



G 20 Climate Profiles

A country-by-country review

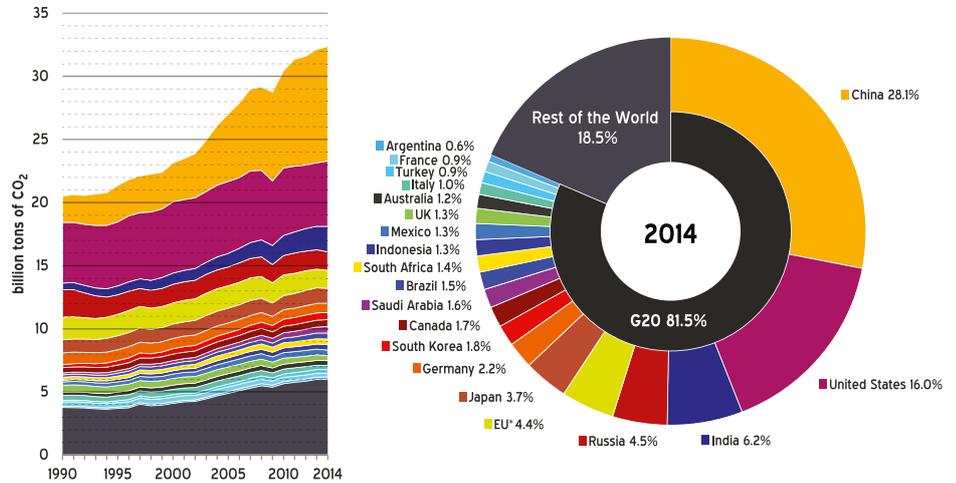
GREENPEACE

G 20: The beginning of the end for coal?

In 2016, the amount of coal power in development globally was cut in half – down to 570 GW from 1,090 GW one year earlier.¹ Much of that culled planned capacity came from the G20 members China and India, where the boom years have given way to an oversupply crisis, extreme air pollution and green energy growth. Ten years ago, coal made up some 70% of electricity supply in China, the world's single biggest coal consumer. Today, it is closer to 60%. Given an overall increase in power generation, it is even more impressive that coal consumption in China fell for the second straight year in 2016.²

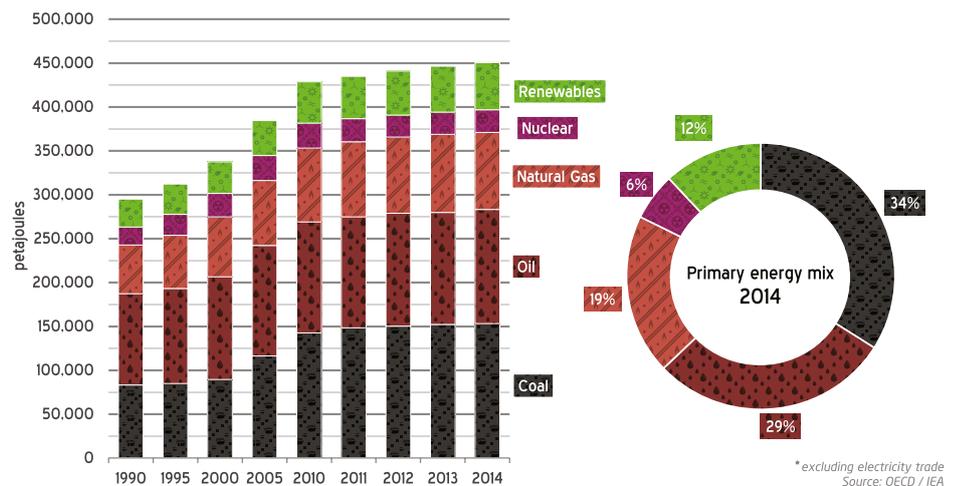
India may follow suit. In late 2016 the India government presented an electricity plan that said no additional coal plants are needed for the next decade at least.³ As wind and solar power grow, coal plants in India may run for fewer hours – which is already happening in China. China has realized that renewables provide energy without polluting the air. But the Chinese have also discovered something often overlooked in the international discussion: wind and solar can grow faster than nuclear ever has. Despite decades of commitment to nuclear power expansion, the Chinese already had more electricity from wind turbines than from nuclear in 2013 (as do Brazil and India today).⁴ By the end of this decade, solar power can also be expected to produce more electricity in these three countries than nuclear will. With these examples set, other countries will increasingly opt for renewables, not coal or nuclear. Other G20 members are also supporting this trend. Canada has adopted a coal phaseout plan by 2030.⁵ Italy is discussing taking the last coal plant off the grid by 2030

G 20 countries | CO₂ emissions from fuel combustion



* excluding France, Germany, Italy & UK | Source: OECD / IEA

G 20 | Primary energy supply by source*



* excluding electricity trade
Source: OECD / IEA

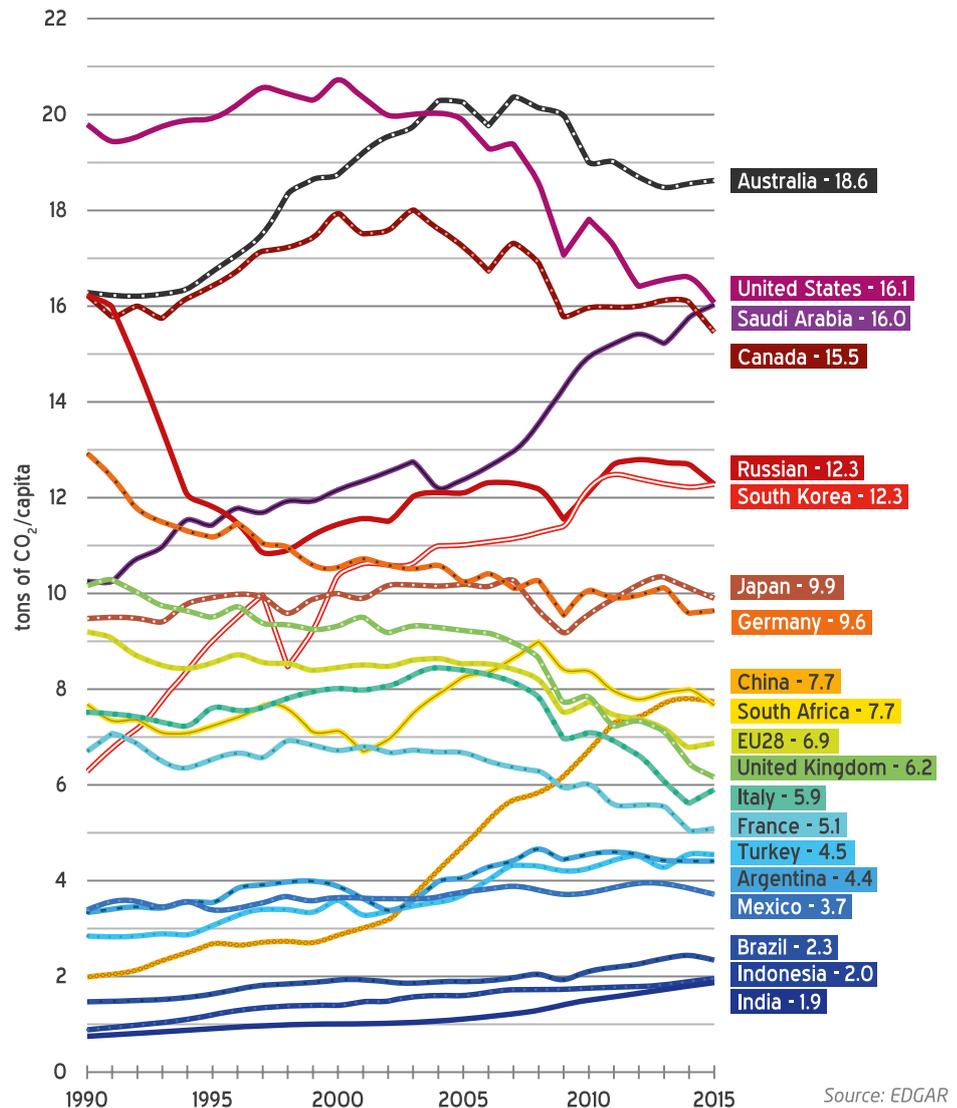
or even 2025.⁶ The UK has reduced carbon emissions more than any other EU country, largely with a carbon floor price for coal and support for renewables. The country aims to be coal-free by 2025.⁷ The first major international commitment away from coal since Trump announced his decision to pull out of the Paris climate agreement was made by South Korea. The new president announced a major shift towards renewables by phasing out nuclear and coal.⁸

The share of coal in the G 20's energy mix was largely the same between 2011 and 2014, and there is little indication that it rose in 2015. Peak coal seems to be near, and the G 20 must accelerate that trend. Globally, not enough progress is being made. Carbon emissions continue to rise in the G 20. Demand for energy is growing as fast as renewables are being added, leaving the total share of green energy relatively stable in recent years despite tremendous progress with wind and solar. For instance, the

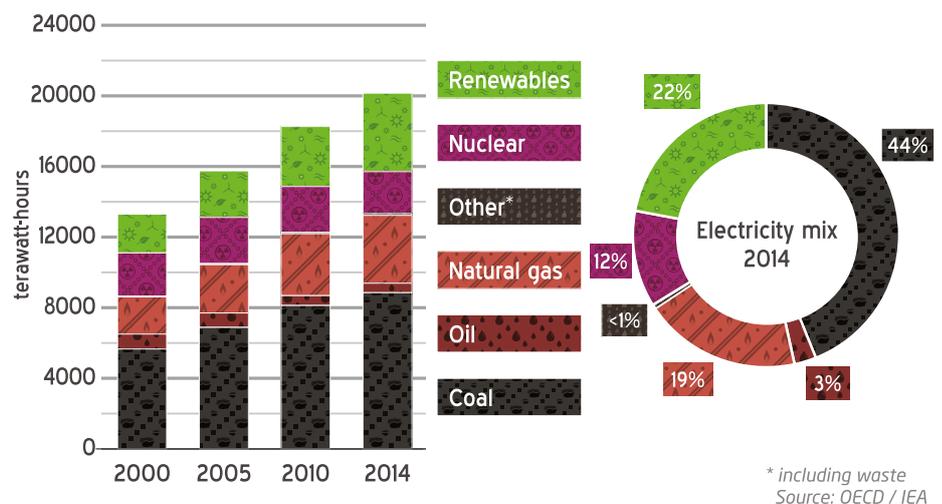
1 http://www.greenpeace.org/india/Global/india/docs/BoomAndBust_2017_EMBARGO.pdf
 2 <http://www.wri.org/blog/2017/01/china%E2%80%99s-decline-coal-consumption-drives-global-slowdown-emissions>
 3 http://www.cea.nic.in/reports/committee/nep/nep_dec.pdf
 4 <http://www.iea.org/statistics/statisticssearch/report/?country=China&product=electricityandheat&year=2013>
 5 <http://www.reuters.com/article/us-canada-energy-coal-idUSKBN13GIEK>
 6 <http://www.qualenergia.it/articoli/20170613-sen-c-e-il-documento-alla-consultazione-7>
 7 <https://www.theguardian.com/environment/2015/nov/18/energy-policy-shift-climate-change-amber-rudd-backburner>
 8 <http://energydesk.greenpeace.org/2017/06/19/south-korea-scrap-coal-nuclear-power/>

amount of renewable electricity in the G20 more than doubled from 2000 – 2014, but the share of renewables in power supply only rose from 17% to 22%. The G20 – a group of 19 major economies plus the European Union – represents more than 80% of global emissions and a wide variety of energy supply systems. Saudi Arabia’s energy system is almost entirely based on oil and gas, whereas South Africa gets a large share of its energy from coal. Russia has a more diversified conventional mix, which includes nuclear and a significant amount of hydropower. What all of these countries lack to date is a significant share of non-hydro renewables. Brazil is the main outlier in the G20; thanks to its large share of hydropower and a decades-long commitment to biofuels, the country gets nearly 40% of its primary energy from renewables. How can we keep demand in check? Efficiency will play a major role in heat supply. Homes need to be renovated so they make do with less heating. By mid-century, demand for cooling may also equal demand for space heating as the planet heats up and emerging economies in tropical climates roll out air-conditioning on a massive scale. Because demand for air-conditioning often coincides with solar power generation, solar will be able to grow quickly in countries with a lot of cooling demand. Add in electric vehicles, and the end of coal may be followed by the end of oil. President Trump’s decision to step away from the Paris Climate Agreement will prolong the arrival of this future. Most onlookers argue, however, that Trump cannot “bring back coal” as promised – and that large parts of the United States will remain committed to climate protection.⁹ So while Trump’s actions have already affected this G20 meeting, he cannot halt the transition towards a clean energy future. The question for the G20 summit in Hamburg is: how far will the G19 allow Trump to slow down the energy transition? The answer will have a lot to do with coal.

