

# The World **Wind Energy** Association

# 2012 | Annual Report



**WWEA**

World Wind Energy Association

[www.wwindea.org](http://www.wwindea.org)



Opening the Doors for the Caribbean Winds  
CUBA 2013

**WWEC 2013**  
XII World Wind Energy Conference  
& Renewable Energy Exhibition  
3 - 5 June 2013, Havana, Cuba  
[www.wwec2013.net](http://www.wwec2013.net)

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WWEA Head Office  
Charles-de-Gaulle-Str. 5  
53113 Bonn  
Germany

T +49-228-369 40-80  
F +49-228-369 40-84

secretariat@wwindea.org  
[www.wwindea.org](http://www.wwindea.org)

Authors: Stefan Gsänger, Jean-Daniel Pitteloud

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## The World Wind Energy Association WWEA Uniting the World of Wind Energy

The World Wind Energy Association (WWEA) is a non-profit organisation which works for a world energy system fully based on the various renewable energy technologies, with wind energy as one cornerstone.

WWEA acts as a communication platform for all wind energy actors worldwide, WWEA advises national governments and international organisations on favourable policies for wind energy implementation and WWEA enhances international technology transfer, a key in the accelerated dissemination of this clean technology.

Currently, WWEA has close to 600 members from more than 100 countries on all continents. Amongst the WWEA members, there are the national wind energy associations of the major wind countries – which themselves represent more than 50'000 members – as well as companies, scientific institutions and public bodies.

WWEA is governed by a Board which comprises WWEA President Prof He Dexin (China), ten Vice Presidents from the five continents and the Treasurer. The Secretary General Stefan Gsänger manages the daily administration of the association at the WWEA Head Office in Bonn/Germany.

Since 2007, WWEA has Special Consultative Status at the United Nations. WWEA has also observer status e.g. at the UNFCCC Climate Conferences and cooperates with further international organisations. WWEA is represented at the International Steering Committee of REN21 and works closely with the International Renewable Energy Agency

IRENA, an agency whose foundation goes back to WWEA's years long lobbying.

WWEA organises annually World Wind Energy Conferences like the WWEC2013 in Havana/Cuba in June 2013 and in the previous years in:

- Bonn/Germany (2012)
- Cairo/Egypt (2011)
- Istanbul/Turkey (2010)
- Jeju/South Korea (2009),
- Kingston/Canada (2008),
- Mar del Plata/Argentina (2007),
- New Delhi/India (2006),
- Melbourne/Australia (2005),
- Beijing/China (2004),
- Cape Town/South Africa (2003),
- Berlin/Germany (2002).

In cooperation with Husum fair, WWEA has invited for the World Summit for Small Wind Turbines, taking place in Husum/Germany in conjunction with New Energy fair.

WWEA cooperates with and supports numerous wind and renewable energy events all over the world.

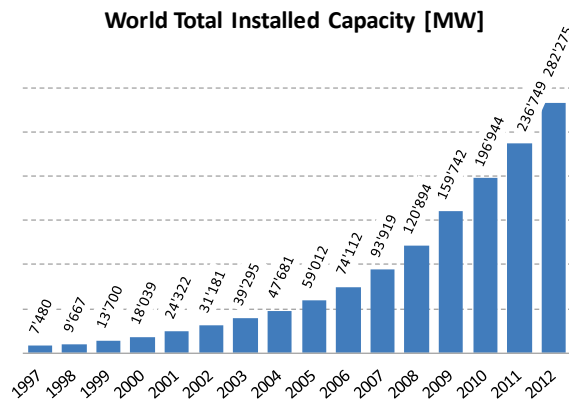
WWEA publishes on a regular basis information about wind energy and provides up-to-date information about wind energy technology, like

- the annual World Wind Energy Report
- the WWEA Quarterly Bulletin
- the technology website [www.world-wind-energy.info](http://www.world-wind-energy.info)
- the biannual yearbook Wind Energy International which comprises updated country reports about 100 countries and numerous special reports.
- the Small Wind World Report

## Executive Summary

- The worldwide wind capacity reached 282'275 Megawatt, out of which 44'609 Megawatt were added in 2012, more than ever before.
- Wind power showed a growth rate of 19,2 %, the lowest rate in more than a decade.
- All wind turbines installed by the end of 2012 worldwide can provide 580 Terawatt-hours per annum, more than 3 % of the global electricity demand.
- The wind sector in 2012 had a turnover of 60 billion Euro/75 billion USD.
- Altogether, 100 countries and regions used wind power for electricity generation; Iceland has become the 100<sup>th</sup> country that is using wind power.
- China and USA both installed around 13 Gigawatt of new wind turbines; USA added most of it in second half of the year in a rush to avoid the anticipated PTC expiration.
- Continents:
  - Asia accounted for the largest share of new installations (36,3 %), followed by North America (31,3 %) and Europe (27,5 %). Latin America stood for 3,9 % and Australia/Oceania for 0,8 %. Africa (0,2 %) is still a tiny wind market.
  - Latin America and Eastern Europe continue to be the most dynamic world regions while Africa showed stagnation, with only Tunisia and Ethiopia installing new wind farms.
- Asia:
  - China continued to be the by far largest Asian market and added 13 Gigawatt, however, significantly less than in the previous year.
  - India was again the third largest market for new wind turbines worldwide, adding 2,5 GW. The third largest Asian wind market, Japan, still grew very slowly and installed less than newcomer Pakistan.
- North America:
  - The US market set a new record and became the world's largest market for new wind turbines, adding 13 GW.
  - The Canadian market slowed down and grew below the global average.
- Europe:
  - Germany continued its role as the largest and most stable market in Europe with 31 GW, followed by Spain with 22,8 GW.
  - UK took over the position as second largest European market for new turbines from Spain which installed even less than Italy.
  - Italy, France and the UK continued to be the medium-sized markets, with total capacity between 7,5 and 8,5 GW. Poland, Romania and Sweden became major markets for new turbines.
- The share of offshore wind in the overall capacity increased to 1,9 %, after 1,5 % in 2011.
- Policy uncertainties in major markets represent a major barrier for wind penetration.
- WWEA expects a global capacity of more than 500'000 Megawatt by the year 2016. Around 1'000'000 Megawatt are possible by the year 2020.

## General Situation: New Record in New Installations

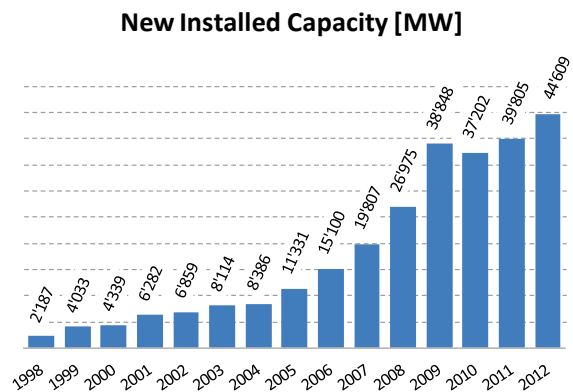


Without doubt wind power has become a pillar of the energy systems in many countries and is recognised as a reliable and affordable source of electricity.

In the year 2012, the worldwide wind capacity reached 282'275 Megawatt, after 236'749 Megawatt in 2011, 196'944 Megawatt in 2010 and 159'742 MW in 2009.

The market for new wind turbines reached a new record: 44'609 Megawatt were installed in 2012, an increase of 12 % compared with 2011 when 39'805 Megawatt were erected.

The contribution of wind power to the energy supply has reached a substantial share even on the global level: All wind turbines installed around the globe by the end of 2011 contribute potentially 580 Terawatt-hours to



the worldwide electricity supply, more than 3 % of the global electricity demand.

In the year 2012, 100 countries were identified where wind energy was used for electricity generation. The 100th entrant on the list is Iceland, a country which has already almost 100 % of its energy supply coming from renewable energy.

