

RENEWABLE ENERGY

KEYS, DATA, HISTORY AND DEVELOPMENT
OF CLEAN SOURCES



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01

A wide-angle photograph of a solar farm. Numerous blue solar panels are arranged in long rows across a green field. The perspective leads the eye towards a bright blue sky in the background.

Renewable energy is
gaining ground... except in Spain

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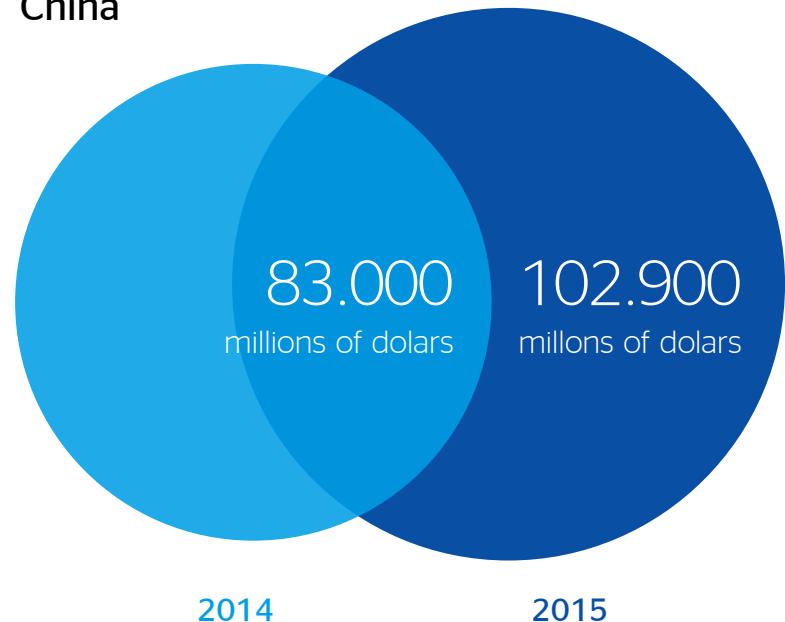


The planet's survival is an issue over which, by definition, all interests converge. After wasting precious decades and, with some exceptions, renewable energy finally seems to be managing to get politicians, businesses and citizens to unite and fight for a common cause.

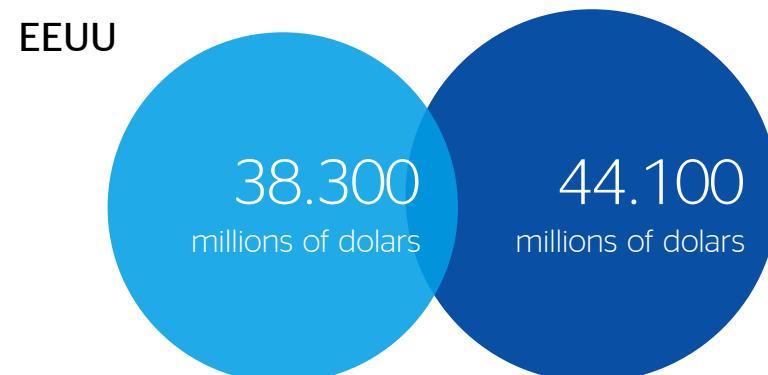
According to numerous recent reports and articles, **thanks to renewable energy, CO₂ emissions are under control and remain at stable** despite economic growth and dwindling oil prices.

This key drivers behind this trend are the **investments** that are being pledged by countries such as China (\$102.9 billion invested in 2015, compared to \$83 billion the previous year) and the United States (\$44.1 billion in 2015 vs. \$38.3 billion in 2014).

China



EEUU



The BRICS (an acronym that stands for **Brazil, Russia, India, China and South Africa**), are also playing a key role in the development of renewable energy. This group of countries is investing in the development of **wind farms, solar parks and biofuel plants** production capacity of over 1 million liters, according to the [Renewable Energy Report 2016](#) published by [REN21](#), the most quoted source in the field of renewable energies.

Renewable energy increased from 1,701 GW (GigaWatts) in 2014 to 1,849 GW in 2015. Among renewable energy sources, wind energy and hydropower have led the market that already accounted for 23.7% of energy consumed at the end of 2015, according to the aforementioned report. On the other hand, sectors that still require greater effort , due to their environmental impact are **climate control** and **transport**.