G20 countries | CO₂ emissions per capita



G20 | Electricity generation by source



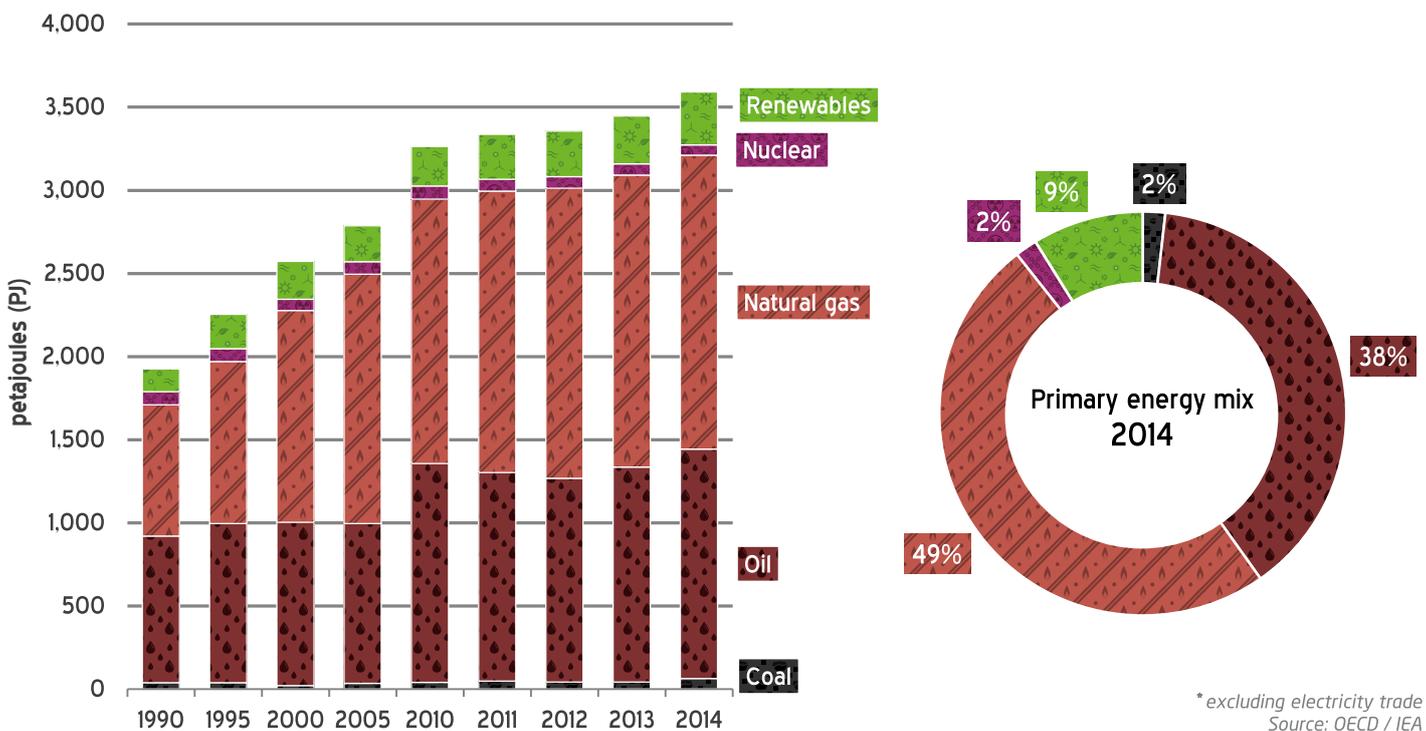
⁹ <http://wearestillin.com/>

ARGENTINA

President Macri is looking for foreign investors for nuclear and Argentina's massive new oil and gas deposits in Patagonia (Vaca Muerta). But wind and solar are now cheaper than new nuclear - and can also be added much faster. In addition, the local environmental impacts of fracking must be weighed against the need for domestic energy, which can also come from wind and solar.

Climate target in Paris Accord	74 % above 1990 by 2030, excluding LULUCF	Fossil fuel subsidies in 2015 (according to the IMF)	17.5 bn USD
CO₂ emissions from energy production, compared to 1990	+94 % (2014)	CO₂ costs avoided due to renewable energies	1.6 bn EUR
Annual CO₂ emissions per capita	4.4 tons (2015)	Renewable energy jobs	30,000 (2015)
Share of renewable power	32 % (2014)	Total CO₂ emissions from energy production	192,000,000 tons

Argentina | Primary energy supply by source*



After 15 years outside of international credit banking, Argentina began returning to capital markets in 2016. An estimated 5% of all households lack a grid connection, and social tariffs are offered to poor households for electricity and natural gas. One initial outcome of international financing could be a CANDU nuclear reactor of Canadian design; if so, it would be the first such plant contracted since the last one was

completed in 2007 in Romania. Argentina also has plans to build small modular reactors (SMRs), with one prototype of around 30 MW currently under construction 100 km northwest of Buenos Aires. Another result could be large wind and solar projects. The country issued tenders for more than a gigawatt of renewable energy capacity in 2016, and the auctions were oversubscribed sixfold. As a consequence, another 1.4

gigawatts of renewable energy were added for a total of 2.4 gigawatts. In 2017, the World Bank agreed to provide 480 million USD in loan guarantees for Argentina's renewable energy auctions. The country adopted renewable energy goals in 2015, with a goal of 20% of energy demand from non-hydro renewables by 2025. An expected 10 GW of new capacity is likely to be added by then towards that goal.

The government also aims to explore shale gas domestically. At the beginning of 2017, the country was negotiating terms with oil firms to have 5 billion USD invested in the sector this year, rising to 15 billion annually in the next few years. Clearly, Argentina is planning for a significant increase in energy consumption as the country forges on with economic growth. Since 1990, primary energy demand has roughly doubled. Nuclear power has actually shrunk during these years, from 79 PJ to 63 PJ, whereas oil consumption grew by some 50% and gas more than doubled. Non-hydro renewables overtook hydropower in 2014 though the two have been growing in sync for those 25 years; hydropower was also slightly lower in 1990.

Not surprisingly, Argentina's carbon footprint has roughly doubled during this time frame.

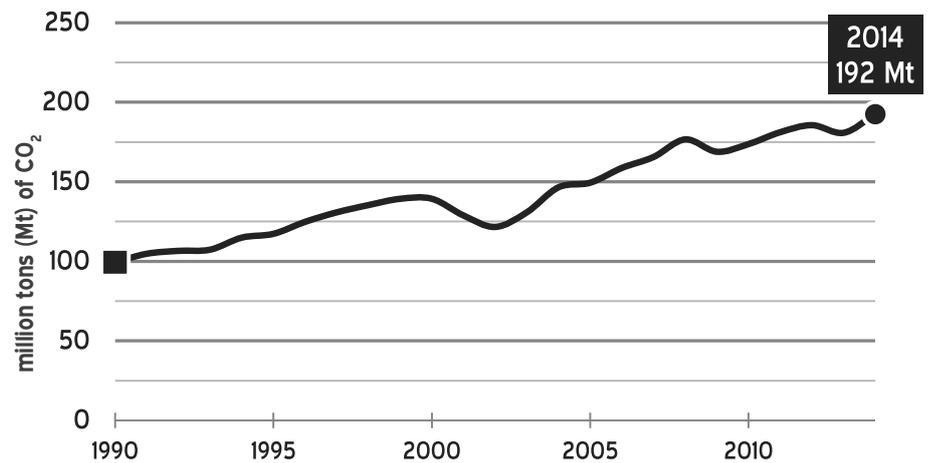
In the power sector, hydropower grew from some 28,800 GWh in 2000 to 41,400 GWh in 2014. The only other major growth in renewables came from biofuels, which increased from 673 GWh in 2000 to 2,780 GWh in 2014. Solar has only been added in the past few years; a mere 16 GWh was reported in 2014. Otherwise, the main additions have been in wind power, which grew from 35 GWh in 2000 to a mere 730 GWh in 2014, all of which was added quite recently.

On the other hand, fossil fuels have rapidly grown as well. Even before the global drop in oil prices at the end of 2014, Argentina had consistently increased its reliance on oil for power from 2,900 GWh in 2000 to some 19,500 GWh in 2014 – a nearly sixfold increase. Coal power also more than doubled. But Argentina's most important electricity source is still gas, which grew by nearly a third in the power sector.

Greenpeace's recommendations

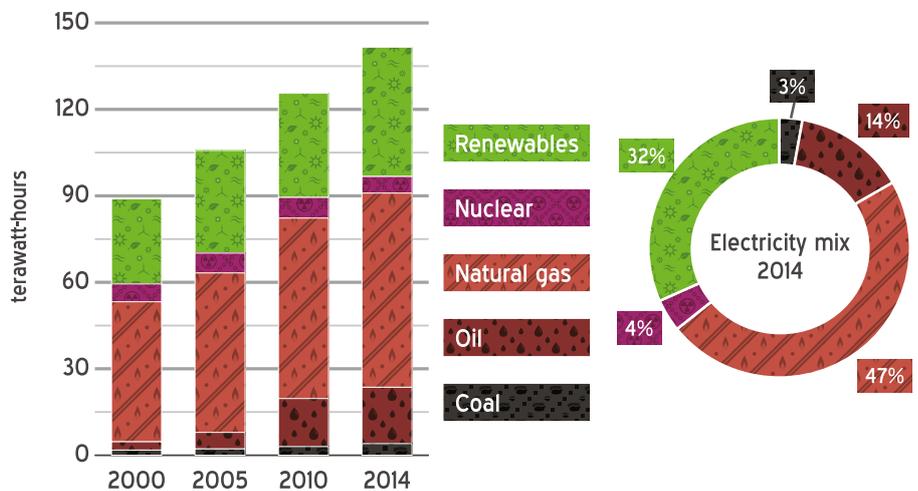
► In September 2016, Argentina became one of the first countries to ratify the Paris Agreement. But the country's INDC reveals that it is out of

Argentina | CO₂ emissions from fuel combustion



Source: OECD / IEA

Argentina | Electricity generation by source



Source: OECD / IEA

step with market trends, as it is pushing the development of "non-conventional fossil fuel resources and nuclear" instead of wind and solar, which have clearly become the cheapest sources of new electricity.

