



RENEWABLES 2014 GLOBAL STATUS REPORT



KEY FINDINGS
2014

RENEWABLE ENERGY POLICY NETWORK FOR THE 21st CENTURY



REN21 is the global renewable energy policy multi-stakeholder network that connects a wide range of key actors. REN21's goal is to facilitate knowledge exchange, policy development and joint action towards a rapid global transition to renewable energy.

REN21 brings together governments, nongovernmental organisations, research and academic institutions, international organisations and industry to learn from one another and build on successes that advance renewable energy. To assist policy decision making, REN21 provides high quality information, catalyses discussion and debate and supports the development of thematic networks.



Global Status Report: yearly publication since 2005

Global Futures Report

Regional Reports

www.map.ren21.net

REN21 publications:

2004 2005 2006 2007 2008 2009

REN21 events:

renewables 2004, Bonn
 BIREC, Beijing International Renewable Energy Conference
 WIREC, Washington International Renewable Energy Conference
 Chinese Renewable Energy Status Report

→ PROVIDE HIGH-QUALITY INFORMATION TO DRIVE INFORMED POLICY DECISIONS

Using its multi-stakeholder network, REN21 facilitates the collection of comprehensive and timely information on renewable energy. This information reflects diverse viewpoints from both private and public sector actors, serving to dispel myths about renewable energy and catalysing policy change.

Renewables Global Status Report (GSR)

First released in 2005, REN21's *Renewables Global Status Report* (GSR) has grown to become a truly collaborative effort, drawing on an international network of over 500 authors, contributors, and reviewers. Today it is the most frequently referenced report on renewable energy market, industry, and policy trends.

Thematic Reports

REN21 produces thematic reports which aim to provide in-depth analysis about a topic and stimulate discussion:

- Renewables Global Futures Report (GFR)
- Local Renewable Energy Policies Status Report
- 10 Years of Accelerating the Global Energy Transition
- Mini-Grid Policy Toolkit

Regional Reports

These reports detail the renewable energy developments of a particular region; their production also supports regional data collection processes and informed decision making.

Renewables Interactive Map

The Renewables Interactive Map is a research tool for tracking the development of renewable energy worldwide. It complements the perspectives and findings of the GSR by providing constantly updated market and policy information and detailed exportable country profiles.

Indian Renewable Energy Status Report

2010

DIREC, Delhi International Renewable Energy Conference

Global Status Report on Local Renewable Energy Policies

2011

Global Futures Report
MENA Renewable Energy Status Report

2012

Global Futures Report
MENA Renewable Energy Status Report

2013

ADIREC, Abu Dhabi International Renewable Energy Conference

ECOWAS Status Report on Renewable Energy & Energy Efficiency

2014

First REN21 Renewables Academy, Bonn

SAIREC, South Africa International Renewable Energy Conference

2015

→ INITIATE DISCUSSION AND DEBATE TO DRIVE POLITICAL COMMITMENT

International Renewable Energy Conferences (IRECs)

The International Renewable Energy Conference (IREC) is a high-level political conference series. Dedicated exclusively to the renewable energy sector, the biennial IREC is hosted by a national government and convened by REN21. SAIREC 2015 will be held in South Africa, 4–7 October 2015.

Renewables Academy

The REN21 Renewables Academy provides an opportunity for lively exchange among the growing community of REN21 contributors. It offers a venue to brainstorm on future-orientated policy solutions and allows participants to actively contribute on issues central to the renewable energy transition.

Thematic workshops, panel discussions and webinars

REN21 convenes and participates in a series of workshops, panel discussions, and webinars to spread information on renewable energy globally.

→ STRENGTHEN AND LEVERAGE REN21'S MULTI-STAKEHOLDER BASE

- Broad dissemination of activities of the REN21 Secretariat as well as network members through four editions of the REN21 newsletter.
- In-depth information for members through the REN21 newswire.
- Dynamic interaction with key institutional partners such as IEA, IRENA, SE4ALL, and UNEP.

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KEY FINDINGS

THE GSR IN THE GLOBAL CONTEXT

The evolution of renewable energy over the past decade has surpassed all expectations. Global installed capacity and production from all renewable technologies have increased substantially; costs for most technologies have decreased significantly; and supporting policies have continued to spread throughout the world.

Developments in the early 2000s showed upwards trends in global renewable energy investment, capacity, and integration across all sectors; yet most mainstream projections did not predict the extraordinary expansion of renewables that was to unfold in the coming decade. Numerous scenarios projected levels of renewable energy for 2020 that were already surpassed by 2010. Today, renewable energy technologies are seen not only as a tool for improving energy security, but also as a way to mitigate greenhouse gas emissions and to provide direct and indirect social benefits.

Governments are increasingly aware of renewable energy's potential role in advancing national development. While the primary objective of developing a renewable energy sector is often to maintain or expand energy services, the far-reaching impact of these technologies adds several co-benefits including: reducing the health and environmental impacts associated with the use of fossil and nuclear fuels, improving educational opportunities, creating jobs, reducing poverty, and increasing gender equality.

In much of the world, considerable time and household income are spent securing energy services. Energy poverty presents a significant hurdle to achieving development goals of improved health, prosperity, and a liveable environment. Renewable energy systems provide an unprecedented opportunity to accelerate the transition to modern energy services—displacing traditional biomass, carbon-based fuels, and fossil-fuel grid-based electricity and, thereby, lowering the hurdles to sustainable development.

Renewables also contribute to climate mitigation efforts. The Intergovernmental Panel on Climate Change (IPCC), under the United Nations Framework Convention on Climate Change (UNFCCC), clearly states in its 2014 report that climate change is already having a sweeping effect on all continents and in every ocean. The problem will likely grow substantially worse unless greenhouse gas emissions are brought under control. Renewables, coupled with energy efficiency measures, can help reduce emissions by providing low-carbon energy services.

It is clear that renewables are becoming a mainstreamed energy resource. This is welcome news as we enter the Decade of Sustainable Energy for All (SE4ALL), which seeks to mobilise country action to ensure universal access to modern energy services, improved rates of energy efficiency, and expanded use of renewable energy sources by 2030. Although the following pages clearly document advancements in the uptake of renewables, the REN21 *Renewables 2014 Global Status Report* also demonstrates that we need to move faster and more deliberately if we are serious about ensuring access to clean and sustainable energy for all people by 2030.

i - Note that it is not possible to provide 2013 shares due to a lack of data.

ii - There is debate about the sustainability of traditional biomass, and whether it should be considered renewable, or renewable only if it comes from a sustainable source.

CONTINUED RENEWABLE ENERGY GROWTH

Renewable energy provided an estimated 19% of global final energy consumption in 2012,ⁱ and continued to grow in 2013. Of this total share in 2012, modern renewables accounted for approximately 10%, with the remainder (estimated at just over 9%) coming from traditional biomass.ⁱⁱ Heat energy from modern renewable sources accounted for an estimated 4.2% of total final energy use; hydropower made up about 3.8%, and an estimated 2% was provided by power from wind, solar, geothermal, and biomass, as well as by biofuels.

The combined modern and traditional renewable energy share remained about level with 2011, even as the share of modern renewables increased. This is because the rapid growth in modern renewable energy is tempered by both a slow migration away from traditional biomass and a continued rise in total global energy demand.

As renewable energy markets and industries mature, they increasingly face new and different challenges, as well as a wide range of opportunities. In 2013, renewables faced declining policy support and uncertainty in many European countries and the United States. Electric grid-related constraints, opposition in some countries from electric utilities concerned about rising competition, and continuing high global subsidies for fossil fuels were also issues. Overall—with some exceptions in Europe and the United States—renewable energy developments were positive in 2013.

Markets, manufacturing, and investment expanded further across the developing world, and it became increasingly evident that renewables are no longer dependent upon a small handful of countries. Aided by continuing technological advances, falling prices, and innovations in financing—all driven largely by policy support—renewables have become increasingly affordable for a broader range of consumers worldwide. In a rising number of countries, renewable energy is considered crucial for meeting current and future energy needs.

As markets have become more global, renewable energy industries have responded by increasing their flexibility, diversifying their products, and developing global supply chains. Several industries had a difficult year, with consolidation continuing, particularly for solar energy and wind power. But the picture brightened by the end of 2013, with many solar photovoltaics (PV) and wind turbine manufacturers returning to profitability.

The most significant growth occurred in the power sector, with global capacity exceeding 1,560 gigawatts (GW), up more than 8% over 2012. Hydropower rose by 4% to approximately 1,000 GW, and other renewables collectively grew nearly 17% to more than 560 GW. For the first time, the world added more solar PV than wind power capacity; solar PV and hydropower were essentially tied, each accounting for about one-third of new capacity. Solar PV has continued to expand at a rapid rate, with growth in global capacity averaging almost 55% annually over the past five years. Wind power has added the most

First released in 2005, the annual **Renewables Global Status Report** provides a comprehensive and timely overview of renewable energy markets, industries, investments, and policy developments worldwide. It enables policymakers, industry, investors, and civil society to make informed decisions.

The report covers recent developments, current status, and key trends on all renewable technologies and end-use sectors. By design, it does not provide analysis or forecast.

The Renewables Global Status Report relies on up-to-date renewable energy data, provided by an international network of more than 500 contributors, researchers, and authors.

capacity of all renewable technologies over the same period. In 2013, renewables accounted for more than 56% of net additions to global power capacity and represented far higher shares of capacity added in several countries.

Over the past few years, the levelised costs of electricity generation from onshore wind and, particularly, solar PV have fallen sharply. As a result, an increasing number of wind and solar power projects are being built without public financial support. Around the world, major industrial and commercial customers are turning to renewables to reduce their energy costs while increasing the reliability of their energy supply. Many set ambitious renewable energy targets, installed and operated their own renewable power systems, or signed power purchase agreements to buy directly from renewable energy project operators, bypassing utilities.

By the end of 2013, China, the United States, Brazil, Canada, and Germany remained the top countries for total installed renewable power capacity; the top countries for non-hydro capacity were again China, the United States, and Germany, followed by Spain, Italy, and India. Among the world's top 20 countries for non-hydro capacity, Denmark had a clear lead for total capacity per capita. Uruguay, Mauritius, and Costa Rica were among the top countries for investment in new renewable power and fuels relative to annual GDP.

In the heating and cooling sector, trends included the increasing use of renewables in combined heat and power plants; the feeding of renewable heating and cooling into district systems; hybrid solutions in the building renovation sector; and the growing use of renewable heat for industrial purposes. Heat from modern biomass, solar, and geothermal sources accounts for a small but gradually rising share of final global heat demand, amounting to an estimated 10%. The use of modern renewable technologies for heating and cooling is still limited relative to their vast potential.

The growth of liquid biofuels has been uneven in recent years, but their production and use increased in 2013. There is also growing interest in other renewable options in the transport sector. The year saw a continued rise in the use of gaseous biofuels (mainly biomethane) and further development of hybrid options (e.g., biodiesel-natural gas buses, and electric-diesel transport). There are limited but increasing initiatives to link electric transport systems with renewable energy, particularly at the city and regional levels.

Some highlights of 2013 include:

- In the European Union, renewables represented the majority of new electric generating capacity for the sixth consecutive year. The 72% share in 2013 is in stark contrast to a decade earlier, when conventional fossil generation accounted for 80% of new capacity in the EU-27 plus Norway and Switzerland.
- Even as global investment in solar PV declined nearly 22% relative to 2012, new capacity installations increased by about 32%.
- China's new renewable power capacity surpassed new fossil fuel and nuclear capacity for the first time.
- Variable renewables achieved high levels of penetration in several countries. For example, throughout 2013, wind power met 33.2% of electricity demand in Denmark and 20.9% in

Spain; in Italy, solar PV met 7.8% of total annual electricity demand.