Overlapping criteria

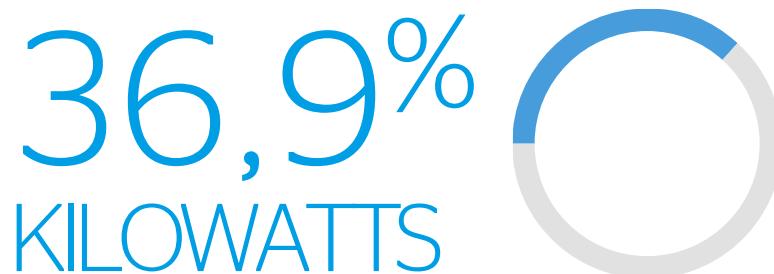
The renewable energy sector is in the midst of a vibrant stage that combines all the ingredients of a race that, with exceptions such as Spain in 2015, is growing and gaining traction in all its modalities. But maybe more than referring to a race, we should be talking about an Olympics due to the broad range of fields involved and its universal nature.

But many **economic, geographic, political, environmental, business and, also, ideological** interests overlap. Thus, things that excite environmentalists discourage investors; what in Spain is banned is subsidized in the US, and yesterday's utopia is today's priority.



Spain's collapse

"There was less wind and less rainfall than in 2014, but, last year, renewable energy sources - wind, water, sun, biomass - were one of the main sources of electricity in Spain.



Up to 36.9% of the total amount of kilowatts used in the country came from clean energy sources.

Lagging far behind in second place, nuclear energy generated (besides certain waste that will take thousands of years to decay), 21.8% of the electricity", according to the [Spanish Electricity System 2015 Report](#).

This quote makes reference to the same year 2015 that is widely regarded, by almost all analysts, as the worst for the development of renewable energies in Spain.

It may be a question of perspective, but [hardly any sources](#) have endorsed the latest Renewable Energy Law passed in June 2015.

The fact is that the **drop in renewable energy consumption** in 2015 was a result of combination of factors, including four years of investor hiatus, the Renewable Energy Law entering into force, and cutbacks affecting the solar industry. The unanimity with which the business leaders of the industry rejected the latest batch of measures and the resulting dramatic drop in investments, paints a grim landscape in Spain which, in the meantime, will be facing

over 20 arbitration processes in the International Centre for Settlement of Investment Disputes ([ICSID](#)), the [Stockholm Chamber of Commerce](#) and [Uncitral](#).

According to by Greenpeace, the breach of emission reduction targets will cost Spain an estimated €100 million in fines, and several hundred million more in [purchases of carbon emission rights](#).



China and the United States, leading the way.

The collapse of investments in Spain justifies a pessimism that is in stark contrast with other countries' booming activity.

In regions such as the United States, China or Latin America, investments and **subsidies, technologies and collective awareness** are beginning to generate a feeling among society that conventional sources of energy, such as fossil and oil, can be replaced before they are exhausted. Indeed, the status of renewable energies shifts radically depending on the region, country, point in time or source of information source.

Technological development, political contexts and business needs and opportunities are prone to constant and sharp fluctuations, and as interests differ and often conflict, situation assessments can change dramatically depending on their focus. Nearly 148 new gigawatts from clean sources began working last year, the equivalent of Africa's entire generating capacity. In economic terms, investments stood at \$286 billion (a bit over €250 billion), with **China and the United States as the main drivers of the world's renewable market**, according to REN21. According to this report, activity in the United States has also had its share of ups and downs, with wind power investments dropping sharply in 2014 due to climate instability.

According to this report, activity in the United States has also had its share of ups and downs, with wind power investments dropping sharply in 2014 due to climate instability. In the US, where each state is allowed to pass their own laws, this flexibility allows adapting laws to each region's reality. In short, it can be said that there is a consensus regarding the need to progressively stop using finite and polluting sources and turn to clean sources of energy. It is also evident that increasingly cheaper technologies will bolster their development and encourage investment. But the unstoppable growth of energy consumption at a global scale, means this trend toward clean energy should not be overlooked.



02

Legislation, the essential framework for the development of renewable energy

[See Website](#)



Our planet's health depends on the awareness and collaboration from every single person in it. It depends on the adoption of clean and renewable energies that replace finite and polluting sources. Political and climatological factors also have an impact, but technological development and the laws that support and drive their adoption are indispensable.

Barely one year ago, during the National Clean Energy Summit held in Nevada, U.S. President **Barak Obama** officially called for the need to **promote the use of green energy**. While he presented [Walmart](#), [Google](#) and [Apple](#) as examples of some of the leading U.S. companies that were betting on clean power sources, he also denounced the efforts by the traditional energy sector to hamper the development of renewable energy, and stressed the need to promote self-consumption among individuals.

The United States seems determined to implement a number of actions to **introduce and promote the use of renewable energies**.