- In contrast, Argentina is one of only ten signatory countries to mention nuclear as a part of their plans to reduce carbon emissions. Argentina must step away from nuclear deals with China that will only lock the country into expensive projects for decades.
- Fossil fuel subsidies must be abolished.
- The renewable energy target needs to be substantially increased.

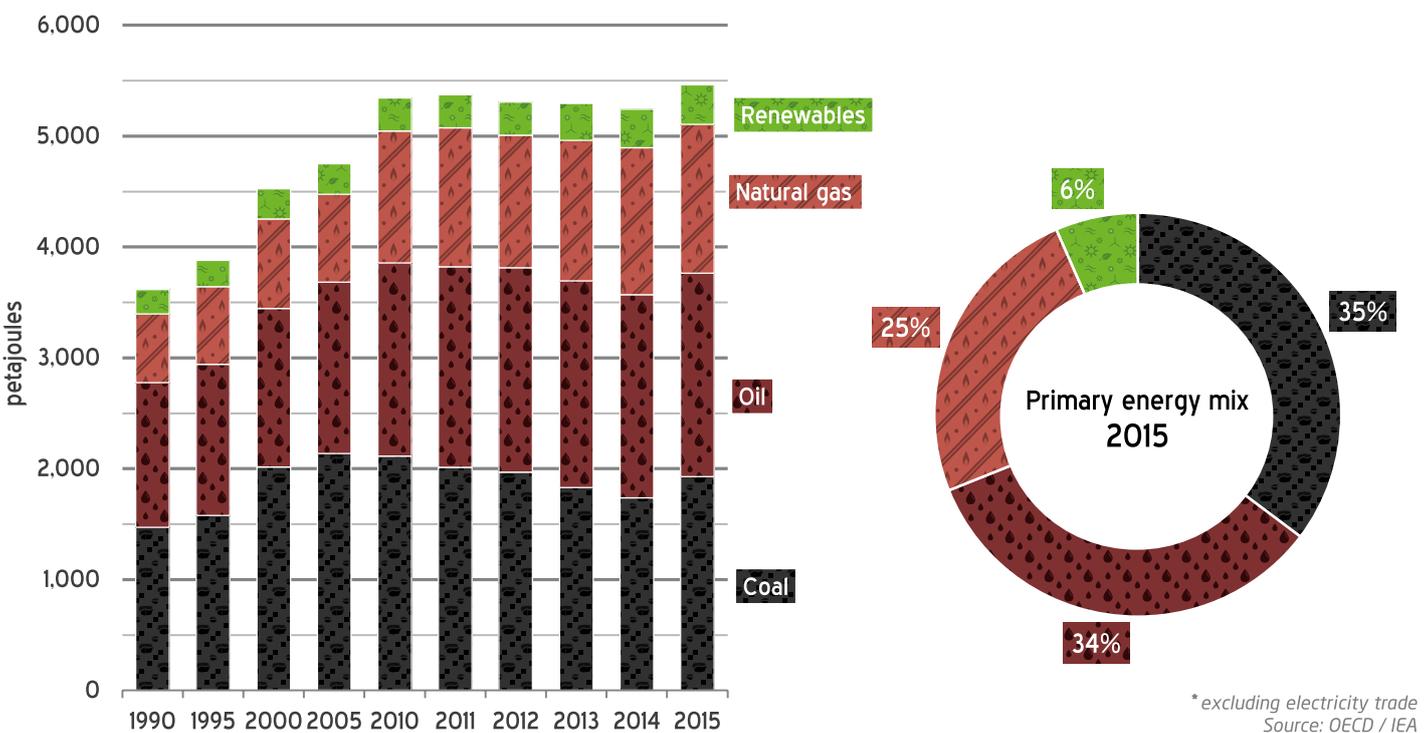


AUSTRALIA

Australia is the world's largest coal exporter, with annual carbon emissions from burning Australia's exported coal in user countries amounting to twice Australia's domestic emissions from all sources. Australia is also one of the world's largest per capita emitters, but has massive potential for renewable energies. Unfortunately, the national government still protects the domestic coal sector.

Climate target in Paris Accord	26% - 28% reduction below 2005 by 2030	Fossil fuel subsidies in 2015 (according to the IMF)	30.06 bn USD
CO₂ emissions from energy production, compared to 1990	+44% (2014)	CO₂ costs avoided due to renewable energies	2.5 bn EUR
Annual CO₂ emissions per capita	18.6 tons (2015)	Renewable energy jobs	20,500 (2015)
Share of renewable power	13% (2015)	Total CO₂ emissions from energy production	374,000,000 tons

Australia | Primary energy supply by source*



In recent years, Australia has become a country to watch, though not always for good news. After a massive push for renewables, Australia may now be home to the largest share of residential solar worldwide. At the same time, it has consistently expanded wind power under regional leadership.

On the other hand, the current and previous national governments have viewed this progress with scepticism,

and conventional utility experts often try to blame renewables for grid downtime – generally unjustifiably. As in other OECD countries, primary energy consumption has been flat to slightly decreasing since 2010, though it grew by some 50% from 1990–2010. Fossil fuels make up nearly 95% of demand.

Carbon emissions are slightly below the level of 2008, when they peaked. However, in the Paris Agreement,

Australia pledged a 26% – 28% decrease by 2030, which it is not on target to meet. Likewise, the target for 2020 – a 5% reduction relative to the year 2000 – implies a roughly 12% decrease below the level of 2014. Australia's legislated carbon price was abolished in June 2014, leading to a rise in CO₂ emissions of 7.5% to February 2017.¹ While emissions per unit of GDP are falling, on current policy settings total

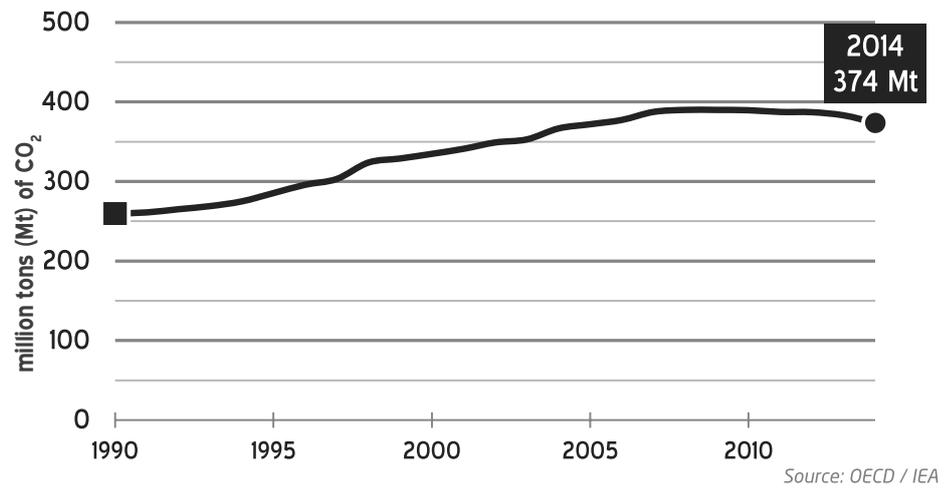
¹ <http://www.smh.com.au/environment/climate-change/disastrous-australias-carbon-emissions-jump-as-coalfired-power-ramps-up-20170228-gunc8f.html>

emissions are projected to continue to rise. Australia's primary emissions reduction policy mechanism is the national Emissions Reduction Fund (ERF). The ERF is on track to fall far short of meeting Australia's 2030 NDC target under the Paris Agreement.² In the power sector, coal clearly remains king, though a shift to natural gas and the growth of renewables reduced coal power by more than 10% from 2000 – 2014 even as total power demand grew from 210,000 GWh to nearly 250,000 GWh. Gas more than tripled during that time frame, from just over 26,000 GWh to nearly 55,000 GWh.

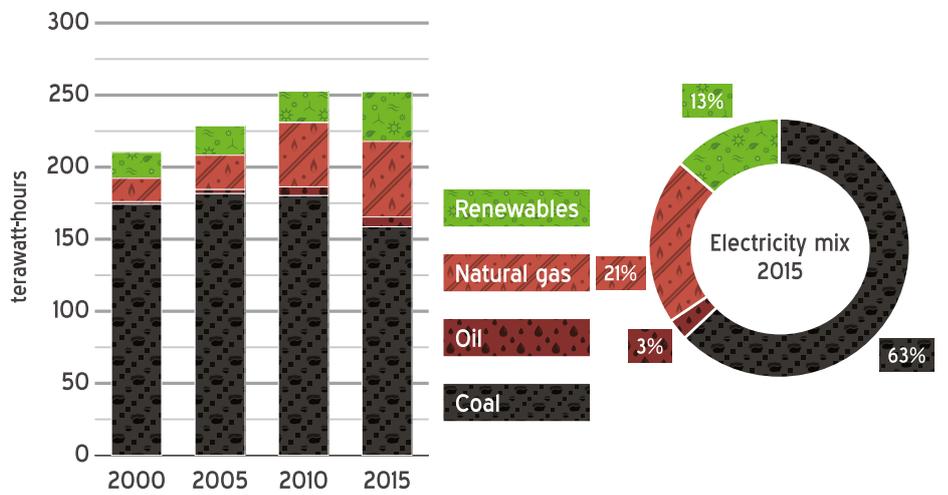
Solar and wind saw quite healthy growth from nearly nothing in 2000 to almost 4,900 GWh for solar and just over 10,000 GWh for wind by 2014. Biofuels are also used significantly in the power sector at some 3,500 GWh, up from 1,100 GWh in 2000. Australia's Renewable Energy Target scheme aims for 23% of power from renewables by 2020. The level in 2014 was roughly 7.5% for non-hydro renewables and roughly the same amount of hydropower, though the latter fluctuates greatly from one year to the next.

Australia has no nuclear power but is a major exporter of uranium.

Australia | CO₂ emissions from fuel combustion



Australia | Electricity generation by source



Greenpeace's recommendations

Greenpeace is calling for:

- ▶ An immediate national ban on new coal projects.
- ▶ A commitment to a credible plan to wind down Australia's fossil fuel exports, in line with the goals of the Paris Agreement to limit global temperature rise to 1.5 °C.
- ▶ Revised domestic emissions reduction targets of:
 - 40-60% reduction by 2025 from 2000 levels.
 - 60-80% reduction by 2030 from 2000 levels.
 - Zero net emissions by 2040.