- Wind power was excluded from one of Brazil's national auctions because it was pricing all other generation sources out of the market.
- Denmark banned the use of fossil fuel-fired boilers in new buildings as of 2013 and aims for renewables to provide almost 40% of total heat supply by 2020.
- Growing numbers of cities, states, and regions seek to transition to 100% renewable energy in either individual sectors or economy-wide. For example, Djibouti, Scotland, and the small-island state of Tuvalu aim to derive 100% of their electricity from renewable sources by 2020. Among those who have already achieved their goals are about 20 million Germans who live in so-called 100% renewable energy regions.

The impacts of these developments on employment numbers in the renewable energy sector have varied by country and technology, but, globally, the number of people working in renewable industries has continued to rise. An estimated 6.5 million people worldwide work directly or indirectly in the sector.

■ AN EVOLVING POLICY LANDSCAPE

By early 2014, at least 144 countries had renewable energy targets and 138 countries had renewable energy support policies in place, up from the 138 and 127 countries, respectively, that were reported in GSR 2013. Developing and emerging economies have led the expansion in recent years and account for 95 of the countries with support policies, up from 15 in 2005. The rate of adoption remained slow relative to much of the past decade, due largely to the fact that so many countries have already enacted policies.

In 2013, there was an increasing focus on revisions to existing policies and targets, including retroactive changes, with some adjustments made to improve policy effectiveness and efficiency, and others aimed to curtail costs associated with supporting the deployment of renewables. At the same time, some countries expanded support and adopted ambitious new targets.

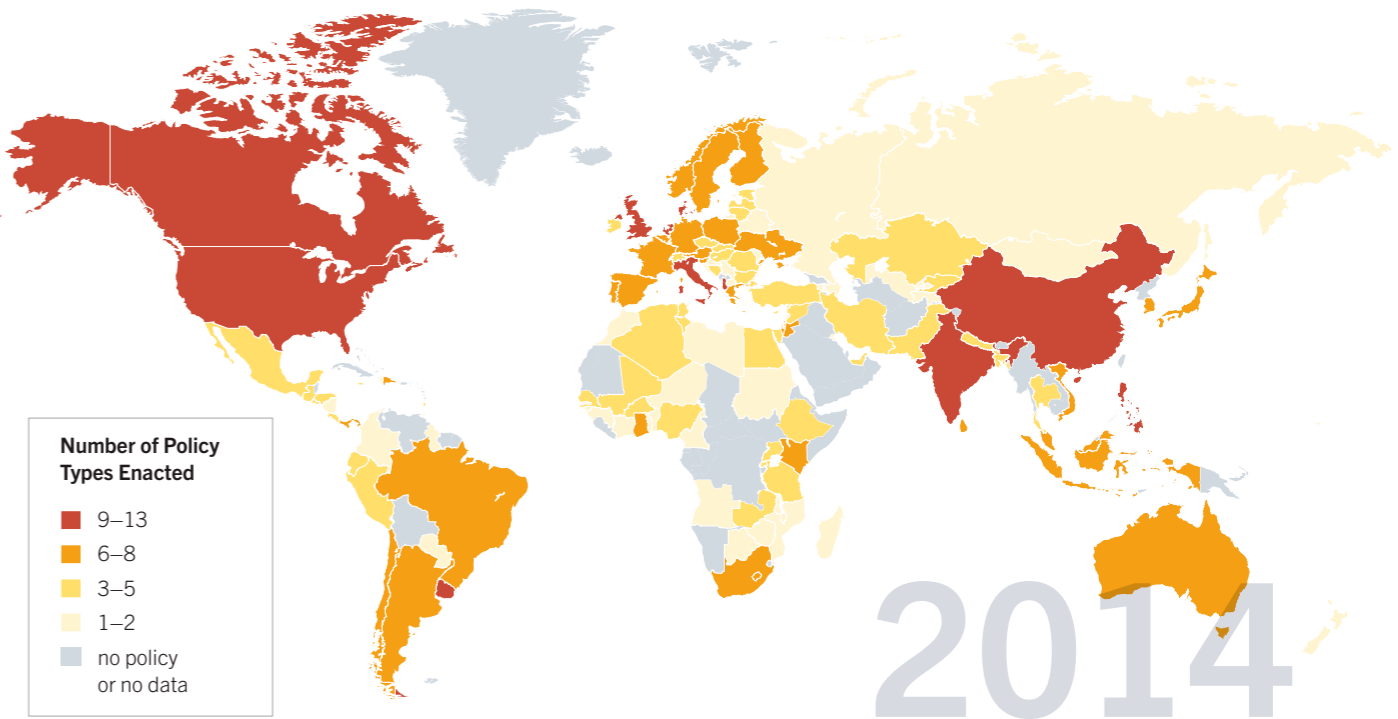
Policy mechanisms continued to evolve, with some becoming more differentiated by technology. Feed-in policies in many countries evolved further towards premium payments in the power sector, and continued to be adapted for use in the heating sector. Particularly in Europe, new policies are emerging to advance or manage the integration of high shares of renewable electricity into existing power systems, including support for energy storage, demand-side management, and smart grid technologies.

As in past years, most renewable energy policies enacted or revised during 2013 focus on the power sector. A mix of regulatory policies, fiscal incentives, and public financing mechanisms continued to be adopted. Feed-in policies and renewable portfolio standards (RPS) remained the most commonly used support mechanisms, although their pace of adoption continued to slow. Public competitive bidding, or tendering, gained further prominence, with the number of countries turning to public auctions rising from 9 in 2009 to 55 as of early 2014.

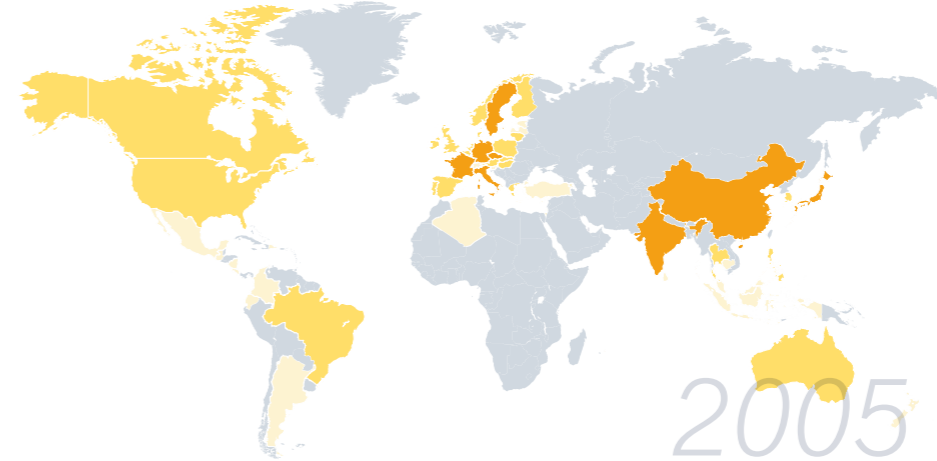
Although the heating and cooling sector lags far behind the renewable power sector for attention from policymakers, the adoption of targets and support policies has increased steadily.

POLICY MAPS

Countries with Renewable Energy Policies, Early 2014



Countries with Renewable Energy Policies, 2005



144
COUNTRIES
HAVE DEFINED
RENEWABLE
ENERGY TARGETS

Number of Countries with Renewable Energy Policies by Type, 2010–early 2014

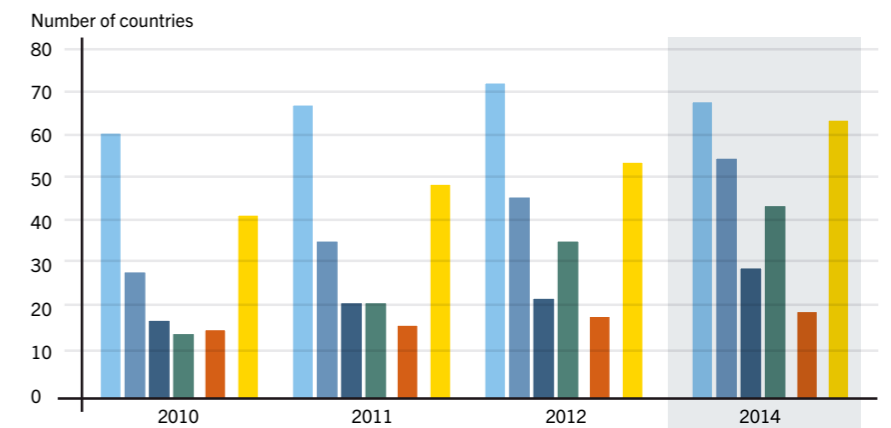
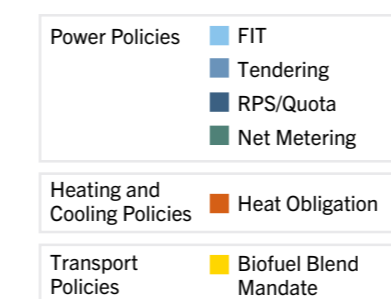


Figure does not show all policy types in use. Countries considered when at least one national or sub-national policy is in place.

RENEWABLE ENERGY INDICATORS 2013

		START 2004 ¹	END 2012	END 2013
INVESTMENT				
New investment (annual) in renewable power and fuels ²	billion USD	39.5	249.5	214.4 (249.4)
POWER				
Renewable power capacity (total, not including hydro)	GW	85	480	560
Renewable power capacity (total, including hydro)	GW	800	1,440	1,560
Hydropower capacity (total) ³	GW	715	960	1,000
Bio-power capacity	GW	<36	83	88
Bio-power generation	TWh	227	350	405
Geothermal power capacity	GW	8.9	11.5	12
Solar PV capacity (total)	GW	2.6	100	139
Concentrating solar thermal power (total)	GW	0.4	2.5	3.4
Wind power capacity (total)	GW	48	283	318
HEAT				
Solar hot water capacity (total) ⁴	GW _{th}	98	282	326
TRANSPORT				
Ethanol production (annual)	billion litres	28.5	82.6	87.2
Biodiesel production (annual)	billion litres	2.4	23.6	26.3
POLICIES				
Countries with policy targets	#	48	138	144
Feed-in	#			
Number of states / provinces / countries	#	34	97	98
RPS / quota policies	#			
Number of states / provinces / countries	#	11	79	79
Tendering	#			
Number of states / provinces / countries	#	8	45	55
Heat obligations / mandates	#			
Number of countries	#	n/a	19	19
Biofuel obligations / mandates ⁵	#			
Number of countries	#	10	52	63

¹ Capacity data are as of the beginning of 2004; other data, such as investment and biofuels production, cover the full year. Numbers are estimates, based on best available information.

² Investment data are from Bloomberg New Energy Finance (BNEF) and include all biomass, geothermal, and wind generation projects of more than 1 MW; all hydro projects of between 1 and 50 MW; all solar power projects, with those less than 1 MW estimated separately and referred to as small-scale projects or small distributed capacity; all ocean energy projects; and all biofuel projects with an annual production capacity of 1 million litres or more. BNEF estimates that, including the unreported investments in hydropower projects >50 MW, total new investment in renewable power and fuels was at least USD 249.4 billion in 2013.