“

These companies are all for free market and suddenly you're not for it anymore”

BARAK OBAMA
President of United States

The United States' 2005 Energy Efficiency Policy offers consumers and federal companies tax incentives to purchase hybrid electric vehicles, build and renovate buildings and buy energy-efficient devices and products.



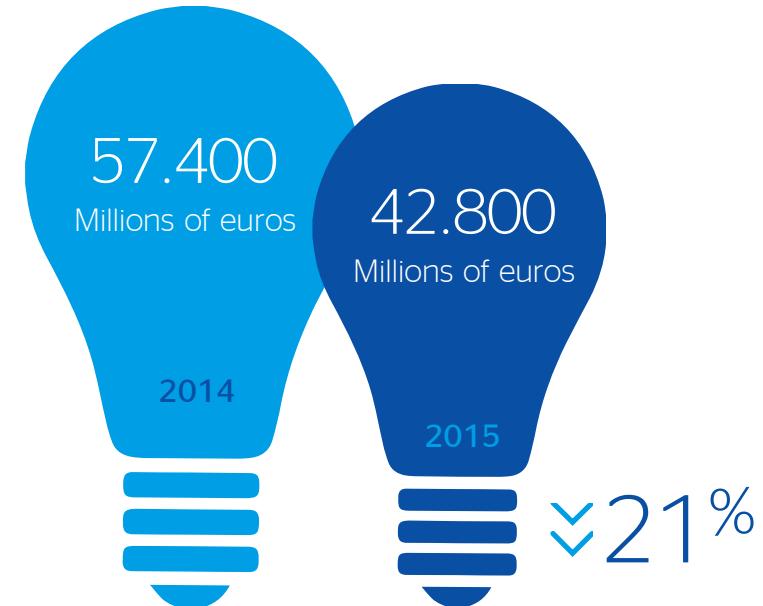
Also, a series of highly valuable research and development investments are being carried out.

These initiatives have succeeded at encouraging institutions, companies and users to embrace the concept of **energy efficiency**. All these programs are backed by the U.S. Department of Housing and Urban Development (HUD), which offers supervisory and technical support services. The Federal Housing Administration (FHA), on the other hand, is responsible for managing the budget and budget allocation among involved communities and companies, as explained in [Xataka](#)'s website.

Another thriving region is Latin America, where, according to inter-governmental organization [IRENA \(International Renewable Energy Agency\)](#), **activity in the renewable energy field is growing fast**, and these technologies are garnering increasing levels of attention. Finally, **China** has become the world's top investor in renewable energy.

According to the Foundation for Energy Efficiency, **Europe** is the exception and is currently **swimming upstream**. According to a UN report, in 2015 the budget allocated to energy efficiency **decreased by 21%**, from €57.4 billion in 2014 to €42.8 billion.

And Spain seems to be one of the most adamant advocates of this European stance against the worldwide trend.



Indeed, **investments and expectations plunged** in the country over that same period of time, mainly as a result of the recently enacted renewable energy laws.

Recent legislation

With Spain's [**Royal Decree 900/2015 entering into force on October 9th**](#), "consumers covered by any self-consumption modality will be subjected to distribution and transport grid access fees to contribute to cover the costs of said networks, and will be charged based on actual network usage.

"Paradoxically, this decree contradicts the guidelines of the European Parliament mentioned at the beginning of the decree; [**Directive 2009/28/CE, of the European Parliament and the Council, of 23 April 2009**](#), on the promotion of the use of energy from renewable sources and amending and subsequently repealing

Directives 2001/77/EC and 2003/30/EC, established the "the obligation to **streamline and expedite administrative procedures** for the authorization and connection.

"Therefore, entrepreneurs, consumers and experts have unanimously criticized these regulations, which were announced last year and had an immediate and profound impact on the sector. In this regard, the [**Association of Renewable Energy Companies**](#) (APPA) announced that it will exhaust all legal and administrative avenues to defend the interests of its members.

Tax policies

Indian climatologist Veerabhadran Ramanathan, Professor of Atmospheric Science at Scripps Institution of Oceanography (University of California, San Diego) and recognized in the 8th edition of the [BBVA Foundation's Frontiers of Knowledge Awards](#) in the category of Climate Change, shared his view on the Spanish government's stance: "**Some taxes do not benefit solar power and that is a mistake. It is fossil fuels that should be taxed**, not renewable sources," he explained in a recent interview with Europa Press.



Some taxes do not benefit solar power and that is a mistake"

VEERABHADRAN RAMANATHAN
Professor of Atmospheric Science at Scripps
Institution of Oceanography

During that same interview, Ramanathan argued that Spain was in position to become “the new Saudi Arabia” thanks to its potential capacity to export clean energy. **Ramanathan** underscored that the **targets** set individually by the countries were **too weak** to make a significant difference. That is why it is now that the biggest share of

the work needs to be tackled, in order to reduce the upward sloping curve of climate change.