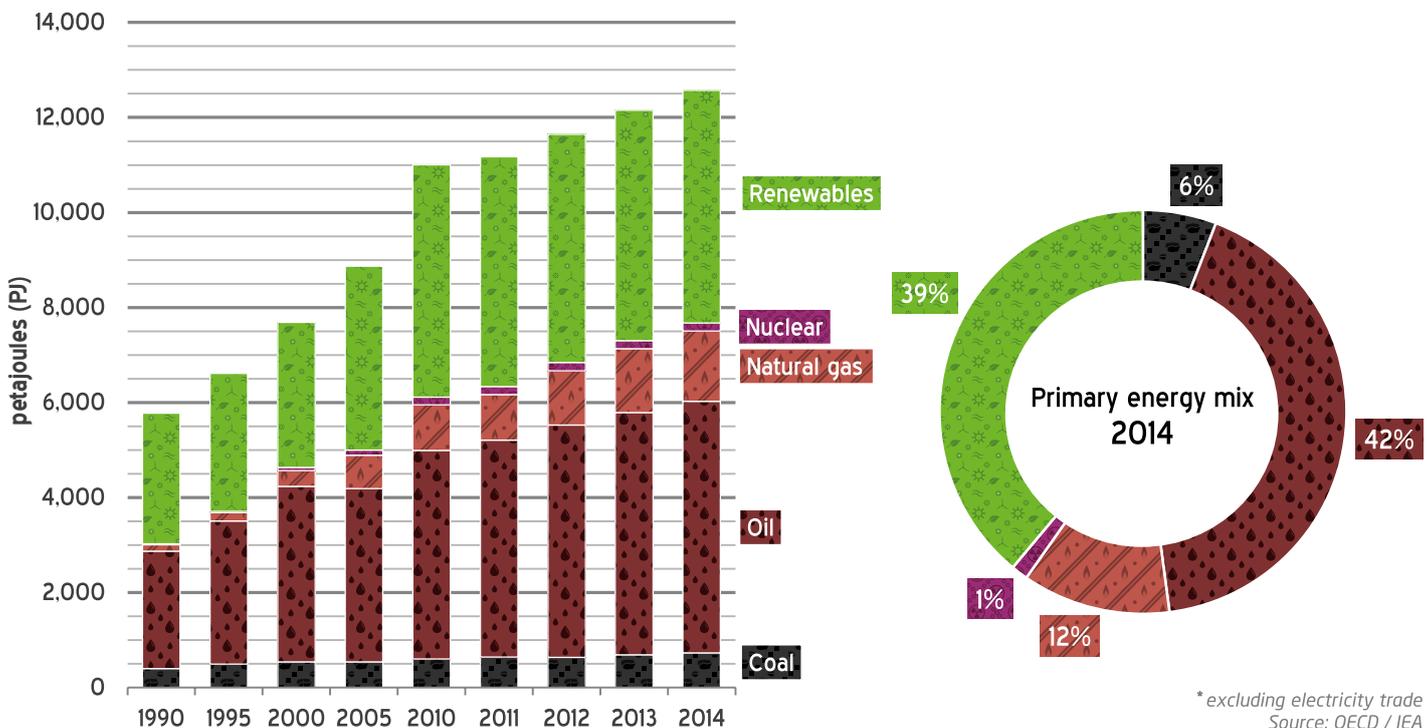
² <http://www.smh.com.au/environment/climate-change/disastrous-australias-carbon-emissions-jump-as-coalfired-power-ramps-up-20170228-gunc8f.html>

BRAZIL

Brazil has relatively low carbon emissions from the power sector, but the growing consumption of natural gas, oil and coal has led to a 50 % rise since 2009. In addition, growing rates of deforestation in the Amazon rain forest remain a focal point for global warming.

Climate target in Paris Accord	37% and 43% reduction below 2005 levels by 2025 and 2030, including LULUCF	Fossil fuel subsidies in 2015 (according to the IMF)	55.4 bn USD
CO₂ emissions from energy production, compared to 1990	+158% (2014)	CO₂ costs avoided due to renewable energies	22.3 bn EUR
Annual CO₂ emissions per capita	2.3 tons (2015)	Renewable energy jobs	918,000 (2015)
Share of renewable power	73% (2014)	Total CO₂ emissions from energy production	476,000,000 tons

Brazil | Primary energy supply by source*



Brazil is the world's second largest producer of biofuels after the United States thanks to a policy promoting ethanol production from sugar cane dating back to the 1970s. An estimated 95% of new cars sold in the country can run on any blend of gasoline and ethanol. Nonetheless, oil consumption has more than doubled since 1990 from around 2,500 PJ to some 5,300 PJ in 2014. Likewise, total primary energy demand also grew from around 5,900 PJ to 12,700 PJ during

that time frame. Brazil's success with solar heat is often not captured in official statistics like those collected by the IEA and used for this report. The country has adopted policies both at the city and national levels to require solar thermal systems on new buildings, making Brazil the third largest market worldwide for solar thermal heat according to REN 21. The country's carbon emissions from the energy sector have skyrocketed since 2009, while progress in

combating deforestation since the early 2000s halted around 2012 and is now being reversed. Brazil has historically been an outlier in greenhouse gas reports, with land use change and agriculture playing an unusually large role relative to energy. Around 46% of Brazil's emissions come from land use (mostly land use change), and 22% come from agriculture and cattle ranching activities. These sectors are deeply connected, and together

represent 68% of the problem.

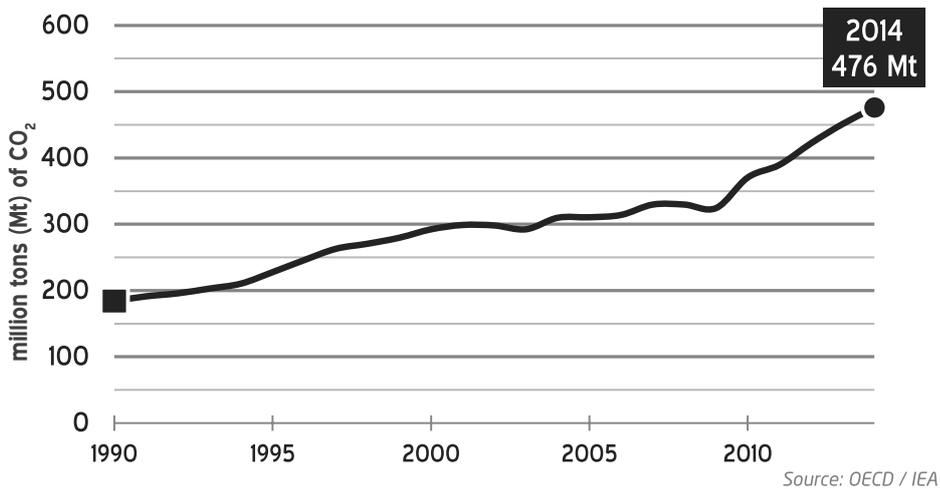
Brazil's commitment under the Paris Agreement still doesn't aim at ending deforestation (only the end of illegal deforestation in the Amazon is considered). Between 2012 and 2016, deforestation increased by 75%. In its pledge for the Paris Agreement, Brazil largely focuses on ramping up non-hydro renewables. The goal is a 43% reduction in carbon emissions by 2030. By that time, renewables are to make up 45% of energy supply, 18% of which would be biofuels.

The amount of hydropower has been roughly stable since 2005, though it doubled from 1990 – 2005. Wind power has grown sixfold since 2010, coming in at some 12,200 GWh in 2014. Still, that figure only represents 2% of power supply. The country had some great success with auctions for wind power in 2013, but interest rates rose afterwards, preventing the country from repeating that initial success. Solar power is also just getting started; in 2013, PV was still clearly more expensive than onshore wind, so the country has adopted separate auctions for the technology to prevent wind and solar from competing with each other.

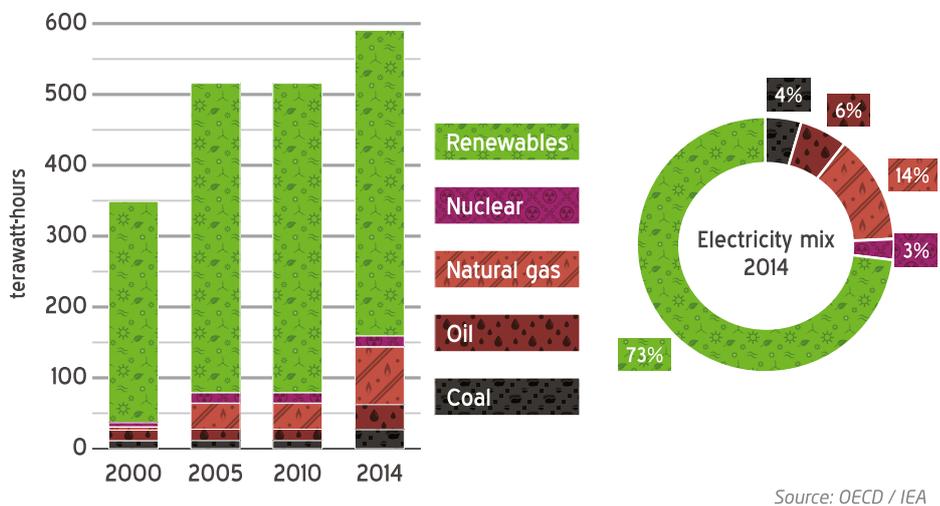
Greenpeace's recommendations

- ▶ Brazil must tap its renewable energy potential (with no further hydropower expansion, which has enormous impact on the forest and traditional/indigenous populations). The country's already installed hydropower capacity would allow for a large share of fluctuating wind and solar power to reduce carbon emissions from electricity even further.
- ▶ In addition to utility-scale projects, distributed renewables will strengthen urban and rural communities, providing greater democratic input within the energy sector. Energy efficiency would increase for the whole system, and citizens would benefit economically by becoming energy producers themselves.

Brazil | CO₂ emissions from fuel combustion



Brazil | Electricity generation by source



- ▶ The Brazilian government should consider the future financial losses from further fossil fuel extraction that will be incurred due to climate change and a growing global divestment movement.
- ▶ Brazil should pledge to remain below the global per capita average for carbon emissions starting in 2020 and limit CO₂-equivalent emissions to around a gigatonne by 2030.
- ▶ Bigger investments need to be made in public transport and in infrastructure for non-motorized transport to curb fossil fuel consumption.
- ▶ Deforestation needs to be curtailed in the Amazon and Cerrado regions - Brazil should include in its NDC the goal of

ending any kind of deforestation (legal and illegal), aligned with effective actions in order to contain deforestation. For example, the country could create more conservation areas (there are around 80 million hectares of non-designated public lands in the Amazon), as well as retake the demarcation of indigenous land.