³ The GSR 2013 reported a global total of 990 GW of hydropower capacity at the end of 2012; this figure has been revised downward due to better data availability. Data do not include pumped storage.

⁴ Solar hot water capacity data include water collectors only; including air collectors, estimated totals are 283.4 GW for 2012 and 330 GW for 2013. The number for 2013 is a preliminary estimate. Note that past editions of this table have not considered unglazed water collectors.

⁵ Biofuel policies include policies listed both under the biofuels obligation/mandate column in Table 3 (Renewable Energy Support Policies) and in Reference Table R18 (National and State/Provincial Biofuel Blend Mandates). The 10 countries identified with biofuels blend mandates in the "Start 2004" column were actually in place as of 2005, the earliest year for which data are available.

Note: Renewable power capacity (including and not including hydropower) and hydropower capacity data are rounded to nearest 5 GW; other capacity numbers are rounded to nearest 1 GW except for global investment, numbers <15, and biofuels, which are rounded to one decimal point. Policy data for 2013 include all countries identified as of early 2014.

As of early 2014, at least 24 countries had adopted renewable heating (and cooling) targets, and at least 19 countries had obligations at the national or state/provincial level. Renewable heating and cooling is also supported through fiscal incentives, as well as through building codes and other measures at the national and local levels in several countries.

As of early 2014, at least 63 countries used regulatory policies to promote the production or consumption of biofuels for transport; this was up from the 49 reported in GSR 2013. Some existing blend mandates were strengthened, and the use of fiscal incentives and public financing expanded. In some countries, however, support for first-generation biofuels was reduced due to environmental and social sustainability concerns. Although most transport-related policies focus on biofuels, many governments continued to explore other options such as increasing the number of vehicles fuelled with biomethane and electricity from renewable sources.

Thousands of cities and towns worldwide have policies, plans, and targets to advance renewable energy, often far outpacing the ambitions of national legislation. Policy momentum continued in 2013 as city and local governments acted to reduce emissions, support and create local industry, relieve grid capacity stress, and achieve security of supply. To accomplish these goals, they increasingly made use of their authority to regulate, make expenditure and procurement decisions, facilitate and ease the financing of renewable energy projects, and influence advocacy and information sharing. As cities seek to share and scale up best practices, highlight their commitments to renewable energy, and account for their achievements, local governments are increasingly prioritising systematic measurement and reporting of climate and energy data.

INVESTMENT FLOWS

Global new investment in renewable power and fuels—not including hydropower projects >50 megawatts (MW)—was an estimated USD 214.4 billion in 2013, down 14% relative to 2012 and 23% lower than the record level in 2011. Including the unreported investments in hydropower projects larger than 50 MW, total new investment in renewable power and fuels was at least USD 249.4 billion in 2013.

The second consecutive year of decline in investment—after several years of growth—was due in part to uncertainty over incentive policies in Europe and the United States, and to retroactive reductions in support in some countries. Europe's renewable energy investment was down 44% from 2012. The year 2013 also saw an end to eight consecutive years of rising renewable energy investment in developing countries.

Yet the global decline also resulted from sharp reductions in technology costs. This was particularly true for solar PV, which saw record levels of new installations in 2013, despite a 22% decline in dollars invested. Lower costs and efficiency improvements made it possible to build onshore wind and solar PV installations in a number of locations around the world in 2013 without subsidy support, particularly in Latin America. Considering only net investment in new power capacity, renewables outpaced fossil fuels for the fourth year running.

Further, despite the overall downward trend in global investment, there were significant exceptions at the country level. The most notable was Japan, where investment in renewable energy (excluding research and development) increased by 80% relative to 2012 levels. Other countries that increased their investment in 2013 included Canada, Chile, Israel, New Zealand, the United Kingdom, and Uruguay. Despite the overall decline in China's investment, for the first time ever, China invested more in renewable energy than did all of Europe combined, and it invested more in renewable power capacity than in fossil fuels.

Solar power was again the leading sector by far in terms of money committed during 2013, receiving 53% (USD 113.7 billion) of total new investment in renewable power and fuels (with 90% going to solar PV). Wind power followed with USD 80.1 billion. Asset finance of utility-scale projects declined for the second consecutive year, but it again made up the vast majority of total investment in renewable energy, totalling USD 133.4 billion.

Clean energy funds (equities) had a strong year, and clean energy project bonds set a new record in 2013. North America saw the emergence of innovative yield-oriented financing vehicles, and crowd funding moved further into the mainstream in a number of countries. Institutional investors continued to play an increasing role, particularly in Europe, with a record volume of renewable energy investment during the year. Development banks were again an important source of clean energy investment, with some banks pledging to curtail funding for fossil fuels, especially coal power.

DISTRIBUTED RENEWABLE ENERGY IN DEVELOPING COUNTRIES

In many parts of the world, the lack of access to modern energy services continues to impede sustainable development. Recent assessments suggest that as many as 1.3 billion people still do not have access to electricity, and more than 2.6 billion people rely on traditional biomass for cooking and heating. However, during 2013, people in remote and rural areas of the world continued to gain access to electricity, modern cooking, heating and cooling as the installation and use of distributed renewable energy technologies increased. This expansion was a direct result of improvements in affordability, inclusion of distributed energy in national energy policies, greater access to financing, increased knowledge about local resources, and more-advanced technologies that can be tailored to meet customers' specific needs.

Furthermore, increased use of mini-grids supported the spread of renewable energy-powered electrification in un-electrified peri-urban and rural areas. Recent technical advances that enable the integration of renewables in mini-grid systems, combined with information and communication technology (ICT) applications for power management and end-user services, have allowed for a rapid growth in the use of renewables-powered mini-grids.

There is a growing awareness that stand-alone cooking and electricity systems based on renewables are often the most cost-effective options available for providing energy services to households and businesses in remote areas. As a result, an increasing number of countries is supporting the development of decentralised renewable energy-based systems to expand energy access.

i - Except where noted explicitly, investment data in this section do not include hydropower projects >50 MW because these are not tracked by Bloomberg New Energy Finance, the source for these statistics.

TOP FIVE COUNTRIES

ANNUAL INVESTMENT / NET CAPACITY ADDITIONS / PRODUCTION IN 2013

	1	2	3	4	5
Investment in renewable power and fuels	China	United States	Japan	United Kingdom	Germany
Share of GDP 2012 (USD) invested ¹	Uruguay	Mauritius	Costa Rica	South Africa	Nicaragua
Geothermal power capacity	New Zealand	Turkey	United States	Kenya	Philippines
Hydropower capacity	China	Turkey	Brazil	Vietnam	India
Solar PV capacity	China	Japan	United States	Germany	United Kingdom
CSP capacity	United States	Spain	United Arab Emirates	India	China
Wind power capacity	China	Germany	United Kingdom	India	Canada
Solar water heating capacity ²	China	Turkey	India	Brazil	Germany
Biodiesel production	United States	Germany	Brazil	Argentina	France
Fuel ethanol production	United States	Brazil	China	Canada	France

TOTAL CAPACITY OR GENERATION⁶ AS OF END-2013

	1	2	3	4	5
POWER					
Renewable power (incl. hydro)	China	United States	Brazil	Canada	Germany
Renewable power (not incl. hydro)	China	United States	Germany	Spain / Italy	India
Renewable power capacity per capita (not incl. hydro) ³	Denmark	Germany	Portugal	Spain / Sweden	Austria
Biopower generation	United States	Germany	China	Brazil	India
Geothermal power	United States	Philippines	Indonesia	Mexico	Italy
Hydropower ⁴	China	Brazil	United States	Canada	Russia
Hydropower generation ⁴	China	Brazil	Canada	United States	Russia
Concentrating solar thermal power (CSP)	Spain	United States	United Arab Emirates	India	Algeria
Solar PV	Germany	China	Italy	Japan	United States
Solar PV capacity per capita	Germany	Italy	Belgium	Greece	Czech Republic
Wind power	China	United States	Germany	Spain	India
Wind power capacity per capita	Denmark	Sweden	Spain	Portugal	Ireland
HEAT					
Solar water heating ²	China	United States	Germany	Turkey	Brazil
Solar water heating capacity per capita ²	Cyprus	Austria	Israel	Barbados	Greece
Geothermal heat ⁵	China	Turkey	Iceland	Japan	Italy

¹ Countries considered include only those covered by Bloomberg New Energy Finance; GDP is for 2012 and from the World Bank. The following renewable energy projects are included: all biomass, geothermal, and wind generation projects of more than 1 MW; all hydropower projects of between 1 and 50 MW; all solar power projects, with those less than 1 MW estimated separately and referred to as small-scale projects or small distributed capacity; all ocean energy projects; and all biofuel projects with an annual production capacity of 1 million litres or more.

² Solar water collector (heating) rankings are for 2012, and are based on capacity of water (glazed and unglazed) collectors only; however, including air collectors would not affect order. Note that past editions of this table have not considered unglazed water collectors.

³ Per capita renewable power capacity ranking considers only those countries that place among the top 20 worldwide for total installed renewable power capacity, not including hydropower.

⁴ Country rankings for hydropower capacity and generation differ because some countries rely on hydropower for baseload supply whereas others use it more to follow the electric load and match peaks in demand.

⁵ Not including heat pumps. Rankings are based on a mix of 2010 data and more recent statistics for some countries.

⁶ Capacity, otherwise noted.

Note: Most rankings are based on absolute amounts of investment, power generation capacity or output, or biofuels production; if done on a per capita, national GDP, or other basis, the rankings would be quite different for many categories (as seen with per capita rankings for renewable power, solar PV, wind, and solar water collector capacity).

With the rising awareness that off-grid, low-income customers can provide fast-growing markets for goods and services, and with the emergence of new business and financing models for serving them, rural energy markets are increasingly being recognised as offering potential business opportunities. Many companies have become active across Africa, Asia, and Latin America, selling household-level renewable energy systems and devices. Commercial lenders, social venture capitalists, local and international development entities, governments, and others are actively engaged in the financing of distributed renewable energy. In 2013, levels of participation and progress varied from country to country depending on support policies, broader legal frameworks, and political stability.

MARKET AND INDUSTRY TRENDS

BIOMASS FOR HEAT, POWER, AND TRANSPORT. Biomass demand continued to grow steadily in the heat, power, and transport sectors. Total primary energy consumption of biomass reached approximately 57 exajoules (EJ) in 2013, of which almost 60% was traditional biomass, and the remainder was modern bioenergy (solid, gaseous, and liquid fuels). Heating accounted for the majority of biomass use, with modern biomass heat capacity rising about 1% to an estimated 296 gigawatts-thermal (GW_{th}). Global bio-power capacity was up by an estimated 5 GW to 88 GW. Bio-power generation exceeded 400 Terawatt-hours (TWh) during the year, including power generated in combined heat and power (CHP) plants. Demand for modern biomass is driving increased international trade in solid biofuels, including wood pellets.

Liquid biofuels met about 2.3% of global transport fuel demand. In 2013, global production rose by 7.7 billion litres to reach 116.6 billion litres. Ethanol production was up 6% after two years of decline, biodiesel rose 11%, and hydrotreated vegetable oil (HVO) rose by 16% to 3 million litres. New plants for making advanced biofuels, produced from non-food biomass feedstocks, were commissioned in Europe and North America. However, overall investment in new biofuel plant capacity continued to decline from its 2007 peak.