46 countries installed new wind turbines, four less than in the previous year and after even 52 in 2010.

The turnover of the wind sector worldwide reached 60 billion € (75 billion US\$) in 2012, after 50 billion € (65 billion US\$) in the year 2011.

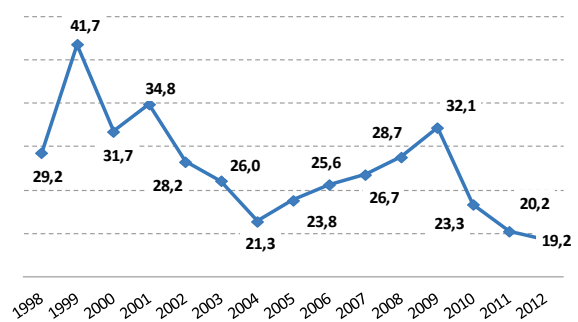
## Lowest Worldwide Growth Rate in More Than a Decade

Although the year 2012 brought a new record in new installations, the markets have cooled down in relative terms.

A very good indicator for the vitality of the market development is the average growth rate. The growth rate is the relation between the new installed wind power capacity and the installed capacity of the previous year.

After an average growth of 30 % in the past decade, the growth has decreased substantially in the past three years: In 2012, the global growth went down to 19,1 %, the lowest rate in two decades. Already the year 2011 had a very low rate, with 20,3 %.

**World Market Growth Rates [%]**



For the first time, the longer-term trend discontinued that the installed wind capacity doubles every third year. In 2009, there was a global wind capacity of 160 GW, compared with 282 GW in 2011.

### Strongest Growth in Latin America and Eastern Europe

Latin American and Eastern Europe continue to represent the world regions with highest growth rates. Hence the trend towards more geographical diversification has continued, as in the last two to three years, strong growth occurred mainly in Eastern European and Latin American markets, while the more traditional markets in Western Europe, North America and Asia have seen rather modest growth.

In 2012, only one country showed a growth rate of more than 100 %: Romania, with 131 %. Ukraine had 82 % growth, Poland 54 %, and Estonia and Finland both 46 %.

Four Latin American countries showed high growth as well: Argentina with 80 % ,Brazil with 75 %, Nicaragua with 62 % and Mexico

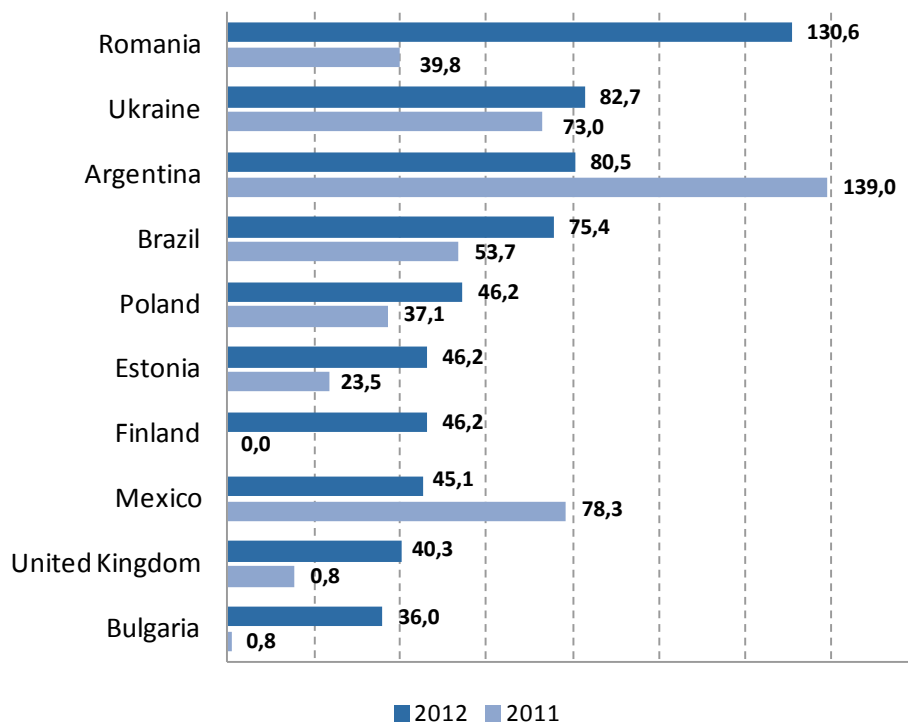
with 45 %. In average, Latin America had a growth of 56 %.

Such rates are low compared with the past, when e.g. in 2009 four countries more than doubled their wind capacity.

Growth substantially above the average could, however, also be found in the UK as well as in Sweden.

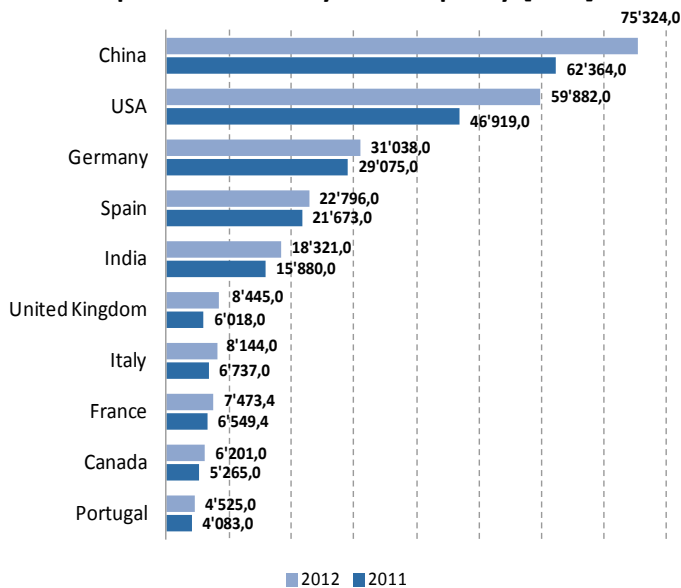
Africa continues to be a major matter of concern, as it not only represents the continent with the smallest capacity but also had the lowest growth rate of all regions, with only 7 %. Only two African countries, Tunisia and Ethiopia, installed new wind turbines in the year 2012.

**Top 10 Countries by Growth Rate [%]  
- Markets bigger than 200 MW -**



## Top Wind Markets 2012: Diversity in Big Five Markets

### Top 10 Countries by Total Capacity [MW]



Since many years, the wind industry has been driven by the Big Five markets: China, USA, Germany, Spain, and India. These countries have represented the largest share of wind power during the last two decades. In 2012, they represented 207 GW, or 73 % of the worldwide wind capacity, only slightly less than in the previous year. However, their market position remained strong as they added 32 GW, 10 % more than in the year 2011 (29 GW), or 72 % of the new installations.

At the same time, the top 10 markets increased their capacity additions from 35 GW to 37 GW (83 % of the total new capacity) while their overall wind capacity share decreased from 87 % in 2011 to 86 % in 2012.

Amongst the top markets, China and USA have both played a very strong role: Both countries accounted each for 29 % of the world wind market 2012. China showed a significant decrease of its global market share, which peaked in the year 2012 when every second new wind turbines was installed in this country.

The US market surprised in the second half of 2012. The main cause was without doubt

the anticipated expiry of the production tax credit, the main driver of wind power investment in USA.

India and Germany both showed robust development and an increase of 2,4 GW, while the Spanish market grew only by 5 %, or 1,1 GW.

Twelve countries (compared with ten in 2011) can be seen as major markets, with turbine sales in a range between 0,5 GW and 2,5 GW: India, Germany, the United Kingdom, Italy, Spain, Brazil, Canada, Romania, Poland, Sweden, France, and Turkey.

