Share of Electric Cars in Annual Sales**
Top Large Markets and World, 2020

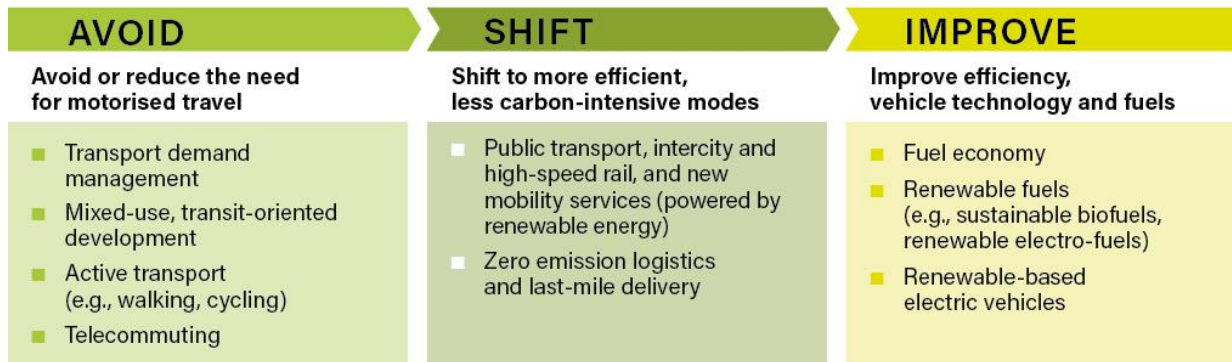


Norway remains the largest market for electric cars in the world.

THE AVOID-SHIFT-IMPROVE FRAMEWORK



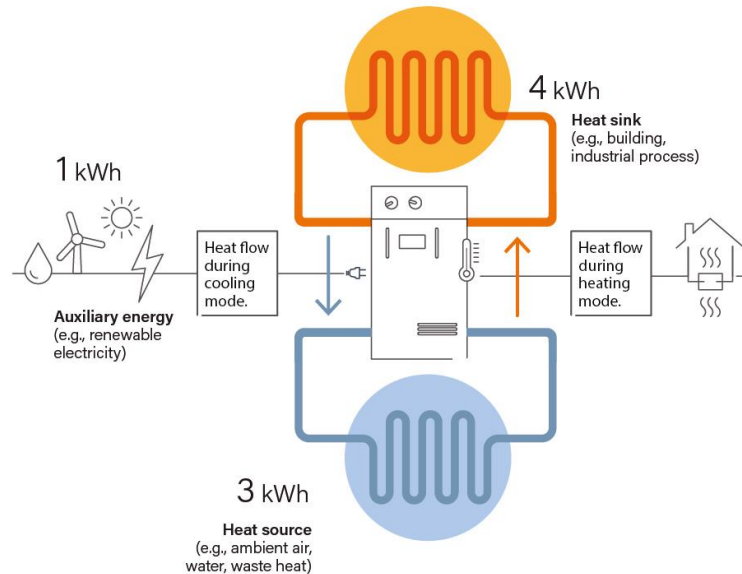
Avoid-Shift-Improve Framework in the Transport Sector



Such a framework can **greatly decrease energy demand and associated greenhouse gas emissions** in the transport sector.

SCHEMATIC OF A HEATING AND COOLING SYSTEM

 Schematic of a Heating and Cooling System with an Electric Heat Pump



When the energy used to drive a heat pump is renewable, so is 100% of its output.



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