In his opinion, it is essential to **promote the use of renewable energy instead of fossil fuels and cut emissions of other polluting gases** which are harmful for the atmosphere, such as HFCs and methane.



Optimism and commitment

As highlighted by [UNESCO's World Water Assessment Programme](#), the **use of renewable energy sources has increased across the world**, with technical advances that have helped drive costs down.

“But since renewable energy resources alone are not **sufficient to meet the predicted dramatic increase in energy demands** through 2030, fossil fuel extraction and development of nuclear energy will continue to increase, as will their impacts on water resources and the environment.”

In short, as concluded by the Conference of Parties (COP21) of the United Nations Framework Convention on Climate Change, held in Paris on December 2015 and the

Association of Renewable Energy Companies “if there is to be a future, it must be renewable.”



03

A silhouette of a person running on a track is centered against a blue-tinted background. The background features a grid pattern of solar panels and a landscape with mountains in the distance.

Future options
for a secure business

[See Website](#)



The need, scope and nature of renewable energy is universal, but its development across different regions is uneven, and business opportunities in the sector are a battlefield where the interests of investors, engineers, environmentalists, politicians and economists clash. Nobody seems to care what consumers - as both clients and citizens - have to say, allowed only to witness the debate as confused and voiceless spectators.

Each one of the aforementioned parts is turning into a faction opposing the other sides. Plans set out by large investors do not take into account smaller entrepreneurs, independent consultants refute the studies from big corporations, renewable energy advocates collide with peers that dare to dissent.

However, in vast areas of the world, essentially the United States, Latin America and in the Asian-Pacific basin, business opportunities and investments continue growing and diversifying.



A business that travels across the world

Is everything okay or is everything wrong? Depends on who you ask and what region you look at. Mergers and acquisitions in the renewable energy industry nearly doubled over the past year in Latin America. No other region in the world experienced a similar growth rate, according to the data collected by consulting firm PricewaterhouseCoopers in its [Power & Renewables Deals 2016 outlook and 2015 review](#), published in late February this year.” According to the same report, the Asia-Pacific region posted all-time high levels, not in growth, but in terms of renewable business transactions over the

same period. And in 2016 the number of mergers and acquisitions is expected to continue at strong rates in the region. In the rest of the world, the situation was also rich in opportunities, according to the United Nations Environmental Program in its [Global Trends in Renewable Energy Investment](#) report: “In 2015, renewable energy set new records for investment and new capacity added. Investments reached nearly \$286 billion, more than six times more than in 2004, and, for the first time, more than half of all added power generation capacity came from renewables.”

A sector with a promising future and business prospects: we just need to determine where and how

The future looks bright for renewable energy, but the alarms go off around two questions: Who has the resources to participate given the high investment levels required, and which laws will govern the investments. Spain has become the paradigm of business disappointment regarding the promotion of this type of investments. In this sense, Protermosolar, the National Association of Photovoltaic Power Producers (ANPIER) and the Spanish Photovoltaic Union (UNEF) have urged the government to “guarantee that Spanish companies and investors receive the same treatment as foreign investors under the



Spain has gone from being ranked the most attractive country in the world to invest in renewable energy in 2007, to being currently ranked at number 25”

JOSÉ MIGUEL VILLARIQ
Chairman of the APPA

Energy Charter in international arbitration processes.”

In the letter addressed to Alberto Nadal, Secretary of State for Energy, the solar industry associations mention a report that Moody's released this week, which argued that **regulatory risk for EU renewables investors is greatest in Spain**. This will undoubtedly impact the cost of new facilities, which will see much higher risk premiums compared to other countries. In fact, the Spanish sector is in turmoil; Siemens' recent acquisition of Gamesa exposed the different interests in a topic that affects everyone, and led **Fernando Ferrando, Vice President of the Renewables Foundation** and former General Manager of Gamesa Energy, to lament what he described as the loss of a leading technological company. Ferrando concluded that “[this outcome denies our](#)

[country of the role it should be playing in the new energy model based on renewable energy sources.](#)”

But the industry's anger does not stop there. **Pep Puig, Chair of Eurosolar**, went as far as to call the Secretary of State for Energy “[a good disciple of Goebbels](#)”.

Alberto Nadal not only accused self-consumers of being “predatory,” but stated that he considered the challenge to “reach a 100% renewable mix by 2050” ‘unattainable, technologically unfeasible.’

Looking past the tension, there seems to be an unanimous consensus over how investment in Spain can be encouraged. According to all experts and voices coming from all sides of the political spectrum, regulatory stability is key to build confidence among investors.