14 (four more than in 2011) markets for new turbines had a medium size between 100 and 500 MW: Mexico, Australia, Belgium, Austria, Denmark, Bulgaria, Norway, Portugal, Ireland, Ukraine, Puerto Rico, the Netherlands, Greece, and newcomer Pakistan.

By the end of 2012, 24 countries had installations of more than 1 GW, two more than in 2011. Romania and Mexico are the new entrants of the Gigawatt club. In the year 2005, this club had only 11 members.

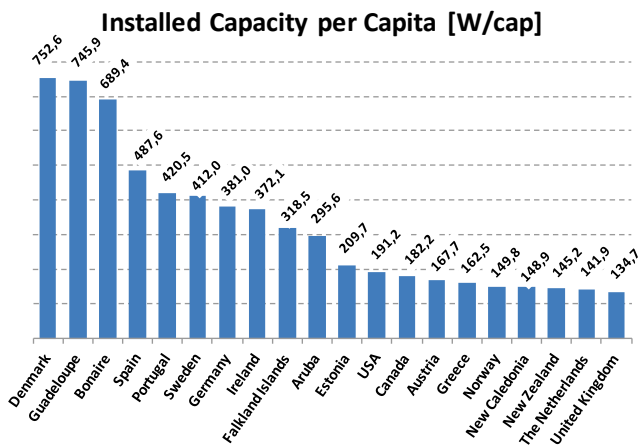
47 countries have today wind farms with an overall capacity of 100 MW or more, compared with 43 countries one year ago. In the year 2005, only 24 countries had more than 100 MW installed capacity.

In 2012, two Latin American countries installed for the first time major wind farms: Puerto Rico (125 MW) and Venezuela (30 MW).

New on the list is also Iceland, the 100<sup>th</sup> country, with a 1,6 MW wind farm. This is a remarkable step, as Iceland is blessed with geothermal and hydropower resources and managed in the past years to convert its energy supply almost 100 % to renewable energy.



## Installed Capacity by Country Size

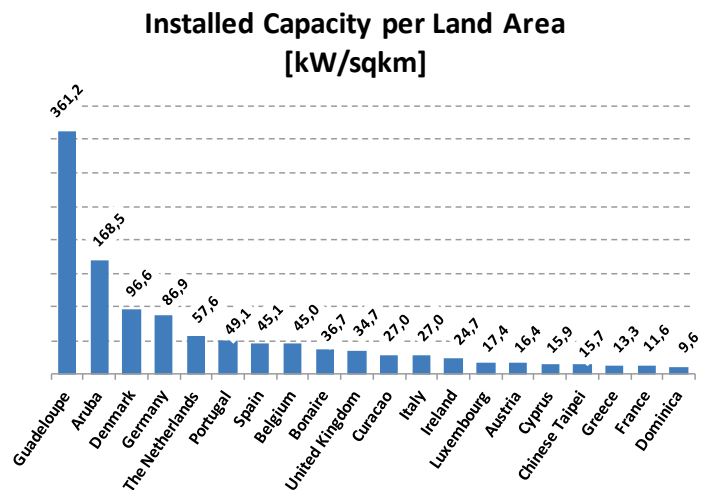


In order to understand the actual commitment of a country to wind power and its progress in wind power utilisation, it is worthwhile not only to look at the total figures, but also to put the installed capacity in relation to the size of a country. It becomes better visible that some of the smaller countries have made remarkable progress in wind power utilisation as well and it reveals the potential of wind power utilisation.

Denmark is the leader in terms of installed wind power capacity per person: Per inhabitant, the country has an installed wind capacity of 752 Watt. Amongst the major countries, also Spain, Portugal, Sweden, Germany, and Ireland rank amongst the top ten. The USA ranks 12<sup>th</sup>, with close to 200 Watt per person, and China ranks 36<sup>th</sup>, with 56 Watt per person, both far behind their absolute position but still above world average. India is on position 52 with 15 Watt per person, below the global average.

By land area, two small countries, Guadeloupe and Aruba, have the top position, again followed by Denmark and Germany. Also the Netherlands, Portugal,

Spain, Belgium and the United Kingdom are amongst the top ten.



However, neither China, USA nor India are amongst the top 20: China holds position 27 (7'800 Watt per square kilometre), India ranks 32<sup>th</sup> (5'600 Watt/sqkm), and the USA are number 30 (6'100 Watt/sqkm).

This geographical distribution reveals that especially the countries with large land mass have still a huge potential which they could use to harvest wind power. The global average is currently 1,9 kW/sqkm.

If all countries had the same density like today Germany or Denmark, the world would see a total installed capacity of 12'000'000 MW, more than enough to cover the world's complete electricity demand.

The global average is 40 Watt of wind capacity per person. If all countries had the same installed capacity per person like today Denmark, the global capacity would reach 5'000'000 MW.

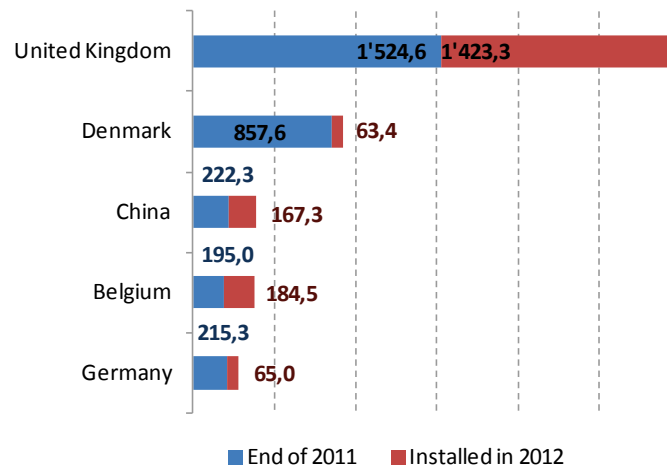
## Offshore Wind: British Dominance

The market for offshore wind turbines has been quite unstable during the past years. In 2012, the growth of the offshore wind sector gained again momentum and grew by 54 %, after a quite weak 2011 with only 14 % growth. By the end of 2012, the cumulative offshore wind capacity reached 5'416 MW, out of which 1'903 MW were added during that year, compared with new installations of 397 MW in 2011 and 1'162 MW in 2010.

In 2012, the growth in offshore wind was well above the average growth rate of the onshore wind sector and, accordingly, the share of offshore wind in the total wind capacity worldwide went up from 1,5 % in 2011 to 1,9 % in 2012. The share of offshore wind in new installations jumped up to 4,3 % in 2012, after only 1,0 % in 2011.

13 countries had offshore wind farms, eleven of them in Europe, as well as two in Asia. Only five countries added major offshore wind farms in 2012: The United Kingdom, Belgium, China, Germany and Denmark.

## Top 5 in Offshore Wind [MW]



Denmark kept its second position in total offshore installations, however, with a very modest growth of only 7 %.

Belgium became the second largest market for new offshore turbines in 2012, almost doubling its installed capacity from 195 MW to 380 MW.

China has now also in offshore wind become one of the biggest players, almost doubling its offshore capacity. However, still offshore wind has only a minor share in China: 0,5 %. China plans to install 5 GW in the coming years.

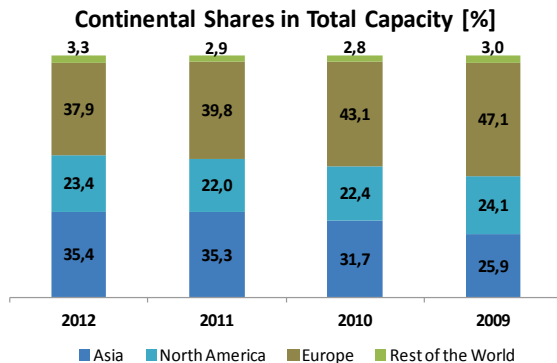
In spite of very ambitious targets, the deployment of offshore turbines in the German North and Baltic sea remained still far behind expectations: Offshore turbines, similar like in China, represent only a marginal share of the total wind capacity, less than 1 %.