GEOTHERMAL POWER AND HEAT. About 530 MW of new geothermal generating capacity came on line in 2013. Accounting for replacements, the net increase was about 455 MW, bringing total global capacity to 12 GW. This net capacity growth of 4% compares to an average annual growth rate of 3% for the two previous years (2010–12). Direct use of geothermal energy—for thermal baths and swimming pools, space heating, and agricultural and industrial processes—is estimated to exceed 300 petajoules (PJ) annually, but growth is not robust. Governments and industry continued to pursue technological innovation to increase efficient use of conventional geothermal resources. In parallel, the use of low-temperature fields for both power and heat continued to expand, increasing the application of geothermal energy beyond high-temperature locations.

HYDROPOWER. Global hydropower generation during the year was an estimated 3,750 TWh. About 40 GW of new hydropower capacity was commissioned in 2013, increasing total global capacity by around 4% to approximately 1,000 GW. By far the most capacity was installed in China (29 GW), with significant capacity also added in Turkey, Brazil, Vietnam, India, and Russia. Growth in the industry has been relatively

steady in recent years, fuelled primarily by China's expansion. Modernisation of ageing hydropower facilities is a growing global market. Some countries are seeing a trend towards smaller reservoirs and multi-turbine run-of-river projects. There also is increasing recognition of the potential for hydropower to complement other renewable technologies, such as variable wind and solar power.

OCEAN ENERGY. Ocean energy capacity, mostly tidal power generation, was about 530 MW by the end of 2013. In preparation for anticipated commercial projects, a handful of pilot installations were deployed during the year for ongoing tests. Particularly in the United Kingdom and France, there are indications that significant capacity growth will occur in the near future, due to concerted industry focus and government support. Major corporations continued to consolidate their positions in the ocean energy sector through strategic partnerships and acquisitions of technology developers.

SOLAR PHOTOVOLTAICS (PV). The solar PV market had a record year, adding more than 39 GW in 2013 for a total exceeding 139 GW. China saw spectacular growth, accounting for nearly one-third of global capacity added, followed by Japan and the United States. Solar PV is starting to play a substantial role in electricity generation in some countries, particularly in Europe, while lower prices are opening new markets from Africa and the Middle East to Asia and Latin America. Interest continued to grow in corporate- and community-owned systems, while the number and size of utility-scale systems continued to increase. Although it was a challenging year for many companies, predominantly in Europe, the industry began to recover during 2013. Module prices stabilised, while production costs continued to fall and solar cell efficiencies increased steadily. Many manufacturers began expanding production capacity to meet expected further growth in demand.

CONCENTRATING SOLAR THERMAL POWER (CSP). Global CSP capacity was up nearly 0.9 GW (36%) in 2013 to reach 3.4 GW. While the United States and Spain remained the market leaders, markets continued to shift to developing countries with high levels of insolation. Beyond the leading markets, capacity nearly tripled with projects coming on line in the United Arab Emirates, India, and China. An increasing range of hybrid CSP applications emerged, and thermal energy storage continued to gain in importance. Industry operations expanded further into new markets, and global growth in the sector remained strong, but revised growth projections and competition from solar PV in some countries led a number of companies to close their CSP operations. The trend towards larger plants to take advantage of economies of scale was maintained, while improved design and manufacturing techniques reduced costs.

SOLAR THERMAL HEATING AND COOLING. Solar water and air collector capacity exceeded 283 GW_{th} in 2012 and reached an estimated 330 GW_{th} by the end of 2013. As in past years, China was the main demand driver, accounting for more than 80% of the global market. Demand in key European markets continued to slow, but markets expanded in countries such as Brazil, where solar thermal water heating is cost competitive. The trend towards deploying large domestic systems continued, as did growing interest in the use of solar thermal technologies for district heating, cooling, and industrial applications. China maintained its lead in the manufacture of

solar thermal collectors. International attention to quality standards and certification continued, largely in response to high failure rates associated with cheap tubes from China. Europe saw accelerated consolidation during the year, with several large suppliers announcing their exit from the industry. Industry expectations for market development are the brightest in India and Greece.

WIND POWER. More than 35 GW of wind power capacity was added in 2013, for a total above 318 GW. However, following several record years, the market was down nearly 10 GW compared to 2012, reflecting primarily a steep drop in the U.S. market. While the European Union remained the top region for cumulative wind capacity, Asia was nipping at its heels and is set to take the lead in 2014. New markets continued to emerge in all regions, and, for the first time, Latin America represented a significant share of new installations. Offshore wind had a record year, with 1.6 GW added, almost all of it in the EU. However, the record level hides delays due to policy uncertainty and project cancellations or downsizing.

The wind industry continued to be challenged by downward pressure on prices, increased competition among turbine manufacturers, competition with low-cost gas in some markets, reductions in policy support driven by economic austerity, and declines in key markets. At the same time, falling capital costs and technological advances increased capacity factors, improving the cost-competitiveness of wind-generated electricity relative to fossil fuels. The offshore industry continued to move farther from shore and into deeper waters, driving new foundation designs and requiring more-sophisticated vessels.

The past decade has set the wheels in motion for a global transition to renewables, but a concerted and sustained effort is needed to achieve it. With increasingly ambitious targets and innovative policies, renewables can continue to surpass expectations and create a clean and sustainable energy future.

MAINSTREAMING RENEWABLES: KEY FINDINGS FOR POLICYMAKERS

As the 2014 GSR clearly demonstrates, the question is no longer whether renewables have a role to play in the provision of energy services, but rather how we can best increase the current pace of deployment to achieve a 100% renewables future with full energy access for all. For this to become reality, current thinking needs to change: continuing with the status quo of a patchwork of sometimes contradictory policies and actions is no longer sufficient. Instead, technology and market developments, finance models, as well as stable and predictable renewable energy policies need to be systematically linked across the public and private sectors in order to support and drive the transition process.

Facilitating more-rigorous adaptation of the energy system to increase shares of renewable energy

Today, the penetration of renewables is no longer a question of technology or economics but one of developing more flexible markets and smarter energy systems. Thus, the policy focus should be on transforming power grids to become more flexible, increasing demand-side integration, and integrating power systems with transport, buildings, industry, and heating and cooling sectors, with the support of regulations, business, and finance models.

Support policies such as feed-in-tariffs or premiums have been primary drivers of renewable energy market growth so far and have proven to be excellent market-introduction policies. With increasing renewable energy shares, however, support policies need to evolve. New policies are needed to restructure the electric power and heating markets, and to develop regulations to provide a fair and efficient basis for blending centralised and distributed generation with demand-flexibility measures. Thus, thinking about future energy systems needs to focus on *how* existing infrastructure must be adapted and enhanced with ongoing integration of large shares of renewable energy—not *whether* or not this should be done.

Creating a level playing field for the entire energy sector

Global subsidies for fossil fuels and nuclear power remain high despite reform efforts. The exact level of subsidies is unknown; estimates range from USD 544 billion (World Bank) to USD 1.9 trillion per year (International Monetary Fund), depending on how "subsidy" is defined and calculated. Whatever number is chosen, the fact is that subsidies for fossil fuels and nuclear

iii - This section has been established to assist policymakers in the development of renewable energy and in the move towards a renewable energy transition. It presents conclusions that have emerged from key renewable energy developments in 2013. The section draws from data in GSR 2014 as well as other resources.

power are significantly higher than financial support for renewables. Frequently, governments do not know how much they spend to subsidise fossil fuels, as many forms of support are often not quantified. Where information does exist, it is often scattered across various ministries, making it difficult to assess. These problems are exacerbated by poor budgetary transparency and limited resources for data gathering. Creating a level playing field can lead to a more-efficient allocation of financial resources, helping to strengthen initiatives for the development and implementation of energy efficiency and renewable energy technologies. Removing fossil-fuel and nuclear subsidies globally would better reflect the true cost of energy generation.

Securing stable policy frameworks for renewables

Globally, policies have largely driven the expansion of renewable energy. Since 2004, the number of countries promoting renewables through direct policy support has nearly tripled, and an ever-increasing number of developing and emerging countries is setting renewable energy targets and enacting supporting policies. However, recent years have also seen policy regression, with some countries reducing renewable energy support, at times retroactively, slowing market and industry development. Stability and predictability of policy frameworks are needed to underpin sustained deployment of renewable energy. Policymakers need to ensure that these frameworks are not short-lived but are designed to establish continuity. The uptake of renewables is necessary not only to mitigate climate change but also to drive universal energy access.

Harnessing local action to ensure global renewable energy uptake

Over the past decade, local governments have become leaders in the advancement of renewable energy—particularly in combination with energy efficiency improvements—regularly exceeding efforts taken by state, provincial, and national governments. Motivated to create local jobs, reduce energy costs, address pollution issues, and advance their sustainability goals, hundreds of local governments worldwide have set renewable energy targets and enacted fiscal incentives or other policies to foster the deployment of renewables. Around the world, governments at the community, city, regional, island, and even country levels have begun to forge their own transition pathways towards a 100% renewable energy future. A better linking of local renewable energy developments with those at the national level will be key for driving the energy transition.

Ensuring long-term and differentiated policies to sustain and increase investment levels

Investment levels and regional allocation have shifted considerably over the past couple of years, with certain regions emerging as investment leaders. Developing and developed countries alike saw reductions in renewable energy investments during 2013, due largely to unstable policy frameworks, but also due to decreasing per-unit costs of renewable energy technologies. As solar, wind, biomass, and other energy sources gain market share, the levelised cost of energy (LCOE) is becoming an important metric in the decision-making process for building new power generation. Strong policy signals from governments are essential to ensure that renewables are a central component of national energy supply chains. Achieving

universal access will take bold, diverse policy action aimed at doubling or tripling current financial flows.

Paying greater attention to the heating and cooling and the transport sectors

To achieve the transition towards renewable energy, more attention needs to be paid to the heating and cooling and transport sectors, as well as to integrated approaches that facilitate the use of renewables in these sectors. Globally, heating and cooling accounts for almost half of total global energy demand. However, this sector continues to lag far behind the renewable power sector when it comes to policies that support technology development and deployment. Experience has shown that well-designed support policies have been highly effective in increasing the market expansion of renewable heating and cooling technologies. Mandatory regulations in the building sector can help increase the penetration of renewable heating and cooling technologies. Improving the accuracy of national data collection on heating and cooling supply and demand is also important. The distributed nature of heat supply and local demand make it difficult to know what sources are available and what is needed; this information is crucial for good policy development.

Improving energy data to monitor advancements in achieving a renewable energy transition

Reliable, timely, and regularly updated data on renewable energy are essential for establishing energy plans, defining targets, designing and continuously evaluating policy measures, and attracting investment.

The data situation for renewable energy has improved significantly in recent years. Better record-keeping and accessibility, and advances in communication and collection methods have contributed greatly to this development. Nonetheless, a number of significant challenges still remain.