In the debate organized by the [Renewables Foundation and El Confidencial](#), even **Guillermo Mariscal, the Popular Party's spokesperson on energy matters**, agreed that regulations need to be changed, and made excuses for the current ones: "Weighted down by the tariff deficit and forced to act to prevent the system from going bankrupt, we were forced to pass a difficult and hard-hitting reform," he explained.



At a global scale

However, the global outlook remains positive; at least for the Secretary General of the United Nations, **Ban Ki Moon**, who exultantly claimed that “we have come from the impossible to the unstoppable” and admitted that the agreement on climate change was the key goal of his mandate: “Over the past nine years, I have spoken repeatedly with nearly every world leader. I have visited the climate front lines, from the Arctic to Antarctica and to the Amazon, from the Sahel to the Aral Sea.” The tone of last December’s Paris UN Climate Summit was also particularly optimistic, in contrast with previous editions. Only environmentalist delegates expressed their

skepticism while the rest of attendees celebrated the final statement. Although the goal was to limit warming to 2°, the final limit agreed was 1.5°. Sources of the World Council Business for Sustainable Development consider the agreement a positive one for the business sector, “for companies, the text is very positive because it sends a very clear message for investment in the long term.”

04



Renewable energy:
the only option for isolated
and excluded populations

[See Website](#)



Renewable energies are not just an investment opportunity, a response to the planet's urgent need for sustainability and a change that will improve our lives. They can also rescue remote populations from their isolation and help ease their problems. Microgrids are making giant strides in every corner of the world, uniting efforts and mobilizing interests.

According to **Elías Fereres Castiel**, President of the [Royal Academy of Engineering](#), in the report entitled **Technologies for human development in isolated rural communities**, technological innovation is the key to changing the situation of these human settlements. “The use of appropriate technologies tailored to local conditions has been effective in achieving the established targets, in a scenario with a predominance of social, institutional, economic, cultural and legal

aspects, among others,” says **Fereres Castiel**, referring to projects that have played a role in the inclusion of **Isolated Rural Communities** (IRCs). This expert is of the opinion that “creating opportunities for people who are isolated and excluded from everything except poverty is justified because it is in the IRC where technology can do most to further the well-being of individuals and the development of communities”.



Microgrids for making yerba mate

Although Argentina is not the most serious case of all the countries with large and inaccessible rural areas, approximately 750,000 people (most indigenous communities) have no access to electricity. This limits their social and economic opportunities, but the **World Bank's** energy expert, **Lucia Spinelli**, says it is very difficult to reach certain areas with traditional electricity services. "The advantage of renewable energies is that they can be connected in these isolated places. Once the system has been installed it can operate, and there is no need for a fuel supply to ensure access to electricity", said the expert in an article published in [El País](#)

IN ARGENTINA

750.000
PEOPLE

HAVE NO ACCESS
TO ELECTRICITY

Today around 150,000 people in remote areas of Argentina are using renewable energy sources -solar panels, hydroelectric systems and wind power- for daily tasks such as lighting their homes, charging their cell phones and even listening to the radio.

In the words of **Victoria Ojea**, online producer at the World Bank, wind, sun and water represent “the new electricity for remote communities”. But Argentina is only

one example of the projects underway. Mapuche communities in Chile generate clean, cheap and uninterrupted energy. Entasopia, a small and dusty village in the **Rift Valley** in **Kenya** -five hours from the capital, Nairobi, and 48 kilometers from the nearest electrical grid- now has photovoltaic energy. Microgrid projects are multiplying and **their impact goes far beyond merely providing light and energy.**



Moneymaking microgrids in Africa

The company [**Powerhive**](#) (whose Board of Directors includes the actor and activist **Leonardo DiCaprio**) claims that the microgrid business is turning out to be profitable, and that this growth will be exploited to roll out projects in new regions of **Africa and Asia**. **Powerhive East Africa Ltd.** is the first private company in the history of Kenya to be granted a utility concession to generate, distribute and sell electricity. “The government of Kenya recognizes that the fastest and least expensive approach to reach 100% electricity access is to allow private investment in distributed generation infrastructure,” says **Zachary Ayieko**,

Managing Director of **Powerhive East Africa** in a company press release.