Position 2012	Country	Total Offshore Capacity 2012 [MW]	Added Capacity 2012 [MW]	Total Offshore Capacity 2011 [MW]	Total Offshore Capacity 2010 [MW]	Total Offshore Capacity 2009 [MW]
1	United Kingdom	2'947,9	1'423,3	1'524,6	1'341,0	688,0
2	Denmark	921,0	63,4	857,6	854,0	663,6
4	China	389,6	167,3	222,3	123,0	23,0
6	Belgium	379,5	184,5	195,0	195,0	30,0
5	Germany	280,3	65,0	215,3	107,0	72,0
3	Netherlands	249,0	0,0	249,0	249,0	247,0
7	Sweden	164,0	0,0	164,0	164,0	164,0
8	Finland	30,0	0,0	30,0	30,0	30,0
9	Japan	25,3	0,1	25,2	2,0	1,0
10	Ireland	25,2	0,2	25,0	25,0	25,0
11	Spain	10,0	0,0	10,0	10,0	10,0
12	Norway	2,3	0,0	2,3	2,3	2,3
13	Portugal	2,0	0,0	2,0	0,0	0,0
	<b>Total</b>	<b>5'426,1</b>	<b>1'903,8</b>	<b>3'522,3</b>	<b>3'102,3</b>	<b>1'955,9</b>

The UK represented 74 % of the offshore market (46 % in 2011) and added 1'423 MW of offshore wind turbines. The country has an exceptional role and a dominant position in the offshore wind sector. More than every third wind turbine installed in the UK was in the sea. More than one out of two offshore wind turbines are currently installed in British waters.

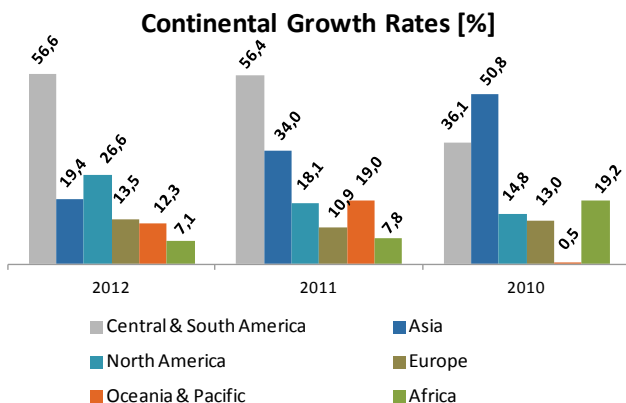
Other countries like Japan or Korea have ambitious offshore wind programmes, however, both countries are facing major technical challenges in particular due to deep water which requires innovative technical solutions.

## Continental Distribution: Asia about to take over Leading Position from Europe



Europe is still the continent with most wind farms, accounting for 38 % of the total wind capacity. However, due to modest growth rates in the past years, Europe lost its dominant position - still in 2006, Europe represented 66 % of the global wind capacity. In terms of new capacity, Europe accounted in 2012 for 27,5 %.

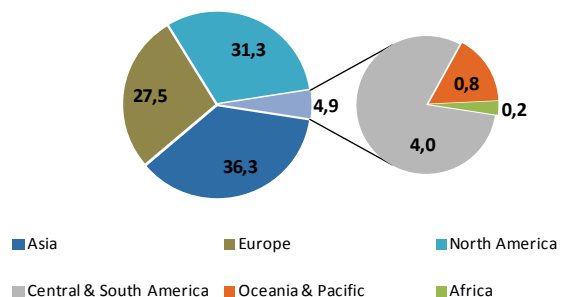
Asia has steadily increased its share in the global wind industry and has now come very close to Europe, with 35 % share. Asia's share in new turbines, however, dropped from 53,7 % to 36,3 %.



It can be expected that in the year 2013, Asia will take over Europe in total capacity.

The share of North America, after several

### Continental Shares in New Capacity 2012 [%]



years of decline, increased again, mainly due to the very strong performance of the US market. The share of North America in new wind turbines recovered from the quite low 17 % in the year 2010 and 21 % in 2011 and reached 31 % in 2012. By the end of 2012, 23,4 % of the global wind capacity was installed in North America.

Latin America saw major progress and increased its share in new capacity from 1,2 % in 2010 and 2,9 % in 2011 to 4 % in 2012. In total capacity, Latin America improved from 1 % (2010) to 1,4 % in 2011 and to 1,8 % in 2012.

Africa's share in the total capacity stayed in 2012 at a very low 0,4 %, only 0,2 % of the new wind turbines was added on this continent. Although one out of seven people are living in Africa, only one out of 500 wind turbines have been installed on this continent so far.

## Africa

All wind turbines installed in Africa in 2012 had a capacity of 1'074 MW (0,4 % of the global capacity), out of which only 71 MW were added (compared with 73 MW in the year 2011).

New capacity included new wind farms in only two countries, Ethiopia and Tunisia.

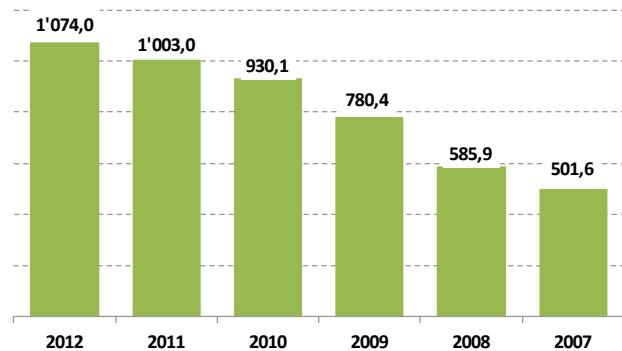
Although Africa was already on a comparatively low level, the 2012 growth rate of 7 % was again lower than in the previous year and far below the global average of 19,1 %.

The three leading wind countries can be found in Northern Africa: Egypt (550 MW installed capacity) and Morocco (291 MW), as well as Tunisia (104 MW). 88 % of the African wind capacity are installed in these three countries, slightly less than in 2011.

Ethiopia was the only Sub-Sahara country with major installations, and a total capacity of 51 MW (21 MW new in 2012). Also Cap Verde installed in total 38 MW, however, no new turbines were erected in 2012.

Although most North African countries have announced ambitious wind power programmes, including recently Algeria, the actual progress in 2012 was not very big. The Arab Spring will most likely result in more stable political environment rather in the longer term, and currently the investment conditions are not yet ideal.

Total Installations in Africa [MW]



In general, new political support schemes will be necessary to support the financing of wind farms in Africa. Governments should implement feed-in tariff programmes, like announced for Egypt.

A special consideration should be given to small scaled and hybrid systems for rural electrification so that hundreds of millions Africans in unserved areas can eventually benefit from modern electricity services.

For the purpose of overcoming basic finance barriers, the establishment of a Global Fund for Renewable Energy Investment, including a Global Feed-in Tariff Programme would offer huge opportunities for many African countries. Such a fund could be established within the frame of the Green Climate Fund. In this context it is very encouraging to see that first steps have been taken to implement on bilateral basis international support schemes for national feed-in legislation.

## Asia

Asia continued to be the continent showing the strongest increase in 2012, adding 16,2 GW, after 21,2 GW in 2011.

The total installed wind capacity in Asia reached close to 100 GW, 35,4 % of the global capacity. The continent had only the fourth highest growth rate of all world regions, with 19,4 %, the growth was smaller than in 2011 (34 %), 2010 (51 %), and 2009 (67 %).

In total, only six Asian countries and regions installed new wind turbines during the year 2012: China, India, Japan, South Korea, Turkey (most wind farms are on the Asian part of this country), and Pakistan. China, like in 2011, accounted for 75 % of the Asian wind capacity, followed by India with 18 % (after 19 % in 2011). All other countries have market shares of less than 3 %.