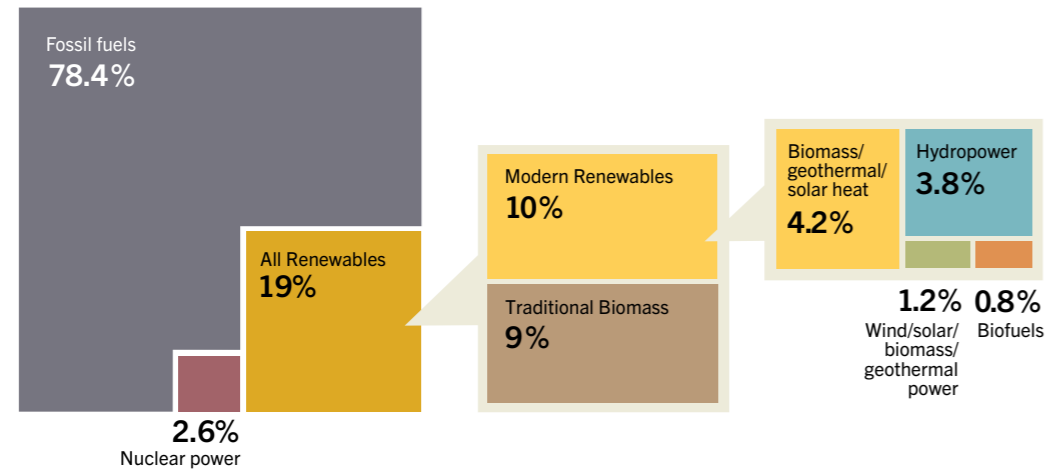
Untimeliness as well as poor data availability, accessibility, and quality cause data gaps, especially for technologies characterised by small-scale installations and a distributed nature.

To overcome some of these existing data gaps, it is essential to develop innovative and collaborative approaches to data collection, processing, and validation. Until recently, "acceptable data" have been limited to official statistics (formal data). For an accurate and timely understanding of the status of the renewable energy sector, official renewable energy data need to be supplemented by informal data. The addition of informal data can improve coverage of sectors and regions and helps resolve the lack of data; it requires, however, the inclusion of previously uninvolved actors from varying sectors. Many of these individual or institutional actors typically have already engaged in some form of data collection but are unaware of the importance of their data or lack the means of sharing them.

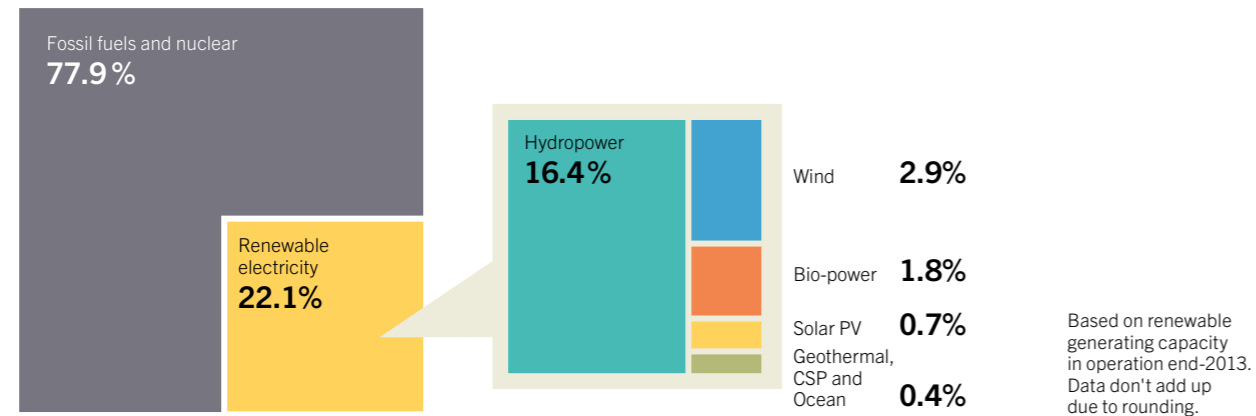
Additionally, cross-sector methods and approaches for data collection must be considered. By utilising links between energy and other sectors, such as health and agriculture, data gaps can be filled and data quality improved. There is a critical need to broaden the definition of renewable energy data, to collect data in a regular and more systematic manner, and to increase transparency.

SELECTED FIGURES & TABLES GSR 2014

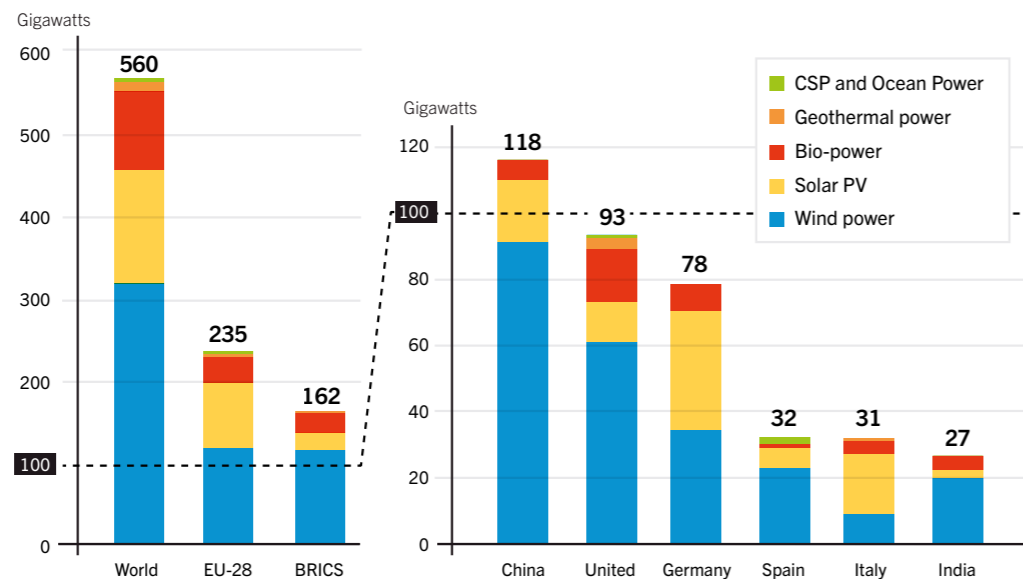
Estimated Renewable Energy Share of Global Final Energy Consumption, 2012



Estimated Renewable Energy Share of Global Electricity Production, End-2013



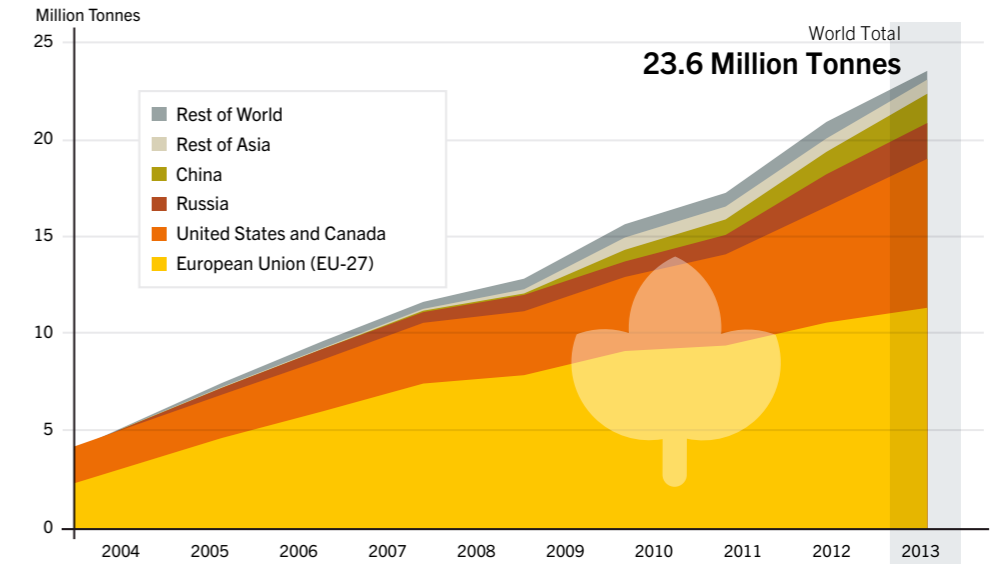
Renewable Power Capacities EU-28, BRICS, and Top Six Countries, 2013



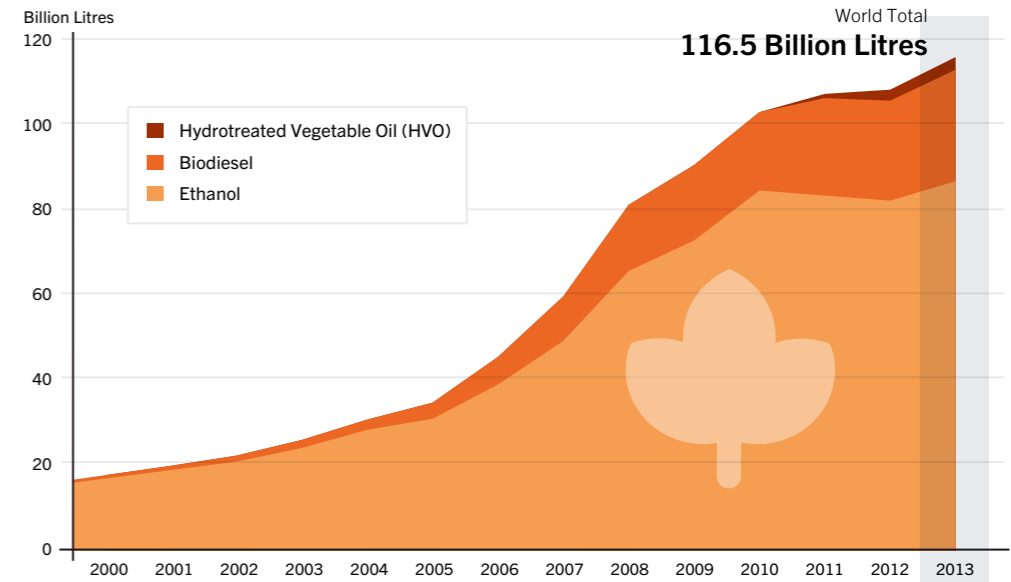
BIOMASS

GEO THERMAL POWER

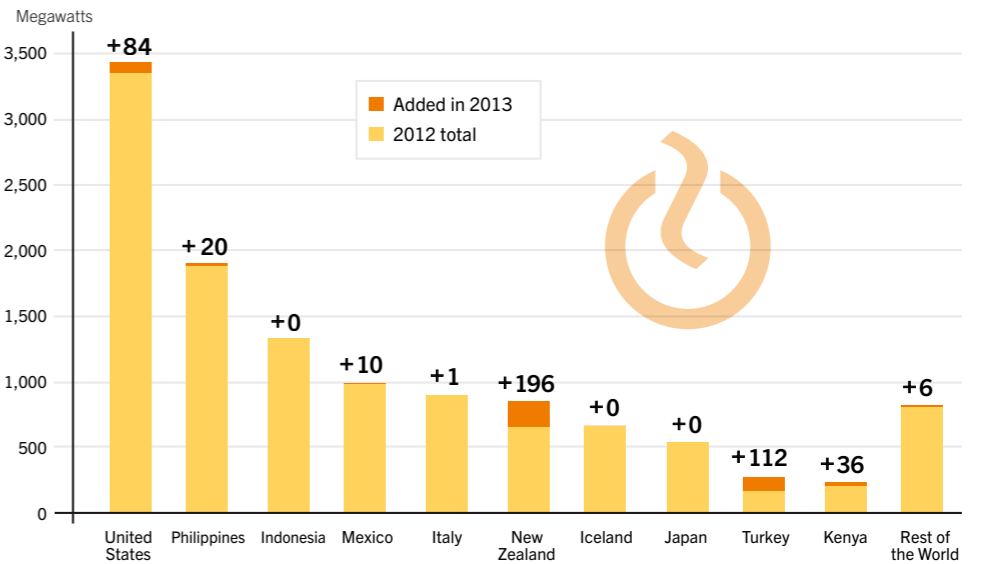
Wood Pellet Global Production, by Country or Region, 2004-2013