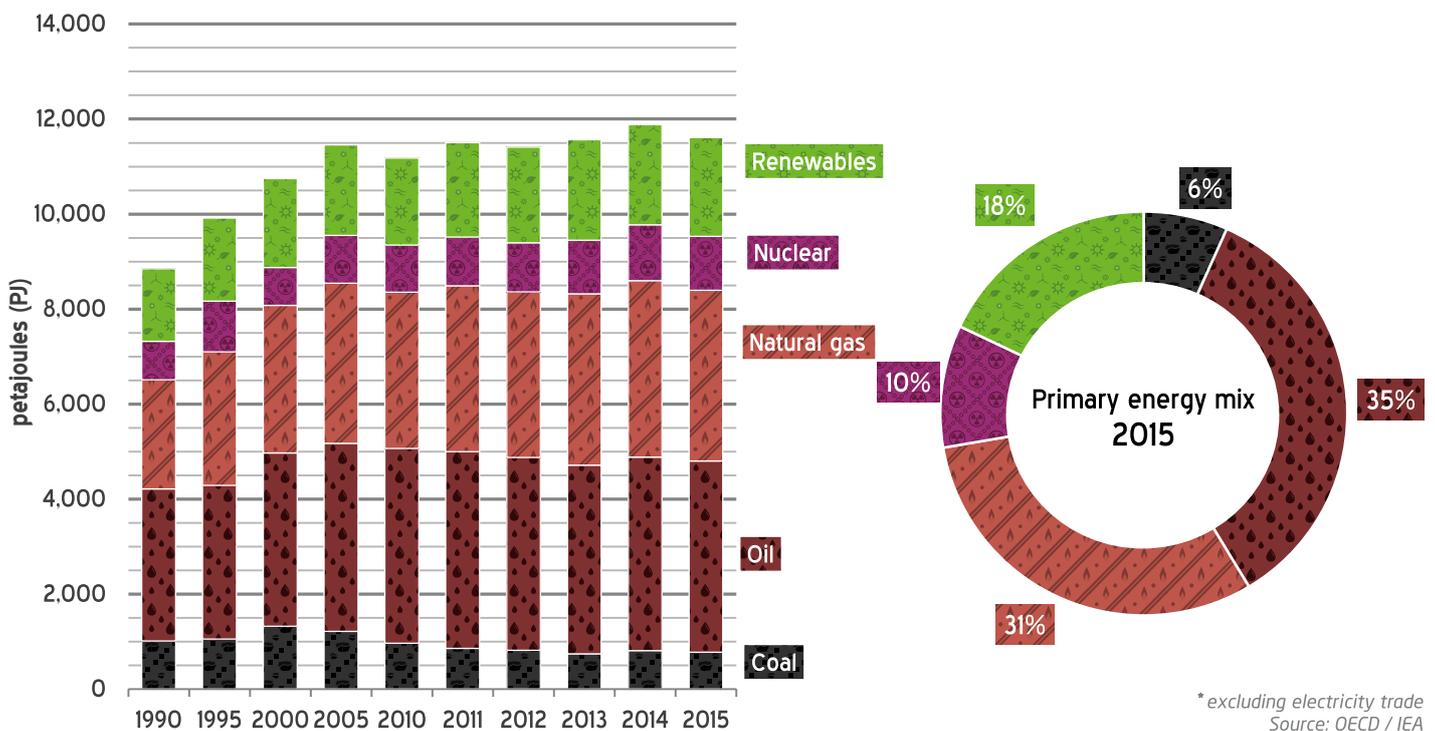


CANADA

Canada has one of the largest per capita carbon footprints in the world despite its large share of hydropower and great renewable energy potential. But its impact goes far beyond domestic consumption: Canada holds massive fossil resources and exports huge amounts of coal and oil from tar sands. Even its current, more environmentally friendly government remains committed to these oil exports.

Climate target in Paris Accord	30 % below 2005 levels by 2030	Fossil fuel subsidies in 2015 (according to the IMF)	46 bn USD
CO₂ emissions from energy production, compared to 1990	+ 32 % (2014)	CO₂ costs avoided due to renewable energies	24.1 bn EUR
Annual CO₂ emissions per capita	15.5 tons (2015)	Renewable energy jobs	36,400 (2015)
Share of renewable power	63 % (2015)	Total CO₂ emissions from energy production	555,000,000 tons

Canada | Primary energy supply by source*



Canada has made some progress in reducing coal consumption, which has fallen by a quarter since 1990. While power demand grew and coal power generation nearly dropped in half, the share of coal fell from around 19% to 10% in 2015. All other sources of energy grew during that time frame. As a result, Canada's total carbon footprint continues to grow. Per capita emissions have fallen since 2005, but population growth has more

than offset that progress. Canada has adopted a coal phaseout plan by 2030.¹ Natural gas has been the big winner in recent years. The country generated some 3,600 PJ of energy from gas in 2015, just behind oil at over 4,000 PJ. Hydropower comes in third, fluctuating generally between 1,200 PJ and 1,400 PJ in recent years, followed closely by nuclear, which ranged from 1,000 PJ to 1,200 PJ. Non-hydro renewable energy

has only grown modestly since 1990, from around 450 PJ to 730 PJ in 2014. In 2011 Canada backed out of the Kyoto Protocol but in 2016 it ratified the Paris Agreement. Its pledge (submitted by the previous Conservative government but maintained by the new Liberal government led by Justin Trudeau) states that "Canada represents only 1.6% of the world's greenhouse gas emissions," an indication of the

¹ <https://www.theguardian.com/world/2016/nov/21/canada-coal-electricity-phase-out-2030>

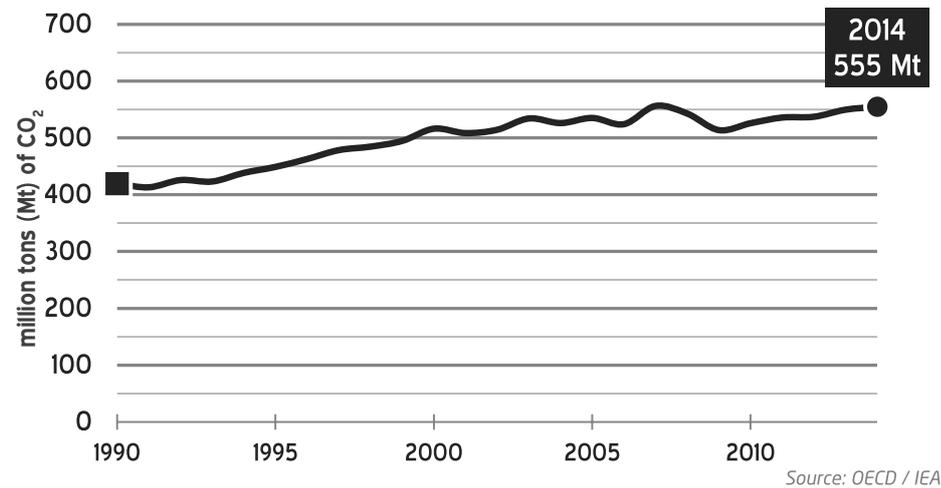
government's reluctance to be a leader in combating climate change. Its pledge stresses perhaps more than any other that the country does not wish to do the right thing unless accompanied by others. It says Canada will do "more in concert with all major emitters." Canada has pledged to reduce its carbon emissions by 30% below the 2005 level by 2030.

The country has wildly differing regions when it comes to energy. Provinces like Manitoba, Quebec, Ontario, and British Columbia have a lot of hydropower, whereas the provinces in the middle rely far more on fossil fuel. Ontario is home to sixteen of the country's eighteen nuclear reactors, which are aging. A debate now rages over plans to revamp these plants so they can continue running. Canada is a good example of how regional players can propel climate action. Ontario's Green Energy Act of 2009 led to a great concentration of wind and solar in the province, where some 40% of the country's 11.9 GW of wind farms and a whopping 98% of all solar had been built by the end of 2016. Alberta's new government is poised to launch its own coal phaseout and renewable energy push, partly to diversify the economy, which has suffered from the recent drop in oil prices. Nonetheless, the Alberta government remains very supportive of oil and pipelines.

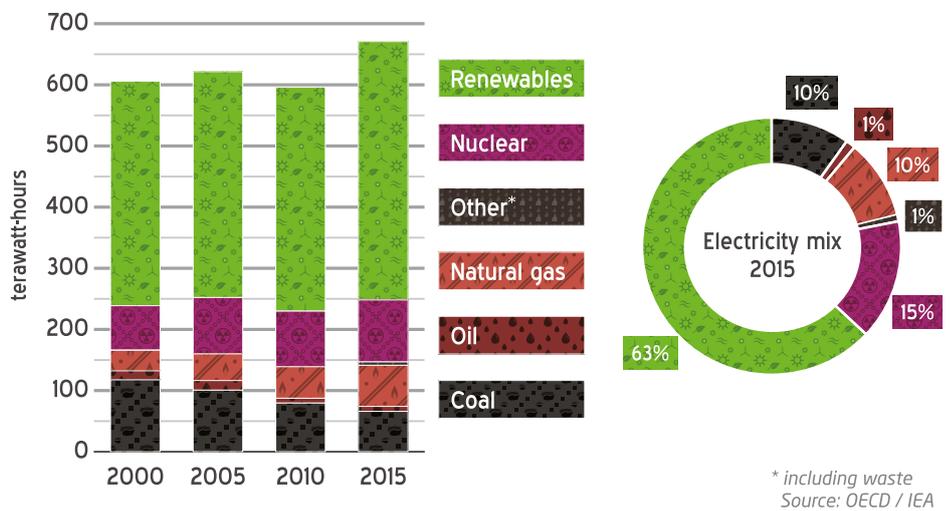
Greenpeace's recommendations

- ▶ Focus on transitioning Alberta from a tar sands and oil economy to a renewable one.
- ▶ As a major supplier of fossil energy to the world, Canada must keep its coal and oil resources in the ground.
- ▶ Canada is in an enviable position to complement fluctuating wind and solar with dispatchable hydropower. The country can easily strive for a 100% renewable power supply by phasing out both coal and nuclear.
- ▶ The Canadian government

Canada | CO₂ emissions from fuel combustion



Canada | Electricity generation by source



must take the Paris Agreement seriously. By not meeting its own voluntary targets, the Canadian government discredits the climate negotiation process. Refusing to accept mandatory targets only makes matters worse.

- ▶ Keep biomass at home. Canada - like the United States - is a major supplier of wood pellets to Europe, many of which are co-fired in coal plants, especially in the UK and Belgium. Canada has tremendous biomass resources, but they must be managed sustainably - international trade of biomass worsens that equation.

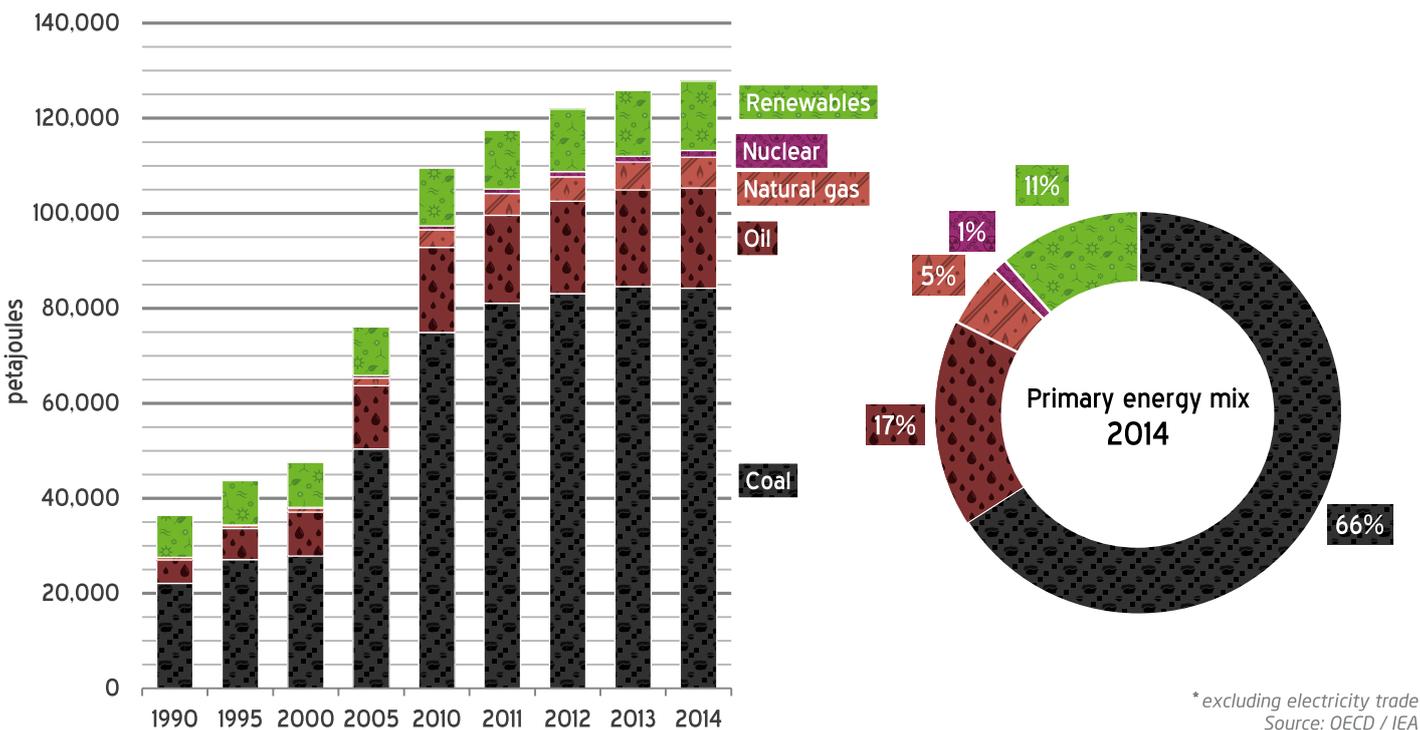


CHINA

There is reason for cautious optimism when it comes to Chinese emissions. The country is a leader in solar hot water (accounting for 70% of the global market), has massive sales of electric two-wheelers and electric cars (more than the EU and United States combined), and is ramping up both wind and solar power more than any other country worldwide. Total coal use and coal-fired power generation have been falling since 2013, and the country has started to strictly control construction of new coal-fired power plants. At the beginning of 2017, the Chinese government stopped the planning and the construction of 104 coal plants.