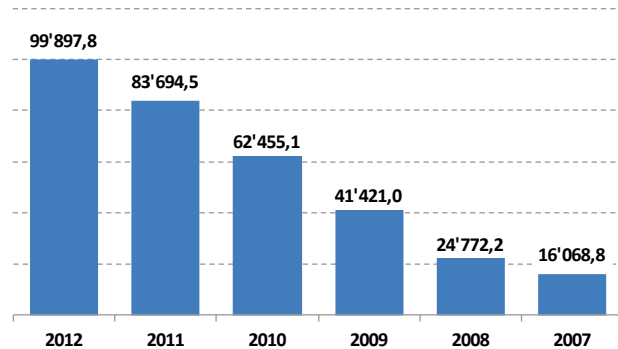
The prospects for the Chinese market are still positive: China still aims at a total wind capacity of 100 GW in 2015 which will most likely be overfulfilled. In the coming years, a stable market size (similar like in 2012) is expected).

Due to the decrease in the Chinese wind market, the Chinese wind industry is currently in a highly competitive situation with strong pressure on prices.

and has just started to export to other markets. It can be expected that this will have a major impact on the market situation of many wind markets around the world.

India as the third largest market for new turbines in 2012 of the world showed an increase of 2'441 MW in 2012 (after 2827 MW in 2011), reaching a total capacity of 18,3 GW. In general, the Indian wind market has a very good future potential, however, policy uncertainties and unpaid electricity bills have damaged investors' confidence.

Total Installations in Asia [MW]



Japan (total capacity 2,6 GW, 87 MW added) continued to be number three wind country in Asia. The expected shift towards more renewable energy after the nuclear accident in Fukushima has, however, not yet materialised in a major take-off of the Japanese wind market, although an attractive feed-in tariff has been adopted in 2012. Still, long permission processes remain to be a major hurdle against a rapid take-off of wind power in the country.

Turkey, geographically predominantly in Asia, showed again strong growth, adding 506 MW (after 525 MW in 2011) and reaching 2,3 GW of wind capacity. The private sector in the country shows strong interest in wind power investment, while the government still seems to favour more expensive nuclear power, although wind power is one of the cheapest electricity sources in Turkey.

South Korea showed again only modest growth in 2012: The country added 76 MW, reaching a total capacity of 483 MW, after 406 MW in 2011. In the mid-term, major investments are expected in offshore wind farms along the Korean coastline.

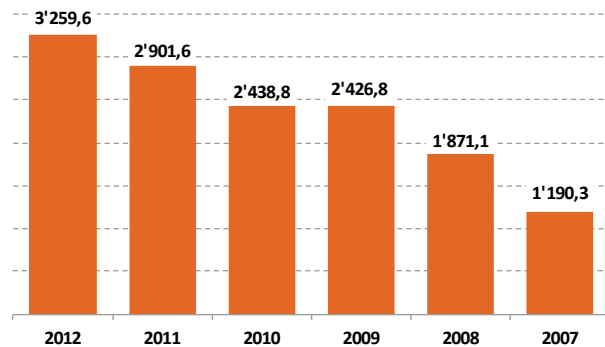
Pakistan made a major step ahead and installed for the first time two major wind farms, with a total capacity of 100 MW. In light of the urgent need for electricity in the country and a feed-in tariff scheme in place, further projects are expected to get online in the year 2013 and beyond.

## Australia and Oceania

The region of Australia and Oceania increased its installed capacity by 358 MW which equals a growth of 16,1 %, after several years of very modest growth.

Only Australia added new capacity in 2012, reaching 2'584 MW. After the first community owned wind farm, Hepburn wind, winner of the World Wind Energy Award 2012, started operation, the community power concept has got a major momentum. Similar projects are now under development and can be expected to contribute to higher social acceptance and,

Total Installations in Oceania & Pacific [MW]



hence, indirectly to increased political support for wind power in Australia.

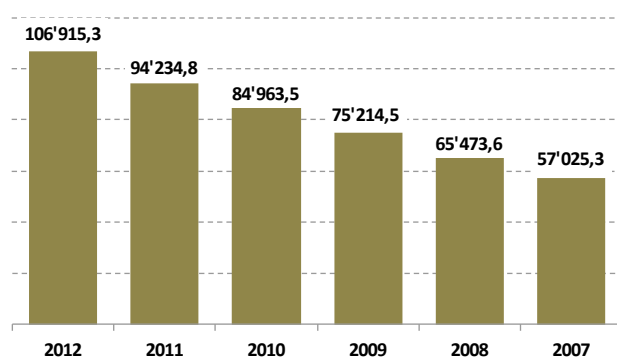
## Europe

The wind capacity in Europe grew from 94 GW in 2011 to 107 GW in 2012. This equals a growth rate of 13 % (compared with 11 % in 2011) and helped Europe to maintain its number one position in terms of total capacity. Europe added 12,7 GW in 2012 (after 8,6 GW in 2011), a new record for the continent and a similar market size like China or the USA. 34 European countries had wind installations, more than on any other continent.

Germany continued to be biggest wind market on the continent, adding 2,4 GW and reaching a total capacity of 31 GW. As the largest industrialised country which has so far decided to shift completely to renewable energy, Germany has an important role: In case the "Energiewende" is successful, it will serve as an example for many other countries to follow. The German energy industry is in a process of fundamental transformation, and the traditional energy companies are about to be replaced by many small and medium sized generators. However, the traditional sector is still fighting against becoming obsolete and the national elections in 2013 will play an important role about the country's energy future.

The second largest European market for wind turbines was for the first time the United Kingdom, which installed 1,9 GW and reached a total capacity of 8,4 GW, enough to take over global rank 6 from Italy. However, 75 % of the new British wind farms were installed offshore, an exceptional situation.

Total Installations in Europe [MW]



Spain, over many years clearly number two on the European market, lost in 2012 again market shares: 21 % of the European wind mills can now be found in the country, after 23 % in 2011. Still the future support scheme for wind power in the country is unclear, a big burden for the Spanish wind sector which runs risk of losing its top international position.

Six countries, Italy, Spain, Romania, Poland, Sweden and France, had a market size of around 1 GW: Italy became the third largest European wind turbine market with sales of 1,3 GW, followed by a rather weak Spain (1,1 GW), and the "new" medium markets Romania, Poland (both 0,9 GW), Sweden and France (both 0,8 GW). In particular the development in France slowed down (from 1 GW in 2011) and is a matter of concern. The country plans to reduce its dependence on nuclear power, and wind power would be the perfect answer to this.

As indicated above, some of the world's fastest growing wind power markets could be

found in Eastern Europe in the year 2012, in particular Poland, Romania, Bulgaria, the Ukraine, Estonia or Croatia.

Amongst the CIS countries, Ukraine became the leader, with an installed capacity of 276 MW and an increase by 83 %. In order to boost the development also in other CIS countries, WWEA has set up a CIS Committee which will focus on the promotion of wind power in the region.

Several of the today leading European wind power nations, especially Denmark, Germany and Spain, have developed their wind industry without external pressure. However,

the legislation by the European Union and its mandatory renewable energy targets have had a very positive impact on the renewable energy policies of many EU members states, which have the legal obligation to fulfill the binding 2020 targets.

Before this background, the current discussion has major importance: Which targets will the European Union set for the year 2030. Naturally, also the climate legislation will have at least an indirect impact on the prospects of renewable energy in Europe – and of course far beyond.

### *Iceland – Welcome to the World of Wind Energy as 100th Country!*

#### *The Energy Sector in Iceland: 100 % Power from Renewables*

Due to its abundant natural hydro- and geothermal resources, Iceland generates already today 100% of its electricity using renewable resources, with about 70% coming from hydropower and 30% from geothermal power. Most of the plants are operated by the company Landsvirkjun which is owned by the Icelandic state and is the main supplier of electricity in Iceland.