Ethanol, Biodiesel, and HVO Global Production, 2000-2013

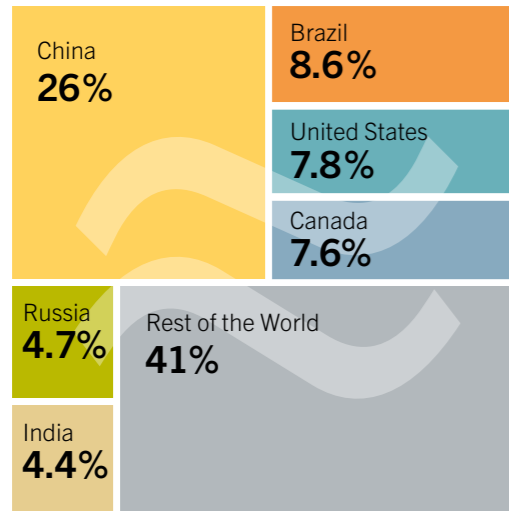


Geothermal Power Capacity and Additions, Top 10 Countries and Rest of World, 2013



HYDROPOWER

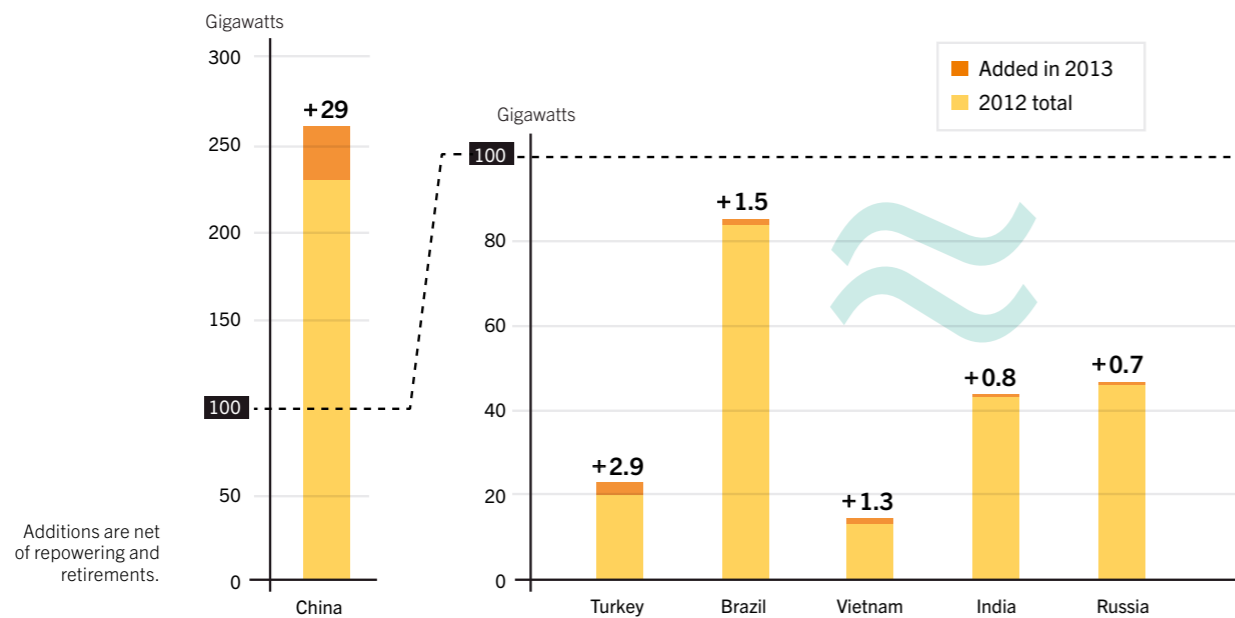
Hydropower Global Capacity, Shares of Top Six Countries, 2013



Global capacity reaches **1,000 GW**

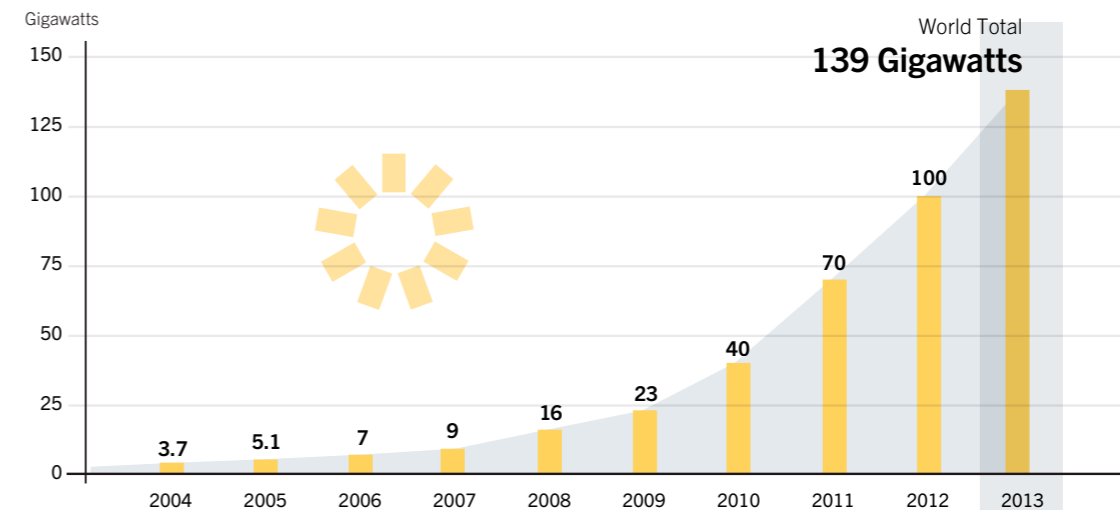


Hydropower Global Capacity Additions, Shares of Top Six Countries, 2013

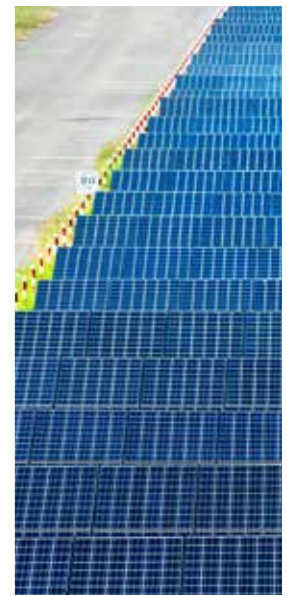
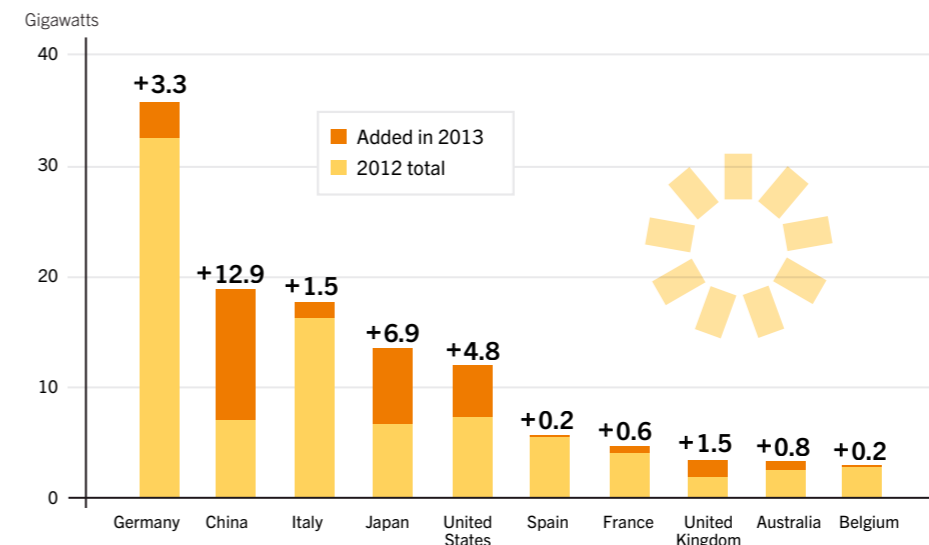


SOLAR PV

Solar PV Total Global Capacity, 2004–2013

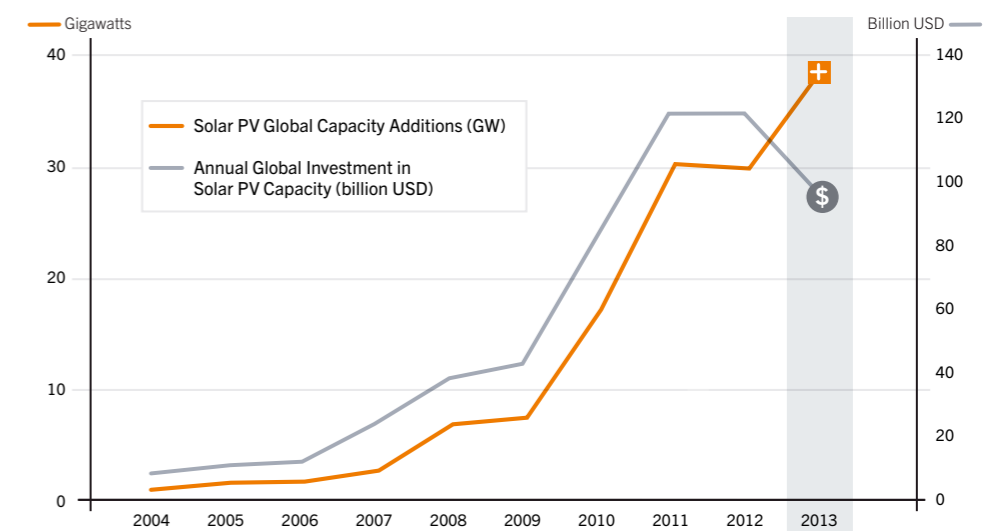


Solar PV Capacity and Additions, Top 10 Countries, 2013



2013:
SOLAR PV INVESTMENT
-22%
SOLAR PV ADDITIONS
+32%

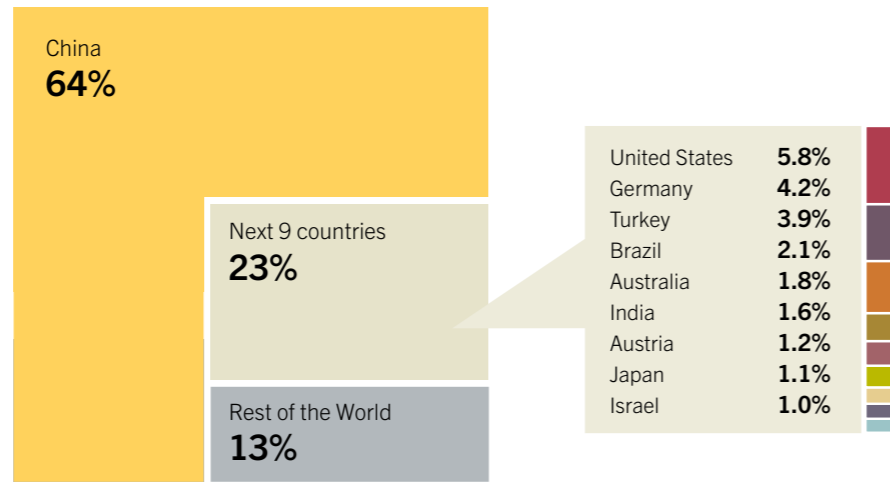
Solar PV Global Capacity Additions and Annual Investment, 2004–2013