Climate target in Paris Accord	64% - 70% reduction of emissions intensity below 2005 by 2030	Fossil fuel subsidies in 2015 (according to the IMF)	2,272 bn USD
CO₂ emissions from energy production, compared to 1990	+ 338% (2014)	CO₂ costs avoided due to renewable energies	99.6 bn EUR
Annual CO₂ emissions per capita	7.7 tons (2015)	Renewable energy jobs	3,523,000 (2015)
Share of renewable power	23% (2014)	Total CO₂ emissions from energy production	9,087,000,000 tons

China | Primary energy supply by source*



A decade ago, every western politician who opposed strict regulations on carbon emissions pointed a finger at China, arguing “why should we clean up our energy when they are building so many coal plants?” It is true that China alone now accounts for nearly a third of global emissions (twice as much as the United States). But the days of scapegoating China are

coming to an end. Air pollution from coal and the need to balance economic structure are the main reasons why coal growth has stopped, but Chinese leaders also take climate change seriously. China’s carbon emissions have tripled since 1990. But since 2014 (not shown in the chart), the country’s emissions have remained at the same level.

The Chinese have stated emission reduction goals in terms of “per unit of GDP” for years, and the pledge for the Paris Agreement is no exception. It states that the goal for 2030 is a 60% to 65% reduction in carbon emissions per unit of GDP. In recent years, CO₂ emissions have however stabilized or even fallen, implying much faster intensity cuts.

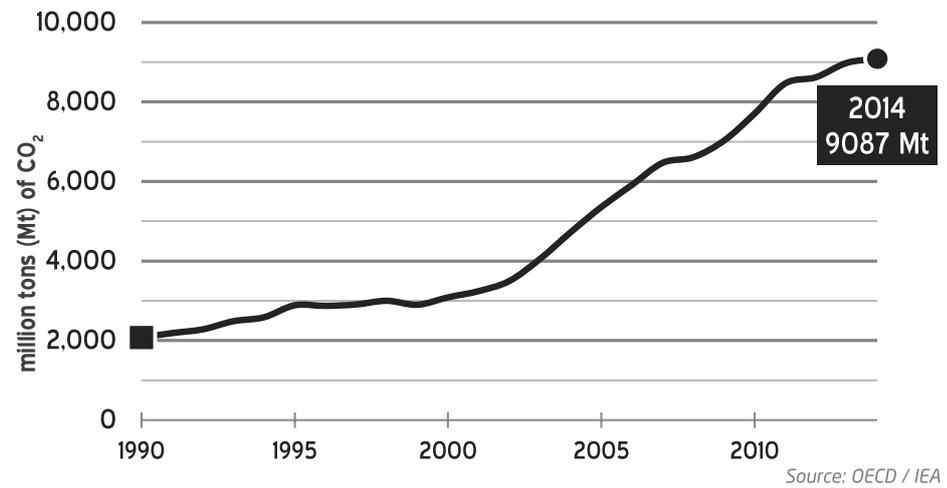
China has long been committed to nuclear power but apparently finds it much easier to ramp up wind power. While nuclear has grown from 16 TWh in 2000 to 133 TWh in 2014, wind power increased from practically nothing in 2000 to 156 TWh in 2014 and has continued to outstrip nuclear recently since reaching 241 TWh in 2016 (compared to only 213 TWh for nuclear). PV started much later; as of 2010, China still did not have 1 TWh of solar power, but it had 29 TWh in 2014 – and 66 TWh in 2016.

As a result, the capacity utilization of Chinese coal plants continues to drop, with the entire thermal fleet falling to 4,165 full-load hours in 2016. Chinese decision-makers will need to realize that fluctuating wind and solar conflict with inflexible nuclear.

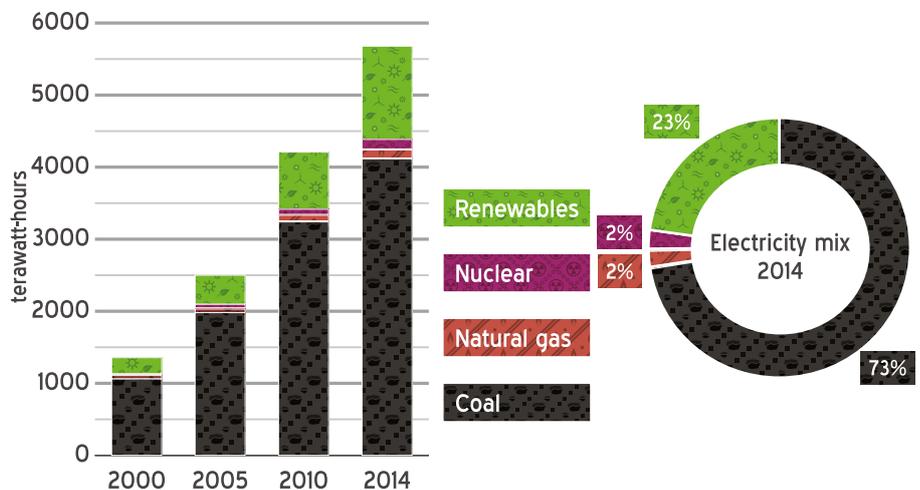
Greenpeace's recommendations

- ▶ Forget about "emissions per unit of GDP" - the climate does not care. The goal must be zero emissions.
- ▶ China's economy is over-reliant on heavy industry sectors accounting for 46% of global aluminium production, 50% of steel, and 60% of cement. China must focus more on innovative solutions to increase efficiency and lower energy intensity for the economic and energy transition.
- ▶ China should ensure a continued fall in coal consumption and a matching increase in clean energy, and set targets to cap and reduce coal use beyond 2020.
- ▶ With emissions already stable for the past few years, China should make every effort to achieve a structural peak in national CO₂ emissions much earlier than 2030.
- ▶ China should introduce immediate structural reform in its electricity system to prevent the curtailing of renewable energy expansion and to boost the uptake of distributed solar power.

China | CO₂ emissions from fuel combustion



China | Electricity generation by source

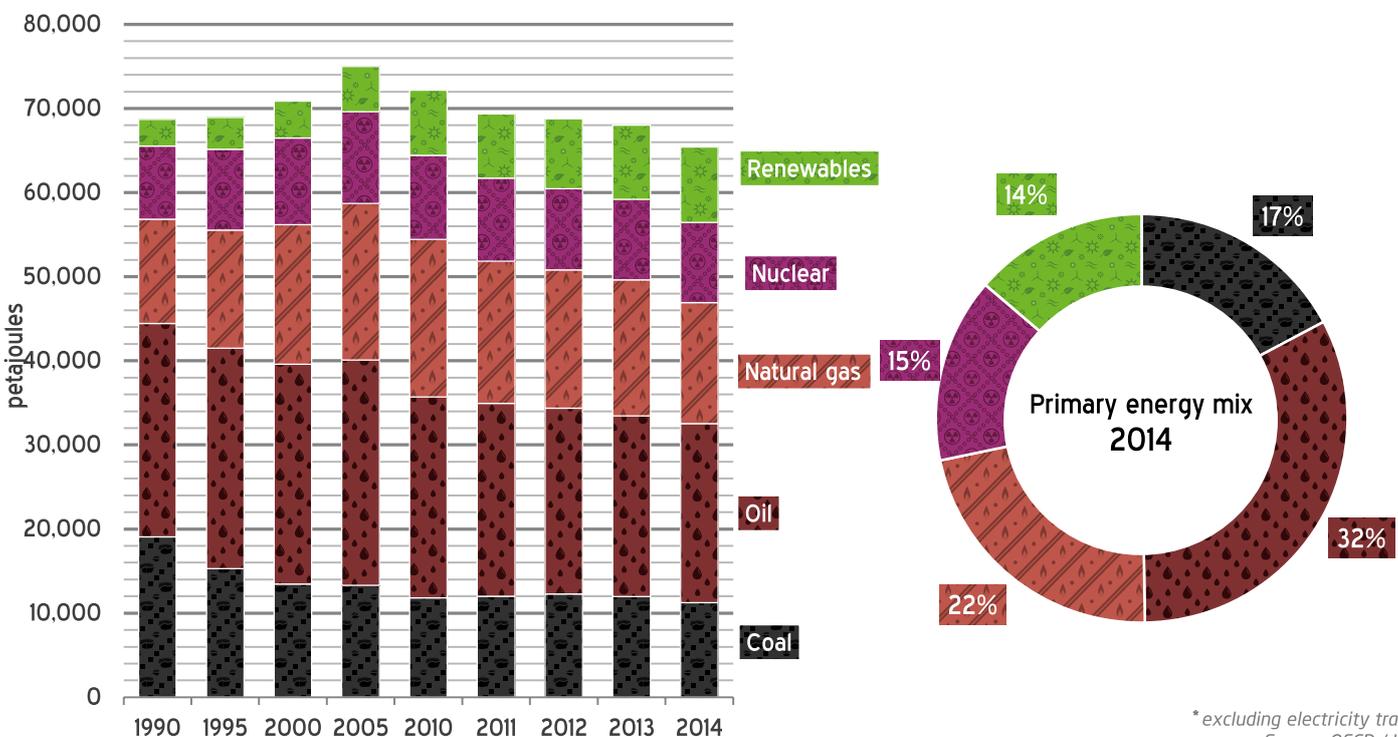


EUROPEAN UNION

The EU has long positioned itself as a climate leader in global negotiations, but internal disagreement over climate ambition for 2030 and beyond and regulation of its energy market has resulted in weak 2030 targets, insufficient progress in emission reductions and a carbon trading system that has not yet and is unlikely to ever produce a high enough price to be a significant driver of the energy transition.