Iceland enjoys a unique position with about 85% of total primary energy consumption coming from renewable energy sources generated domestically. In 2011, geothermal energy provided about 66 % of primary energy (mainly for heating), the share of hydropower was 19% and fossil fuels (mainly oil) 15% for the transport sector and the fishing fleet.

#### **First Wind Turbines in Iceland: A New Pillar**

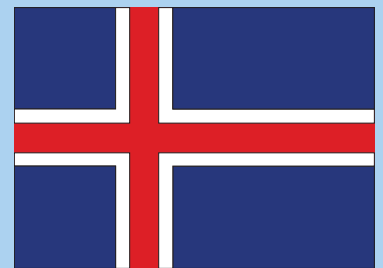
Landsvirkjun applied for a licence to operate two wind turbines at the beginning of June of last year. The two wind turbines are part of a research and development project on the feasibility of wind energy in Iceland. Research in the near future will focus on the unique operational environment in Iceland, such as: the effect of icing, snow drift, ash and sand drift as well as the impact upon wildlife and the Icelandic community. The project will also bring with it much needed operational experience in the field, to be built upon if wind energy proves to be a successful candidate, for further development in Iceland in the future.

After a quite short approval process, the wind turbines were installed in a matter of days, in early December 2012. The official inauguration of the wind turbines was on 14 February 2013 and now they generate electrical energy for the Icelandic national grid. Each of the two wind turbines (manufactured by Enercon) has a 900 KW capacity and the expectation for capacity factor within the region is 0,35-0,40 (10 m/s yearly average wind speed).

Hörður Arnarson, CEO of Landsvirkjun: "It is entirely possible that wind energy could become the third pillar in Landsvirkjun's operations in the future, adding to the list of renewable sources already utilised by Landsvirkjun, such as geothermal and hydroelectric power. It will be interesting to see how wind power in Iceland can be utilised in conjunction with hydropower as the flexibility of hydroelectric power could in fact increase the value of wind power."

Real-time information on the electricity production, of the wind turbines is available on Landsvirkjun's website to give the public an opportunity to observe the project on a day to day basis:

<http://www.landsvirkjun.com/ResearchDevelopment/Research/WindPower/RealTimeData>



## Latin America

In 2012, Latin America became the most dynamic continent for wind power investment, mainly due to Brazil and Mexico. The growth rate of 56 % was the highest worldwide.

Still the continent accounted for only 1,8 % of the globally added wind turbines, however, the share is significantly increasing, and the share of new wind turbines reached already 4 %.

Eight Latin American countries installed new wind turbines in the year 2012: Brazil (1077 MW new), Mexico (419 MW), Argentina (104 MW, there might be some turbines not yet feeding the grid), Puerto Rico (125 MW), Nicaragua (40 MW), Uruguay (24 MW), Venezuela (30 MW) and Ecuador (17 MW).

With the exception of Brazil and Mexico, most Latin American wind markets can still be regarded as in a state of infancy.

The Brazilian wind power market is by far the most advanced, not only because of its size but also because Brazil has managed to attract several wind turbine manufacturers to

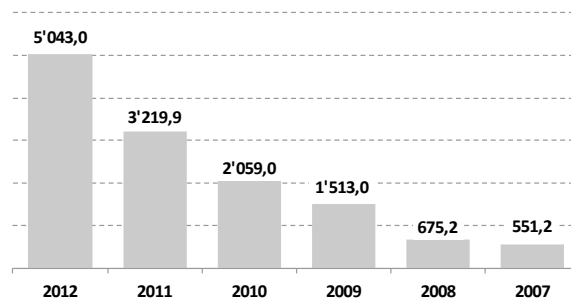
## North America

In the year 2012, North America re-gained old strength and showed growth rates above the global average.

The USA set a new record with 13 GW of new installations, after 6,7 GW in 2011. The main driver was the Production Tax Credit which was expected to expire by the end of 2012. Due to such pressure, many investors rushed in order to connect their wind turbines still in 2012 and to benefit from the PTC. As the PTC got extended at the beginning of 2013 without such sharp deadlines, it can be expected that the growth of the US market will be much more modest in the year 2013.

Still there are major regulatory uncertainties in North America: The long-term future of the national support scheme in the US is unclear. Some groups have suggested to phase out the PTC in the near future, without substitution. This proposal has received quite controversial response throughout the industry.

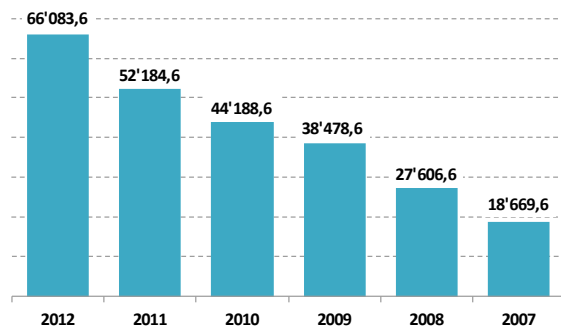
Total Installations in Central & South America [MW]



set up factories in the country. Together with the domestic content requirements and the very low prices coming out of the auctions, the business environment for wind investors in Brazil is very rough. It remains to be seen whether the country will succeed in consolidating its wind power sector in the longer run.

A growing interest in wind power can be observed in the Caribbean and Central American countries. The WWEC2013 in Cuba has attracted very big attention and will have a positive impact on the agenda of the policymakers in the region.

Total Installations in North America [MW]



The Canadian market cooled down in 2012 and saw an increase in its capacity by modest 18 %, adding 936 MW, to a total of 6'201 MW. In particular the ongoing attacks on the Ontario Green Energy Act weakened the Canadian market, as Ontario is the biggest wind province.

A weakness of the North American markets was that, although the industrial basis became stronger, a major share of the wind turbines and related equipment had still to be imported from outside the region. There are only few domestic wind turbine manufacturers in USA as well as in Canada.



## Future challenges and prospects worldwide

Six major drivers will have a decisive impact on the mid-term and long-term prospects of wind power:

1. The ongoing debate on climate change and how to find emission free energy solutions.
2. The depletion of fossil as well as nuclear resources, especially reflected in the increasing oil prices which especially represent a huge burden for the developing countries.
3. An increasing number of local communities, regions and countries are proving practically that 100 % renewable energy is possible.
4. The increasing awareness regarding the hazardous risks related with the utilisation of nuclear energy, driven by reports on the nuclear disaster in Fukushima.
5. The increasing awareness regarding the potentials and actual contributions of wind and other renewable energies to an energy supply which is economically, socially as well as ecologically sustainable.
6. Further improvements in wind energy and related technologies, including backup and storage technologies.

In order to make use of the full potential of wind and other renewable energies, it will be of crucial importance to strengthen the related frameworks, institutions and policies.

The world community as well as national governments will have to set up additional policies in favour of wind energy.

Special consideration has to be given to the deployment of renewable energy in the so-called developing countries.

Incentives for decentralised and integrated 100 % renewable energy supply need to be created, again especially but not exclusively for developing countries.

Another key issue for the prospects of wind power in this context will be social acceptance. Recent studies from Scotland, Germany, the USA and Australia suggest that social acceptance is significantly higher in the case of wind farms which are owned by the local community where the wind farm is located. Obviously in such cases opposition against wind power is also significantly lower. In general, acceptance of wind farms is high, however, people who see themselves as owners of a wind farm naturally have an even more positive attitude.

Policymakers have to draw the right conclusions from such results and introduce legislation that favours community based ownership models of wind farms.

It will be of crucial importance that renewable energy eventually move into the center of the debate at the UN Climate Change conferences. Some experts have already proposed to create a completely new global forum for the worldwide expansion of renewable energies.