SOLAR WATER HEATING

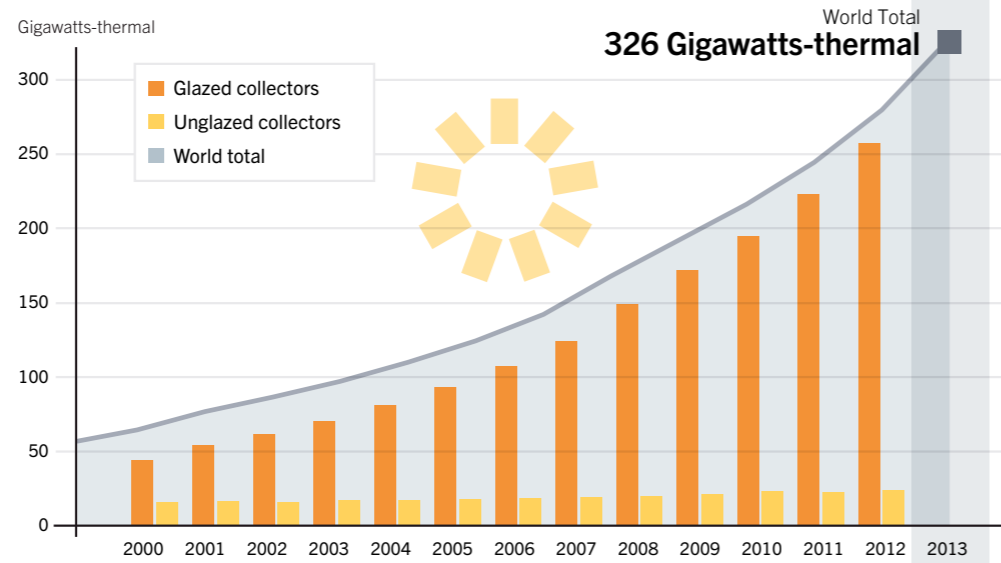
CSP

Solar Water Heating Collectors Global Capacity, Shares of Top 10 Countries, 2012



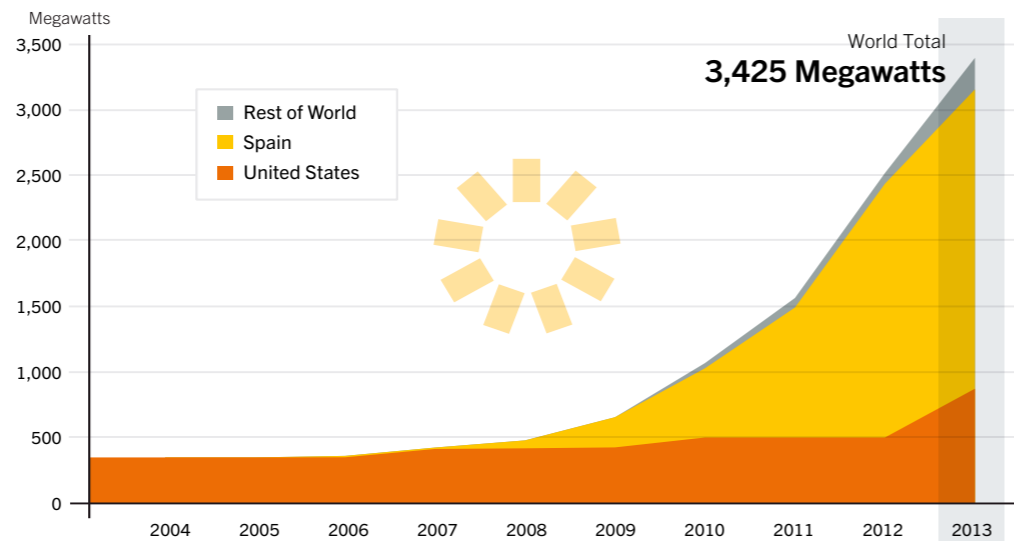
Based on total of ~281.6 GW_{th} glazed and unglazed water collectors. Data are for solar water collectors only (not including air collectors).

Solar Water Heating Collectors Global Capacity, 2000–2013



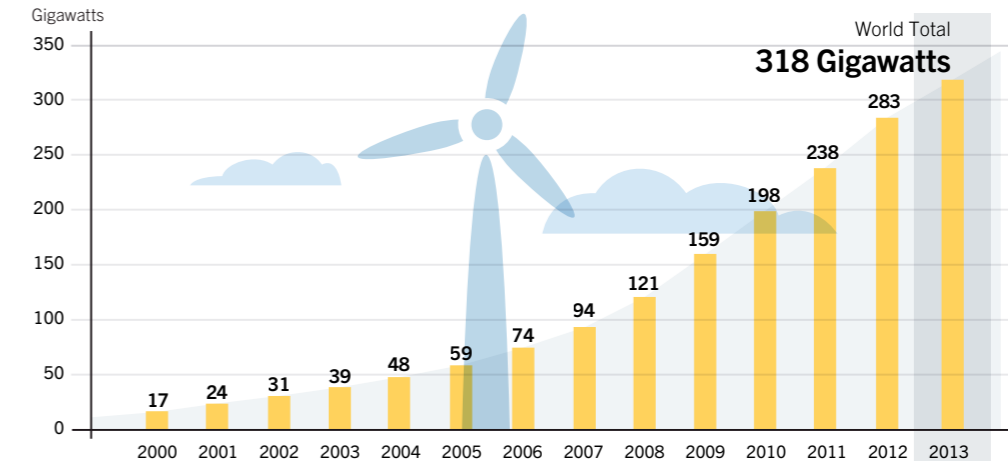
Data are for solar water collectors only (not including air collectors).

Concentrating Solar Thermal Power Global Capacity, by Country or Region, 2004–2013



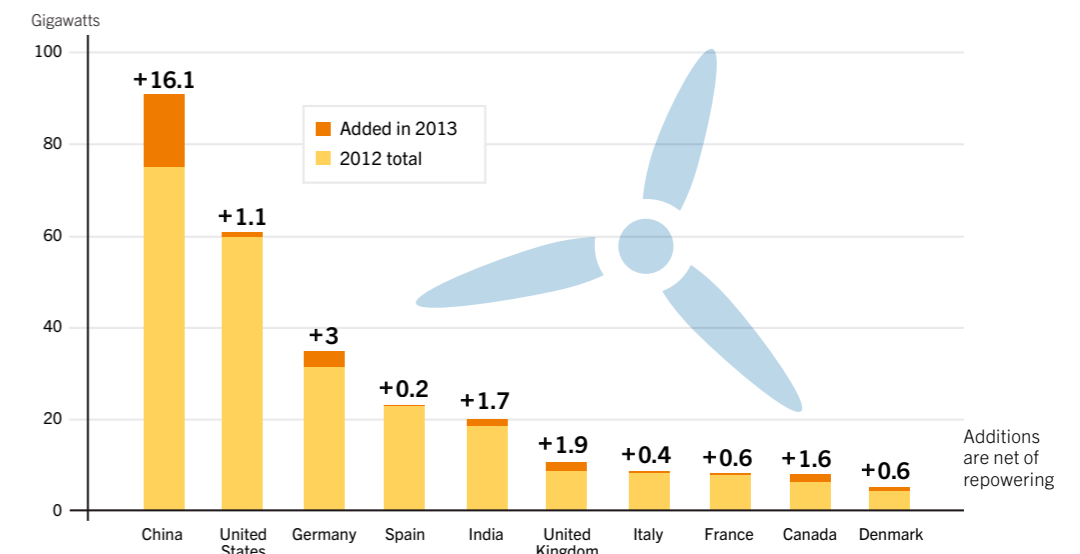
WIND POWER

Wind Power Total World Capacity, 2000–2013

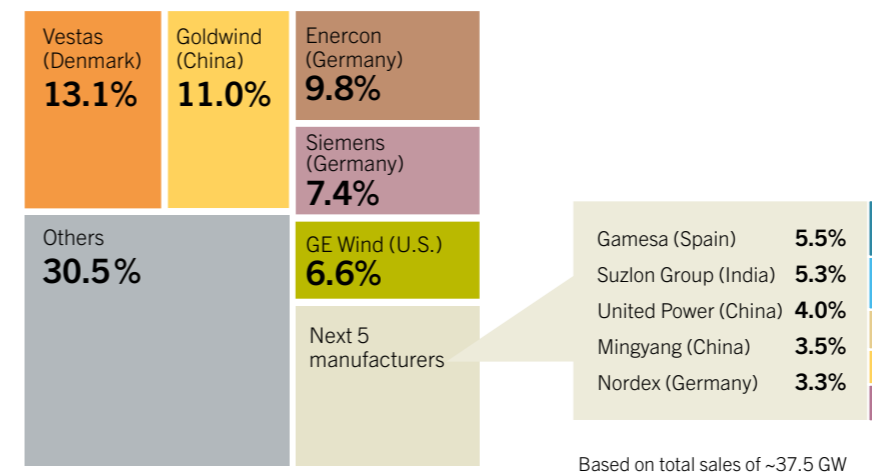


71 countries have more than 10 MW, 24 countries have more than 1GW INSTALLED

Wind Power Capacity and Additions, Top 10 Countries, 2013



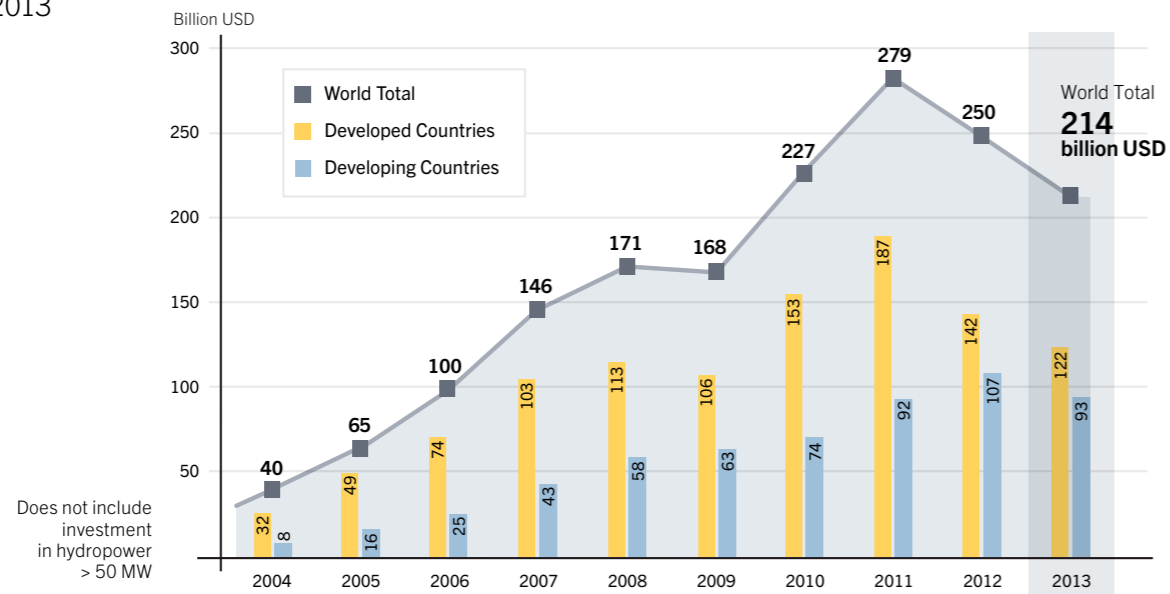
Market Shares of Top 10 Wind Turbine Manufacturers, 2013