Climate target in Paris Accord	at least 40% reduction below 1990 level by 2030	Fossil fuel subsidies in 2015 (according to the IMF)	329.8 bn USD
CO₂ emissions from energy production, compared to 1990	-22.9% (2014)	Share of renewable power	29% (2014)
Annual CO₂ emissions per capita	6.9 tons (2015)	Total CO₂ emissions from energy production	3,160,000,000 tons

European Union | Primary energy supply by source*



* excluding electricity trade
Source: OECD / IEA

The EU has set itself 2020 targets to cut carbon emissions by 20%, boost renewables to a 20% share of the energy system and increase energy efficiency by 20%. In 2014, the EU's carbon emissions had already been reduced by 22%, meaning the EU had already reached its 2020 carbon target. In February 2017, the European Commission published figures showing that renewables made up 16.4% of final energy consumption, putting the continent "well on track" to reach its 2020 target. The efficiency

target, however, appears in danger of being missed: in 2014, the EU had achieved over 90% of the required energy savings. However energy demand rose slightly in 2015. In October 2014, the EU adopted a new set of three climate and energy targets for 2030: a binding target to cut carbon emissions by a minimum of 40% compared to 1990 levels, a binding EU-level target to boost renewables to at least a 27% share and a non-binding target to cut energy demand by at least 27%. The

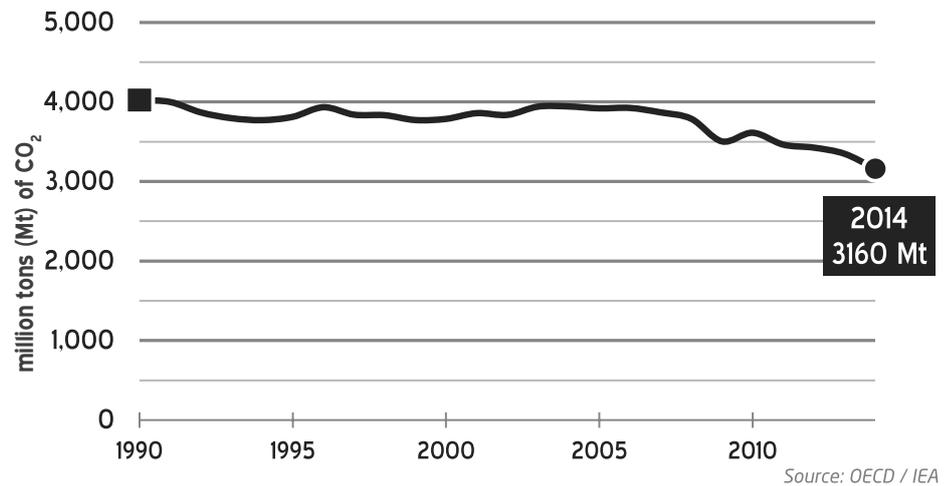
European Commission has proposed to increase the energy efficiency target to 30% and make it binding. However it did not propose to increase the renewables target or reintroduce binding national renewable energy targets, which exist until 2020. This lack of ambition results from a reluctance among member states to commit, and disagreement in relation to the focus of action. For instance, the UK, which wanted a single climate target, wishes to include nuclear energy in its decarbonisation action,

while Germany rules out nuclear in favor of renewables and efficiency. At the same time, Poland and Germany aim to protect their coal sectors from strict carbon limits. European utilities also played a role in limiting ambition in an effort to protect their existing assets and slow down the transition to renewables. Nevertheless, regions and municipalities across Europe are working to implement renewable energy projects. Community renewable energy projects provide economic growth opportunities, including for rural areas. Research commissioned by Greenpeace shows that the activities of about 112 million „energy citizens“ (consumers who contribute to renewable energy production and demand-side flexibility) could meet 19 % of Europe’s electricity demand by 2030, with this figure rising to 264 million energy citizens (half of all EU citizens) being able to supply 45 % of Europe’s electricity demand by 2050.¹ Carbon emissions have fallen significantly since 2007, mainly because of the economic downturn resulting from the financial crisis of 2008 and the increase in renewable energy.

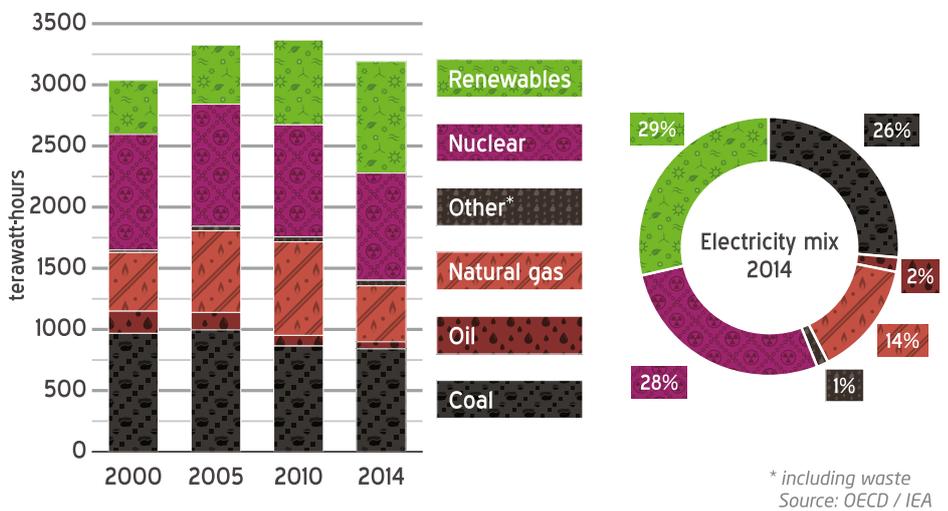
Greenpeace priority recommendations

- ▶ The EU must increase its 2030 targets to at least 55 % carbon emission cuts, at least a 45 % share of renewables and its least 40% energy efficiency. All three targets should be binding for the EU and its member states. The EU should also start work on determining the EU’s role in limiting the rise in global temperature to 1.5 °C.
- ▶ Important provisions for the development of renewables, including priority dispatch and priority grid access, must be reinstated during the current reform of the EU’s renewable and energy market legislation.
- ▶ The EU must create legal rights for citizens to produce, store, sell and consume renewable energy, and set out supportive provisions for citizens to participate in the

European Union | CO₂ emissions from fuel combustion



European Union | Electricity generation by source



energy transition as individuals (renewable self-consumers) and collectively (renewable energy communities).

- ▶ The EU and its member states should retire their coal and nuclear plants to make room for energy citizens. In addition to divesting from all fossil fuels, nuclear energy, and false solutions like bioenergy, the EU should prioritize funding for the transition to an efficient energy system based on 100 % renewables.
- ▶ The EU and its member states should invest in a transition to sustainable mobility, including walkable cities, clean and powerful public transport, bike lanes, and the like.



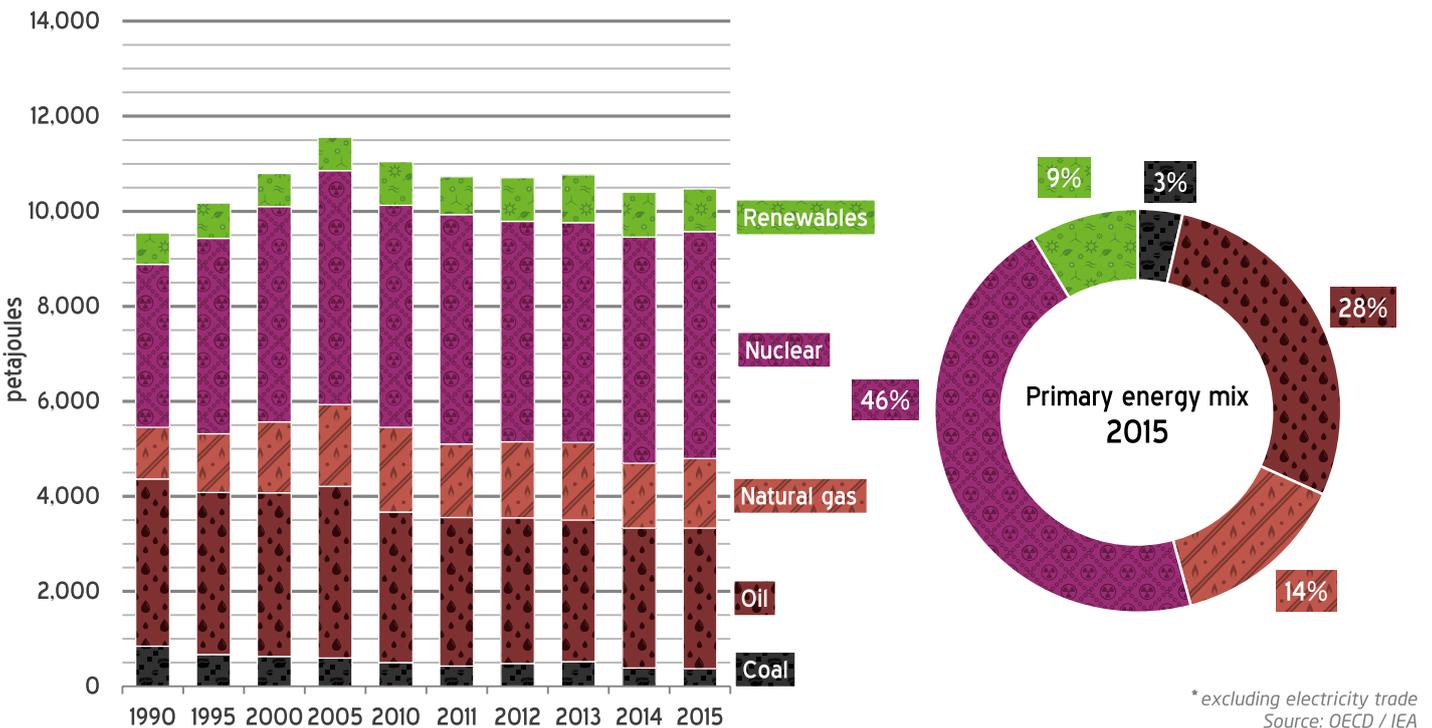
¹ <http://www.greenpeace.org/eu-unit/en/Publications/2016/The-potential-of-energy-citizens-in-the-EU/>

FRANCE

France's carbon footprint is one of the smallest in the EU per capita, but the country's reliance on nuclear is a dead end street. Inflexible nuclear is limiting the amount of wind and solar that can be added in France and more generally on the Central Western Europe grid. Moreover, the country's aging nuclear power plants face serious safety problems. On a positive note, French banks are pulling out of international coal projects in Indonesia, for example, and France has announced it intends to phase out coal by 2023. In early June, President Macron announced France would go beyond its Paris climate commitments.

Climate target in Paris Accord	at least 40% below 1990 level by 2030 within EU	Fossil fuel subsidies in 2015 (according to the IMF)	30.1 bn USD
CO₂ emissions from energy production, compared to 1990	-17% (2014)	CO₂ costs avoided due to renewable energies	6.01 bn EUR
Annual CO₂ emissions per capita	5.1 tons (2015)	Renewable energy jobs	166,100 (2015)
Share of renewable power	16% (2015)	Total CO₂ emissions from energy production	286,000,000 tons

France | Primary energy supply by source*



France has reduced its primary energy consumption below the level in 2000. Likewise, its carbon emissions have fallen to a level not seen since the 1980s. Yet, the path forward seems unclear.

Nuclear makes up more than 40% of primary energy demand, which is often sold as a major success. But after the Fukushima nuclear accident in

Japan, France limited the operating nuclear capacity to 63 GW (the current level) and aims to reduce the share of nuclear in power supply from 75% to 50% by 2025.