In order to provide more financial resources on an international level, WWEA has suggested, together with our partners of the International Renewable Energy Alliance, the creation of a Global Fund for Renewable Energy Investment.

A core element of such a fund should be a global feed-in tariff programme as a primary tool to kick-start markets for grid-connected wind power in the developing world.

## Forecast 2020

In spite of the need to reinforce national and international policies and to accelerate the deployment of wind power, it can be observed that appetite for investment in wind power is strong and many projects are in the pipeline.

Further substantial growth can especially be expected in China, India, Europe and North America.

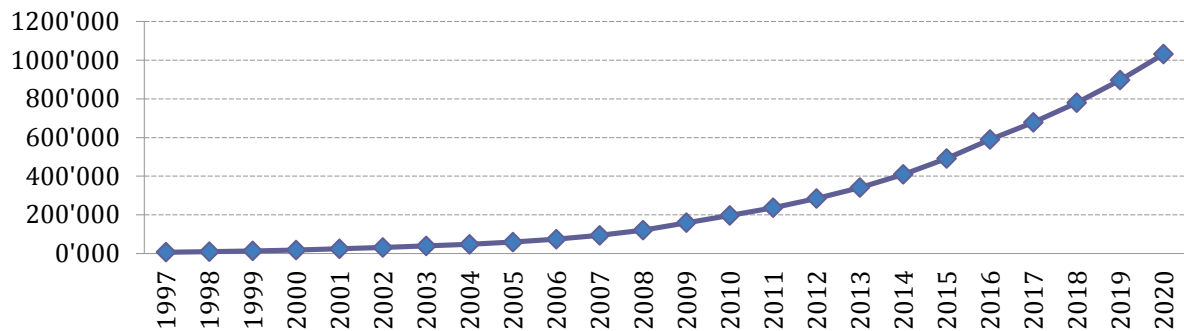
High growth rates can be expected in several Latin American, in particular in Brazil, as well as in new Asian and Eastern European

markets. In the mid-term, also some of the African countries will see major investment, after all in Northern Africa, but also in South Africa.

Based on the current growth rates, WWEA revises its expectations for the future growth of the global wind capacity:

In 2016, the global capacity is expected to 500'000 MW is possible. By the end of year 2020, at least 1'000'000 MW can be expected installed globally.

**Total Installed Capacity 1997-2020 [MW]**  
**Development and Prognosis**



Position 2012	Country/Region	Total capacity installed end 2012 [MW]	Added capacity 2012 [MW]	Growth rate 2012 [%]	Position 2011	Total capacity installed end 2011 [MW]	Total capacity installed end 2010 [MW]	Total capacity installed end 2009 [MW]	Total Capacity installed end 2008 [MW]
1	China	75'324,0	12'960,0	20,8	1	62'364,0	44'733,0	25'810,0	12'210,0
2	USA	59'882,0	12'999,0	27,6	2	46'919,0	40'180,0	35'159,0	25'237,0
3	Germany	31'308,0	2'415,0	7,7	3	29'075,0	27'215,0	25'777,0	23'897,0
4	Spain	22'796,0	1'122,0	5,2	4	21'673,0	20'676,0	19'149,0	16'689,0
5	India	18'321,0	2'441,0	15,4	5	15'880,0	13'065,8	11'807,0	9'587,0
6	United Kingdom	8'445,0	1'897,0	40,3	8	6'018,0	5'203,8	4'092,0	3'195,0
7	Italy	8'144,0	1'273,0	20,9	6	6'737,0	5'797,0	4'850,0	3'736,0
8	France	7'473,4	757,0	14,1	7	6'549,4	5'569,4	4'483,4	3'313,7
9	Canada	6'201,0	936,0	17,8	9	5'265,0	4'008,0	3'319,0	2'369,0
10	Portugal	4'525,0	145,0	10,8	10	4'083,0	3'702,0	3'357,0	2'862,0
11	Denmark	4'162,0	217,0	6,0	11	3'927,0	3'734,0	3'465,0	3'163,0
12	Sweden	3'745,0	846,0	33,8	12	2'798,0	2'052,0	1'448,2	1'066,9
13	Japan	2'614,0	87,0	4,5	13	2'501,0	2'304,0	2'083,0	1'880,0
14	Australia	2'584,0	358,0	16,1	16	2'226,0	1'880,0	1'877,0	1'494,0
15	Brazil	2'507,0	1'076,5	75,4	20	1'429,0	930,0	600,0	338,5
16	Poland	2'497,0	880,0	54,5	19	1'616,4	1'179,0	725,0	472,0
17	The Netherlands	2'391,0	119,0	2,7	14	2'328,0	2'269,0	2'223,0	2'235,0
18	Turkey	2'312,0	506,0	28,5	17	1'799,0	1'274,0	796,5	333,4
19	Romania	1'905,0	923,0	130,6	24	826,0	591,0	14,0	7,0
20	Greece	1'749,0	117,0	7,5	18	1'626,5	1'208,0	1'086,0	989,7
21	Ireland	1'738,0	125,0	6,6	15	1'631,0	1'428,0	1'310,0	1'027,0
22	Austria	1'378,0	296,0	27,1	21	1'084,0	1'010,6	995,0	994,9
23	Belgium	1'375,0	297,0	27,6	22	1'078,0	886,0	548,0	383,6
24	Mexico	1'348,0	419,0	45,1	23	929,0	521,0	416,8	85,0
25	Norway	703,0	166,0	35,2	28	520,0	434,6	431,0	429,0
26	Bulgaria	684,0	168,0	36,0	29	503,0	499,0	176,5	157,5
27	New Zealand	622,8	0,0	0,0	25	622,8	506,0	497,0	325,3
28	Chinese Taipei	563,8	0,0	0,0	26	563,8	518,7	436,0	358,2
29	Egypt	550,0	0,0	0,0	27	550,0	550,0	435,0	390,0
30	Korea (South)	482,6	76,3	18,8	30	406,3	379,3	348,4	278,0
31	Hungary	329,4	0,0	0,0	31	329,4	295,0	201,0	127,0
32	Morocco	291,0	0,0	0,0	32	291,0	286,0	253,0	124,0
33	Finland	288,0	89,0	46,2	34	197,0	197,0	147,0	143,0
34	Ukraine	276,0	125,0	82,7	38	151,1	87,4	90,0	90,0
35	Estonia	269,0	86,0	46,2	36	184,0	149,0	142,3	78,3
36	Czech Republic	260,0	44,0	19,8	33	217,0	215,0	191,0	150,0
37	Argentina	233,2	104,0	80,5	42	129,2	54,0	28,7	29,8
38	Lithuania	225,0	46,0	25,7	37	179,0	163,0	91,0	54,4
39	Chile	190,0	0,0	0,0	35	190,0	170,0	167,6	20,1
40	Croatia	180,0	48,0	37,4	41	131,0	89,0	26,7	18,2
41	Costa Rica	148,2	0,0	0,0	39	148,2	123,0	123,0	74,0
42	Cyprus	147,0	13,0	9,7	40	134,0	82,0	0,0	0,0
43	Puerto Rico	125,0	125,0	∞	New	0,0	0,0	0,0	0,0
44	Pakistan	106,0	100,0	1666,7	71	6,0	6,0	6,0	6,0
45	Tunisia	104,0	50,0	92,6	46	54,0	54,0	54,0	20,0
46	Nicaragua	102,0	40,0	61,9	45	63,0	63,0	40,0	0,0
47	Iran	100,0	0,0	0,0	43	100,0	100,0	82,0	82,0
48	Honduras	70,0	0,0	0,0	44	70,0	0,0	0,0	0,0
49	Latvia	68,0	21,0	119,4	56	31,0	30,0	28,5	26,9
50	Uruguay	52,0	23,6	28,4	50	40,5	30,5	20,5	20,5