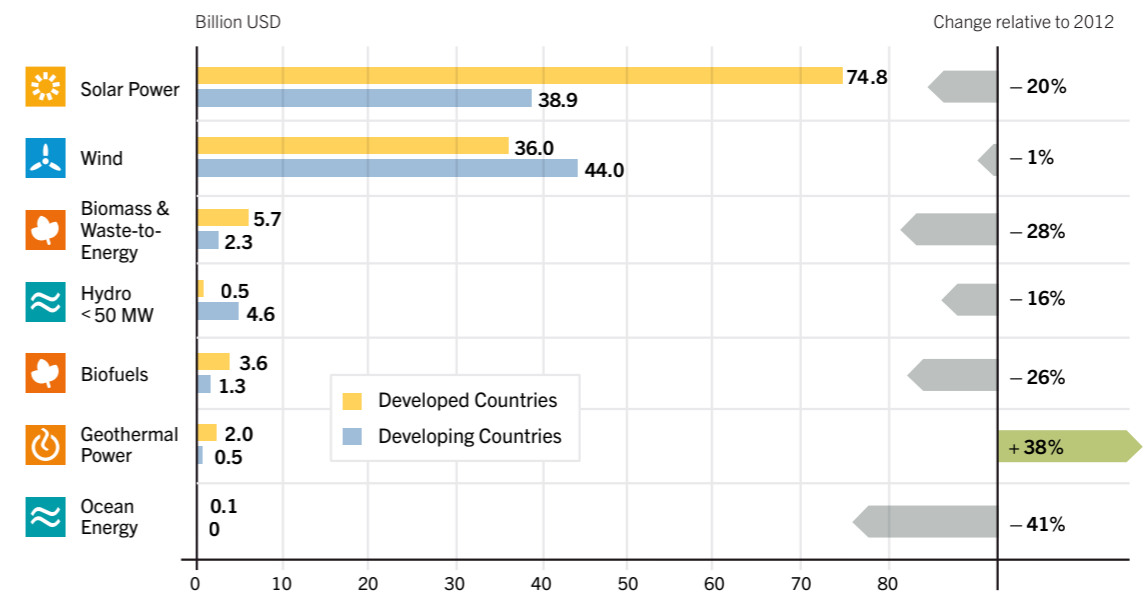
Share of DENMARK'S ELECTRICITY COVERED BY WIND IN 2013: 33.2%

INVESTMENT FLOWS

Global New Investment in Renewable Power and Fuels, Developed and Developing Countries, 2004-2013

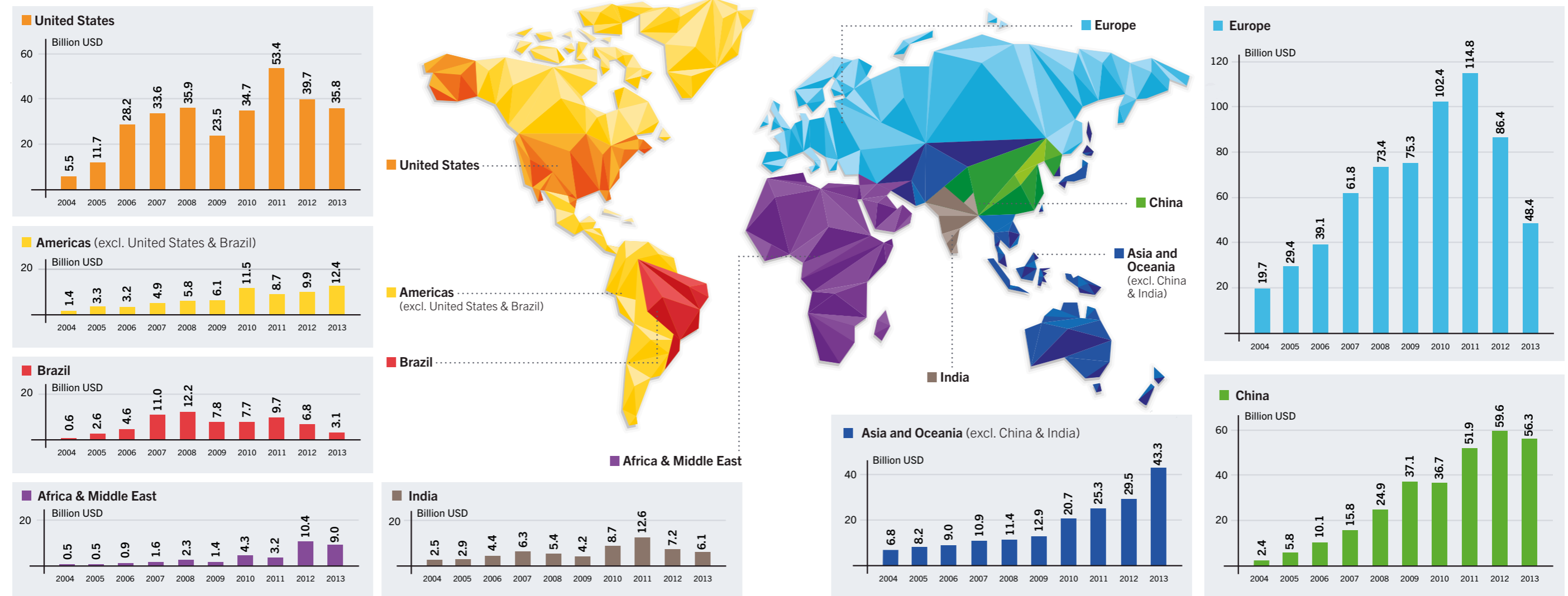


Global New Investment in Renewable Energy by Technology, Developed and Developing Countries, 2013



Global New Investment in Renewable Power and Fuels by Region, 2004-2013

Data include government and corporate R&D.



Data source: UNEP FS/ BNEF Global Trends in Renewable Energy Investment 2014

JOBS IN RENEWABLE ENERGY

Jobs in Renewable Energy



i - Employment information for large-scale hydropower is incomplete and not included.

Estimated Direct and Indirect Jobs in Renewable Energy Worldwide, by Industry

	World	China	Brazil	United States	India	Bangladesh	European Union ^m		
							Germany	Spain	Rest of EU
Thousand Jobs									
Biomass ^{a,b}	782	240		152 ^h	58		52	44	210
Biofuels	1,453	24	820 ^f	236 ⁱ	35		26	3	82
Biogas	264	90			85	9.2	49	0.5	19
Geothermal ^a	184			35			17	1.4	82
Hydropower (Small) ^c	156		12	8	12	4.7	13	1.5	18
Solar PV	2,273	1,580 ^e			112	100 ^k	56	11	153
CSP	43			143 ^j			1	28	0
Solar Heating / Cooling	503	350	30 ^g		41		11	1	31
Wind Power	834	356	32	51	48	0.1	138	24	166
Total	6,492^d	2,640	894	625	391	114	371^l	114	760

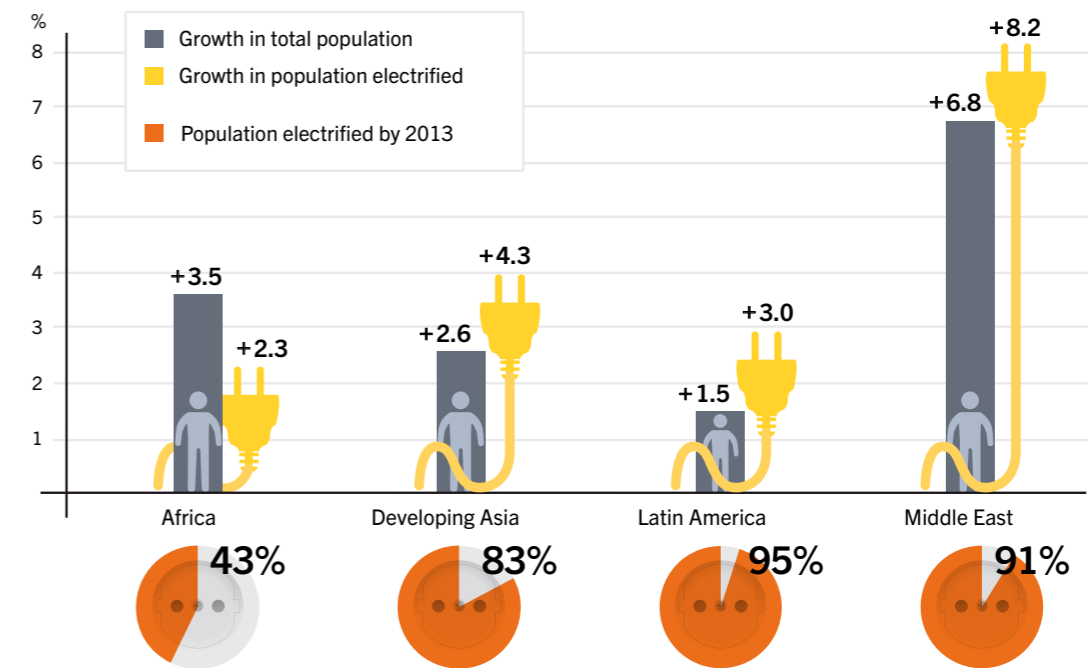
Data source: IRENA

a - Power and heat applications. **b** - Traditional biomass is not included. **c** - Employment information for large-scale hydropower is incomplete, and therefore focuses on small hydro. Although 10 MW is often used as a threshold, definitions are inconsistent across countries. **d** - The total for "World" is calculated by adding the individual totals of the technologies. **e** - Previous estimates were substantially lower (in the 300,000–500,000 range), but installation jobs have expanded massively. **f** - About 331,000 jobs in sugar cane and 208,000 in ethanol processing in 2012; also includes 200,000 indirect jobs in equipment manufacturing, and 81,800 jobs in biodiesel. **g** - Equipment manufacturing; installation jobs not included. **h** - Biomass power direct jobs run only to 15,500. **i** - Includes 173,667 jobs for ethanol and 62,200 jobs for biodiesel in 2013. **j** - All solar technologies combined, with solar PV estimated at close to 100,000 jobs. **k** - Direct jobs only. **l** - Data for 2013. Includes 8,000 jobs in publicly funded R&D and administration; not broken down by technology. **m** - All data are from 2012, except for Germany. The "World" total and the "Rest of EU" total are calculated using the EU country data for 2012 (even if 2013 data for a specific country are available, e.g., Germany).

Note: Data are principally for 2012–2013, with dates varying by country and technology. Some of the data for India and China are older. Totals may not add up due to rounding.

DISTRIBUTED RENEWABLE ENERGY IN DEVELOPING COUNTRIES

Share of Population with Electricity Access, and Rate of Electrification v. Population Growth



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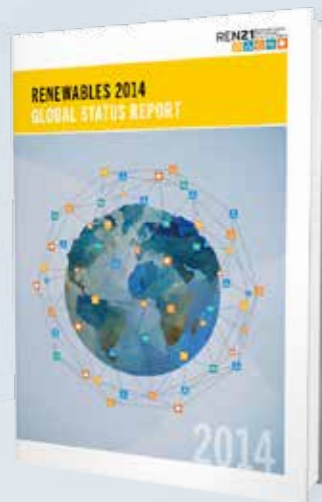
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KEY FINDINGS 2014

RENEWABLES 2014 GLOBAL STATUS REPORT

RENEWABLES 2014 GLOBAL STATUS REPORT

For further details and access to the full report and references, visit www.ren21.net/gsr



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KEY FINDINGS 2014