The company has been laying grids in African countries since 2012, supplying communities of around 200 inhabitants with clean energy. Before this deployment, only 23% of the population in **Kenya** had access to electricity. The aim of this project is to offer clean energy to over 200,000 homes

“Light from roof systems can improve quality of life, but only microgrids can lift people out of poverty”, says **Emily Moder**, Digital Product Manager at [StearnaCo](#), in a Yale University [publication](#) on the company that installed the first microgrid in Kenya. And she adds: “They are the next step up. And by allowing people to build businesses and another source of income, they improve the resilience of rural communities against drought or climate change”



Clean energy is also profitable in Europe

Wildpoldsried is a small farming community in Bavaria, **Germany** that has become efficient at generating and using renewable energy. **Wildpoldsried** produces 321% more energy than it needs and earns \$5.7 million a year thanks to its renewable energy output. It received the **European Energy Award Gold in 2014**.

The town developed its project based on three principles: renewable energy and energy savings; use of environmentally friendly materials; and protection of water resources. On this basis they built an environmentally-friendly DWS system with four biogas production plants using cow

WILDPOLDSRIED GENERATE ANNUALLY

**5.700.000
DÓLARS**

manure as the raw ingredient, supplemented by the use of pellet burners, and seven windmills that produced a total of 16,798 Mwh in 2014, with two more built in 2015.

All the houses in the village -including official buildings- have also been fitted with solar panels, and they have installed three small hydroelectric plants and ecological wastewater and flood control systems. **The village also exports its surplus.** Experts agree that microgrids are the tool for achieving the goal set by the **UN** Secretary General **Ban Ki-Moon** at the 2014 climate summit, namely bringing electricity to 1.3 billion people all over the world -mostly in rural areas- who currently have none.



05

INFOGRAPHIC

Renewable energy



[See Website](#)

There is discussion about how long it will take for planet Earth to be uninhabitable for human beings. To prevent this from happening, legislation is being passed and investment is being made, especially in renewable energy.