Position 2012	Country/Region	Total capacity installed end 2012 [MW]	Added capacity 2012 [MW]	Growth rate 2012 [%]	Position 2011	Total capacity installed end 2011 [MW]	Total capacity installed end 2010 [MW]	Total capacity installed end 2009 [MW]	Total Capacity installed end 2008 [MW]
51	Ethiopia	51,0	21,0	70,0	58	30,0	0,0	0,0	0,0
52	Switzerland	50,0	4,0	9,9	48	45,5	42,3	17,6	13,8
53	Jamaica	47,7	0,0	0,0	47	47,7	29,7	29,7	20,7
54	Luxembourg	45,0	0,0	2,3	49	44,0	44,0	35,3	35,3
55	Cape Verde	38,3	0,0	0,0	51	38,3	2,8	2,8	2,8
56	New Caledonia	38,2	0,0	0,0	52	38,2	38,2	38,2	38,2
57	Dominican Republic	33,6	0,0	0,0	53	33,6	0,2	0,2	0,2
58	Philippines	33,0	0,0	0,0	54	33,0	33,0	33,0	25,2
59	Vietnam	31,0	0,0	0,0	55	31,0	31,0	8,8	1,3
61	Venezuela	30,0	30,0	∞	New	0,0	0,0	0,0	0,0
60	Aruba	30,0	0,0	0,0	57	30,0	30,0	0,0	0,0
62	Guadeloupe	26,8	0,0	0,0	59	26,8	26,8	26,8	26,8
63	Reunion Island	23,4	0,0	0,0	60	23,4	23,4	23,4	23,4
64	Colombia	19,5	0,0	0,0	61	19,5	19,5	20,0	19,5
65	Ecuador	19,0	16,5	660,0	75	2,5	2,5	2,5	4,0
66	Russia	16,8	0,0	0,0	62	16,8	15,4	14,0	16,5
67	Guyana	13,5	0,0	0,0	63	13,5	13,5	13,5	13,5
68	Curacao	12,0	0,0	0,0	64	12,0	12,0	12,0	12,0
69	Cuba	11,7	0,0	0,0	65	11,7	11,7	7,2	7,2
70	Bonaire	10,8	0,0	0,0	66	10,8	10,8	0,0	0,0
71	South Africa	10,1	0,0	0,0	67	10,1	10,0	8,0	21,8
72	Fiji	10,0	0,0	0,0	68	10,0	10,0	10,0	10,0
73	Dominica	7,2	0,0	0,0	69	7,2	7,2	0,2	0,2
74	Israel	6,0	0,0	0,0	70	6,0	6,0	6,0	6,0
75	Faroe Islands	4,0	0,0	0,0	72	4,0	4,0	4,0	4,1
76	Slovakia	3,0	0,0	0,0	73	3,0	3,0	3,0	6,0
77	Vanuatu	3,0	0,0	0,0	74	3,0	3,0	3,0	3,0
78	Nigeria	2,2	0,0	0,0	76	2,2	2,2	2,2	2,2
79	St. Kitts and Nevis	2,2	0,0	0,0	77	2,2	0,0	0,0	0,0
80	Azerbaijan	2,0	0,0	0,0	80	2,0	0,0	0,0	0,0
81	Kazakhstan	2,0	0,0	0,0	78	2,0	0,5	0,5	0,5
82	Belarus	1,9	0,0	0,0	79	1,9	1,9	1,9	1,1
83	Iceland	1,8	1,8	∞	New	0,0	0,0	0,0	0,0
84	Antarctica	1,6	0,0	0,0	80	1,6	1,6	1,6	0,6
85	Jordan	1,5	0,0	0,0	82	1,5	1,5	1,5	1,5
86	Indonesia	1,4	0,0	0,0	83	1,4	1,4	1,4	1,2
87	Mongolia	1,3	0,0	0,0	84	1,3	1,3	1,3	2,4
88	Madagascar	1,2	0,0	0,0	85	1,2	0,0	0,0	0,0
89	Martinique	1,1	0,0	0,0	86	1,1	1,1	1,1	1,1
90	Mauritius	1,1	0,0	0,0	87	1,1	0,0	0,0	0,0
91	Falkland Islands	1,0	0,0	0,0	88	1,0	1,0	1,0	1,0
92	Eritrea	0,8	0,0	0,0	89	0,8	0,8	0,8	0,8
93	Grenade	0,7	0,0	0,0	90	0,7	0,7	0,2	0,2
94	Peru	0,7	0,0	0,0	91	0,7	0,7	0,7	0,7
95	St. Pierre-et-Miquel	0,6	0,0	0,0	92	0,6	0,6	0,6	0,6
96	Syria	0,6	0,0	0,0	93	0,6	0,6	0,6	0,4
97	Namibia	0,2	0,0	0,0	94	0,2	0,2	0,5	0,5
98	North Korea	0,2	0,0	0,0	95	0,2	0,2	0,2	0,2
99	Algeria	0,1	0,0	0,0	96	0,1	0,1	0,1	0,1
100	Bolivia	0,1	0,0	0,0	97	0,1	0,1	0,0	0,0
<b>Total</b>	<b>World</b>	<b>282'275,3</b>	<b>44'609,7</b>	<b>19,3</b>		<b>236'749,7</b>	<b>196'944,6</b>	<b>159'742,4</b>	<b>120'894,0</b>



**WWEA**

World Wind Energy Association

**WWEA Head Office**

Charles-de-Gaulle-Str. 5  
53113 Bonn  
Germany

T +49-228-369-4080  
F +49-228-369-4084  
secretariat@wwindea.org  
www.wwindea.org

## Membership Application

To join simply fill in and return this form by fax  
+49 228 369 4084, or sign up online at [www.wwindea.org](http://www.wwindea.org)

**We/I agree to the five WWEA principles\* and join WWEA as**

*\* Available at [www.wwindea.org](http://www.wwindea.org)*

### Ordinary member (association)

Membership fee: 1 % of the wind energy related annual budget based on the preceding year. The minimum fee is 100 €, the maximum 15'000 €

### Scientific member (scientific institutions)

Membership fee: If headquartered in a non-OECD country 100 €; in an OECD country 500 €

### Corporate member (commercial enterprise, public/governmental body)

Membership fee: Corporate members have to pay 0,1 % of their wind energy related annual turnover based on the preceding year. The minimum fee is 100 € (if headquartered in a non-OECD country); in an OECD country 1'000 €. The maximum fee is 15'000 €. Public bodies and similar organisations might apply for special regulations.

*Small* wind companies with an annual turnover up to 100'000 € pay 150 €; up to 500'000 €: 300 €; up to 1 Mio. €: 500 €, more than 1 Mio. €: 1'000 € respectively 0,1 % of their annual turnover.

### Individual member

Membership fee: 80 € \*\* / 50 € for students

*\*\* Does not apply to individuals related to the wind energy sector.*

**Membership fee = \_\_\_\_\_ €**

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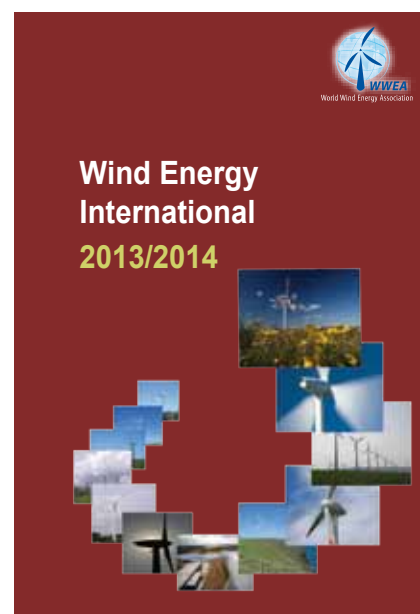
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