INVESTMENT IN RENEWABLE ENERGY

286,000 million euros

DEVELOPING COUNTRIES

156,000
millions de euros

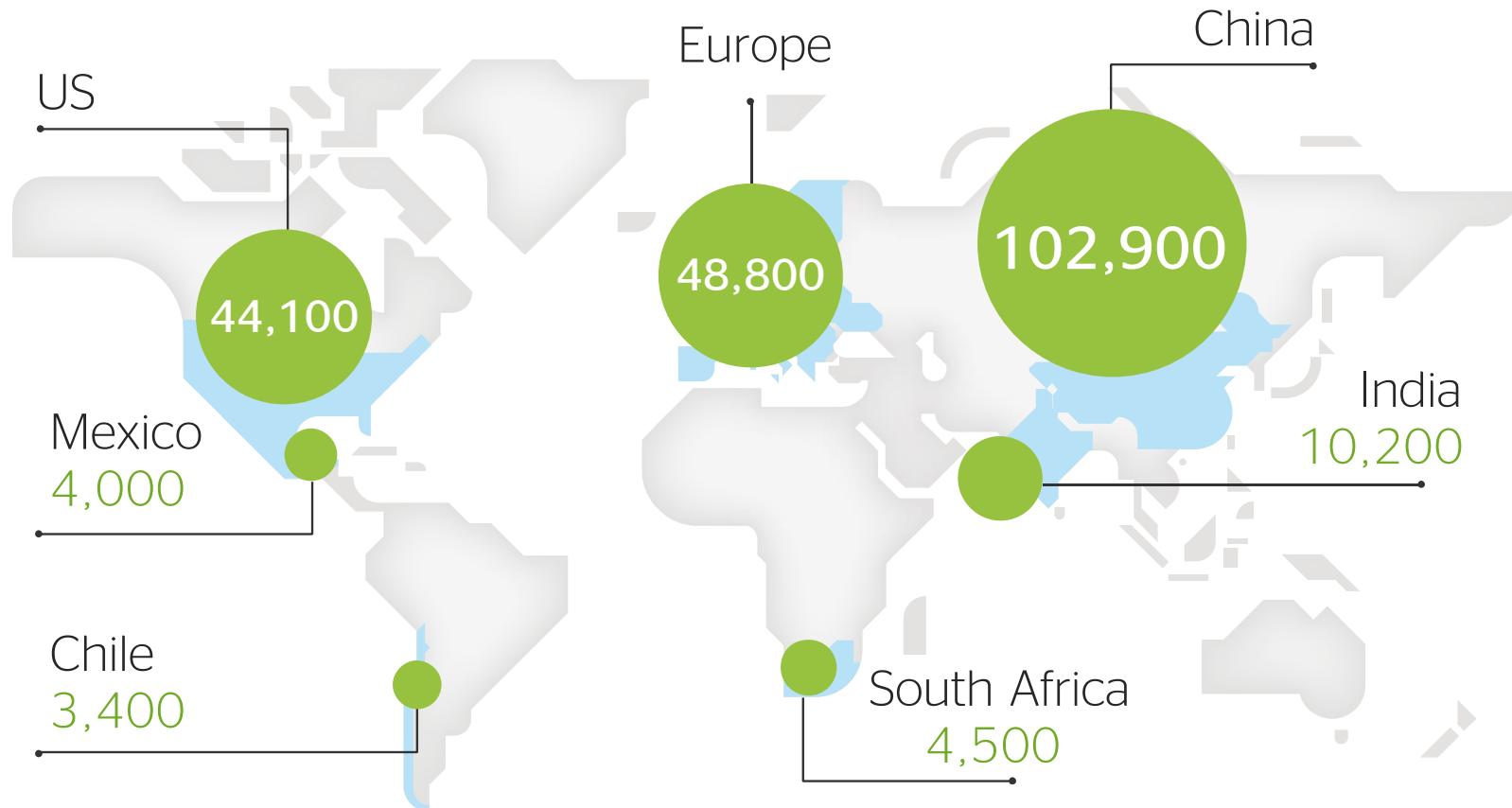
DEVELOPED COUNTRIES

130,000
million euros

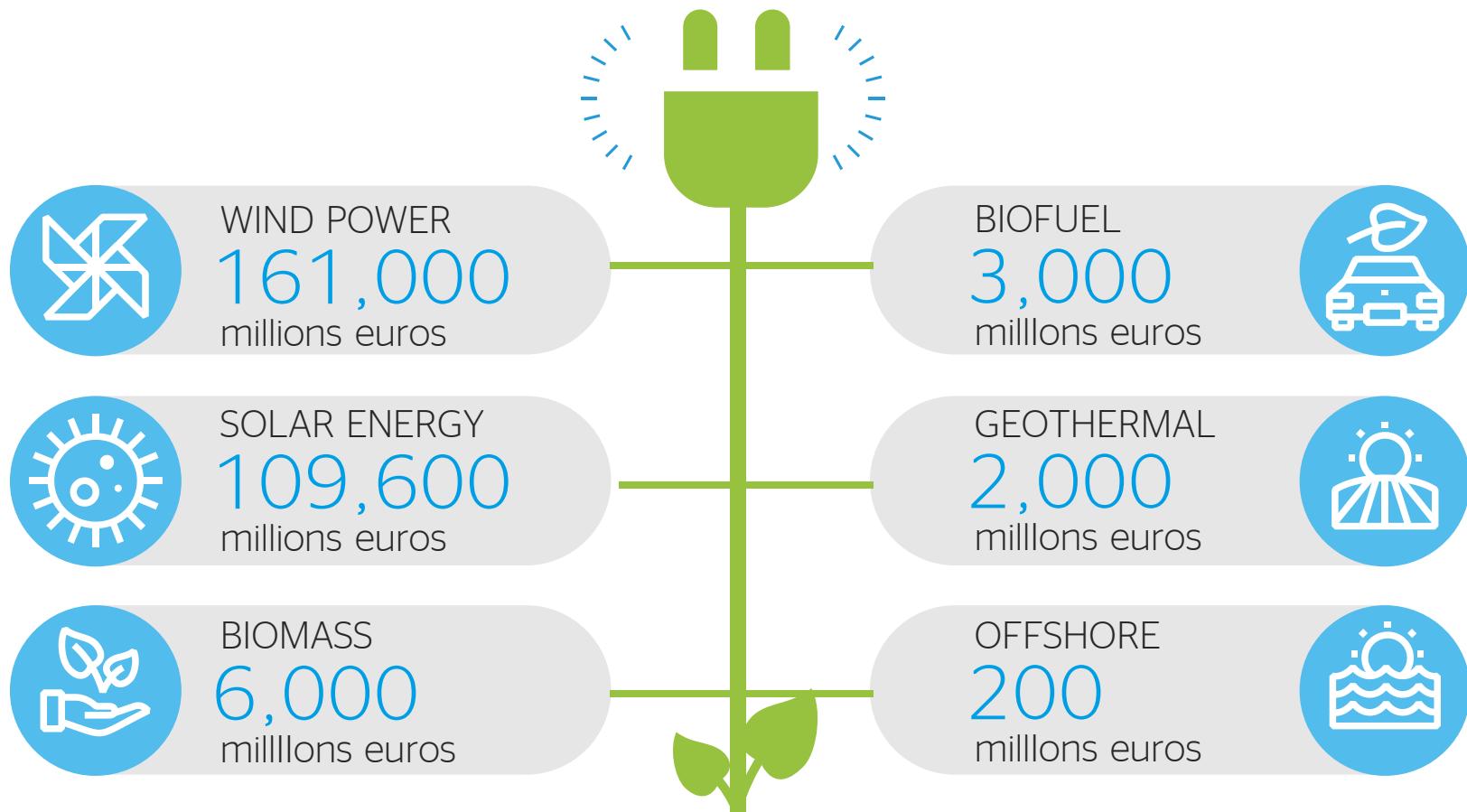


BY COUNTRY AND REGION

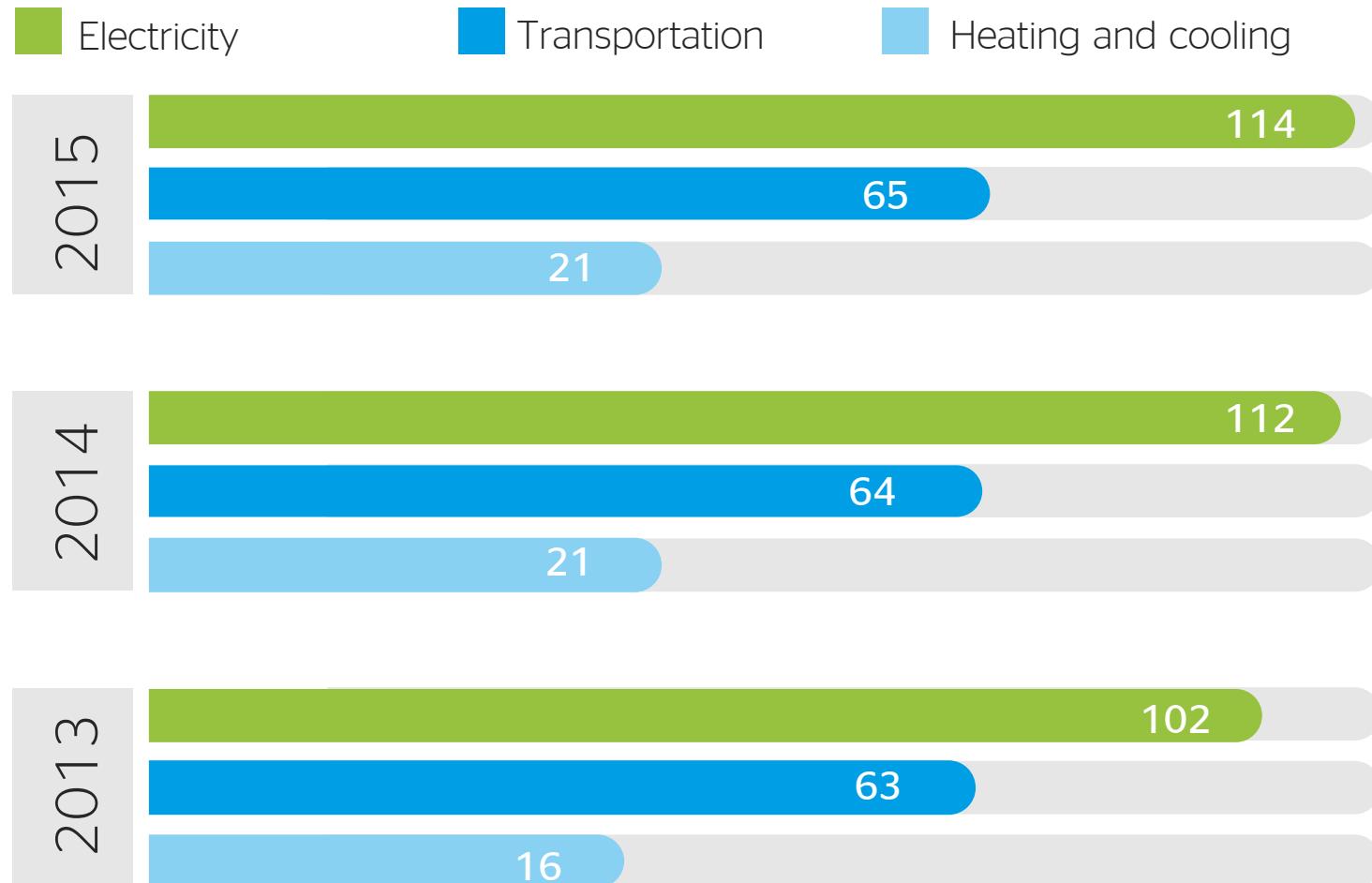
Investment in million euros



INVESTMENT BY ENERGY SOURCE



COUNTRIES WITH RENEWABLE ENERGY POLICIES



ENERGY EFFICIENCY BY COUNTRY

- With policies and targets
- With targets, no policies

- With policies, no targets (or no data)
- With policies, no targets (or no data)



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