France is historically Europe's largest power exporter, but it fell behind Germany in 2016 when roughly a third of French reactors were forced to go offline, forcing the country to increase

power imports last winter. The government's nuclear watchdog ASN is currently investigating the plants for a ten-year extension, which may also further increase the cost of the production of electricity. EDF may ask for a UK-style contract for difference for French nuclear power to ensure that rates higher than wholesale are provided.

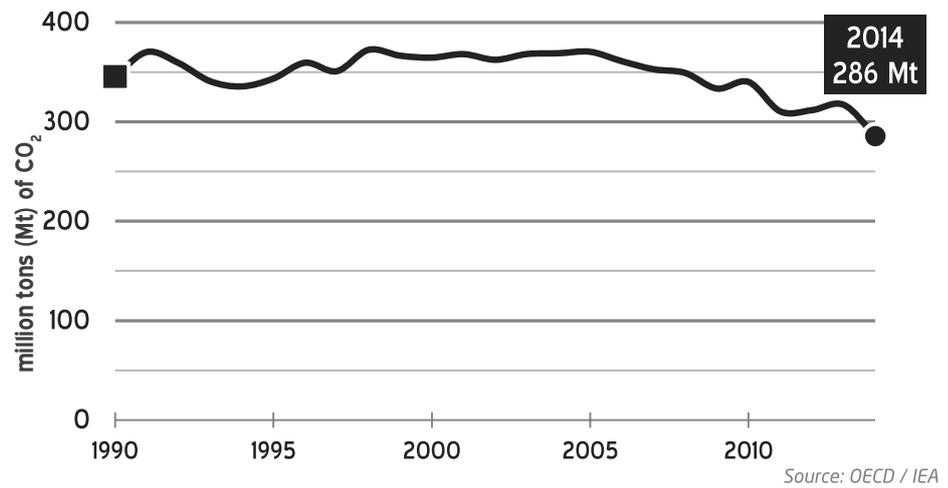
Much of the carbon emissions reduction comes from less oil being consumed outside of the power sector. In the power sector, coal only made up some 6% of electricity supply in 2000 but had fallen to a fraction of 1% by 2014. Oil usage slightly decreased in the industry and transport sector during recent years, while natural gas has fluctuated over the decades at a steady level.

The large share of nuclear seems to be blocking the growth of wind and solar which only made up 3% and 1% of power supply respectively in 2014. Nonetheless, France's Energy Transition Act aims for a 40% reduction in carbon emissions by 2030 relative to 1990. The share of renewables in total energy consumption is to grow to 32% (compared to just 9% in 2015). The Act also aims to strengthen governance: regional planning schemes (SRCAEs) detail the local impact of new energy infrastructure, and bottom-up input is encouraged. Still, France is not on track for its 2020 (23%) and 2030 (32%) national objectives, placing France at the bottom of the EU 27 in terms of renewables development.

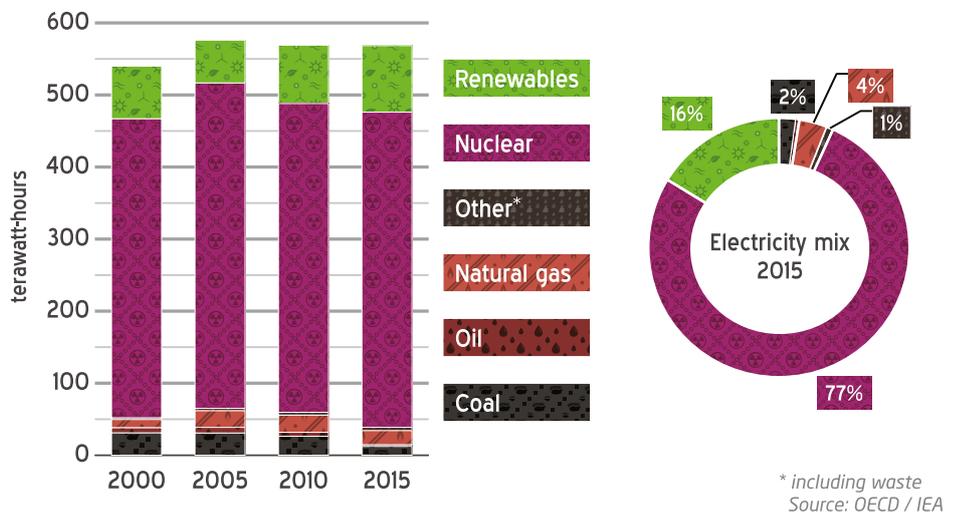
Greenpeace's recommendations

- ▶ The newly elected government must go beyond its commitment outlined in the 2017 Energy Transition Act. The new reviewed energy transition plan (PPE), expected in mid-2018, should provide a clear pathway of nuclear reactor shutdowns by 2023 to reach a maximum 50% nuclear share by 2025. More than 25 nuclear reactors should be shut down by 2023. These plans should also set up more ambitious goals for renewables. By the end of 2018, five reactors should already be shut down so as to remain on track with the objectives for renewables (40% by 2030) and nuclear (50% by 2025).
- ▶ With 75 billion EUR of debt and a negative free cash flow for ten

France | CO₂ emissions from fuel combustion



France | Electricity generation by source



years, EDF is unable to invest properly in nuclear safety and renewables. Nonetheless, EDF has decided to invest 70% of its remaining resources in a risky and dangerous nuclear project at Hinkley Point in the UK. As EDF's main shareholder, the French state has to stop Hinkley and steer its industrial strategy towards a just energy transition program based on renewable energy. France must stop subsidizing nuclear power; in particular, it should give up its plans for state aid for EDF's new projects and for the revamping of old nuclear reactors.

- ▶ France must show that it wants to lead climate action by setting a 100% renewable energy goal for 2050. More ambitious

and concrete plans for energy efficiency in buildings are needed, along with alternatives to internal combustion engines in transport and a drastic emission reduction plan for the agriculture sector.

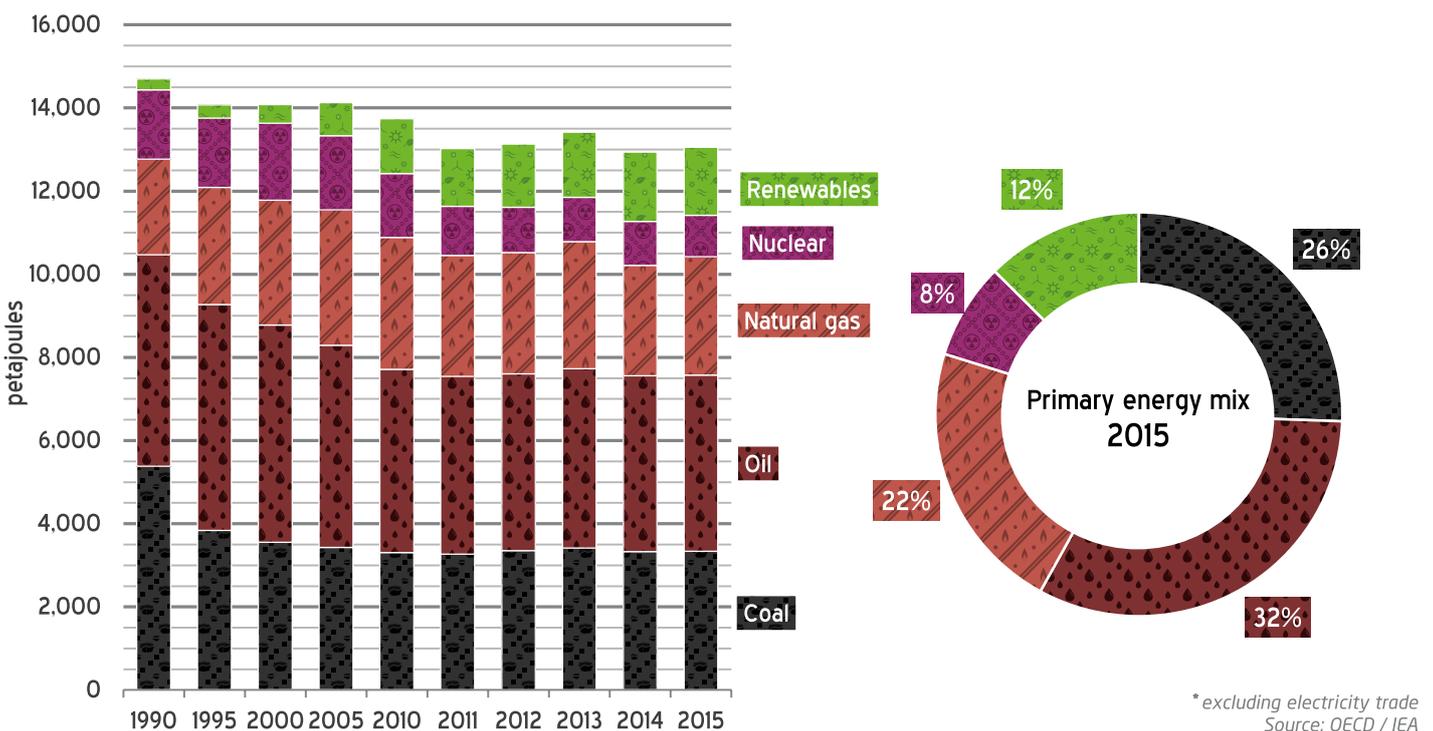


GERMANY

Germany has shown that an industrialized country is able to transform its energy sector towards renewable energies while maintaining a strong economy. In 2016 an estimated 335,000 people worked in the renewable energy sector. However Germany is still underperforming in CO₂ emissions reduction. Without additional measures the country is about to miss its 2020 target of a 40% carbon reduction due to a continuously high share of coal. Germany is the world's largest producer and consumer of brown coal. Even today, the home of the "Energiewende" still sacrifices whole villages for brown coal, forcing people to resettle. Brown coal has the highest CO₂ emissions per kWh of all fossil energy sources.

Climate target in Paris Accord	at least 40% below 1990 level by 2030 within EU	Fossil fuel subsidies in 2015 (according to the IMF)	55.6 bn USD
CO₂ emissions from energy production, compared to 1990	- 23% (2014)	CO₂ costs avoided due to renewable energies	11.8 bn EUR
Annual CO₂ emissions per capita	9.6 tons (2015)	Renewable energy jobs	355,400 (2015)
Share of renewable power	29% (2015)	Total CO₂ emissions from energy production	723,000,000 tons

Germany | Primary energy supply by source*



Primary energy consumption has fallen in Germany since 1990, partly because of reunification and the following closure of old industrial facilities in eastern Germany. This process was largely finished by 1995, so subsequent changes have more to do with the country's energy transition, the Energiewende. In 2015

and 2016, coal power again fell slightly by around 7% as renewables grew rapidly.

Regarding mobility, the German government continues to defend cars and the combustion engine as the dominant means of transportation, even in light of the Dieselgate scandal. Although there are now subsidies

available for electric mobility, electric vehicle sales remain sluggish; only about 11,000 such vehicles were sold in 2016 – a small number compared to the more than 700,000 SUVs and off-road vehicles otherwise sold that year. Germany had reduced its greenhouse gas emissions by 28% in 2015 relative to 1990.¹ An estimated 10% was the

¹ <https://www.umweltbundesamt.de/daten/klimawandel/treibhausgas-emissionen-in-deutschland#textpart-1>

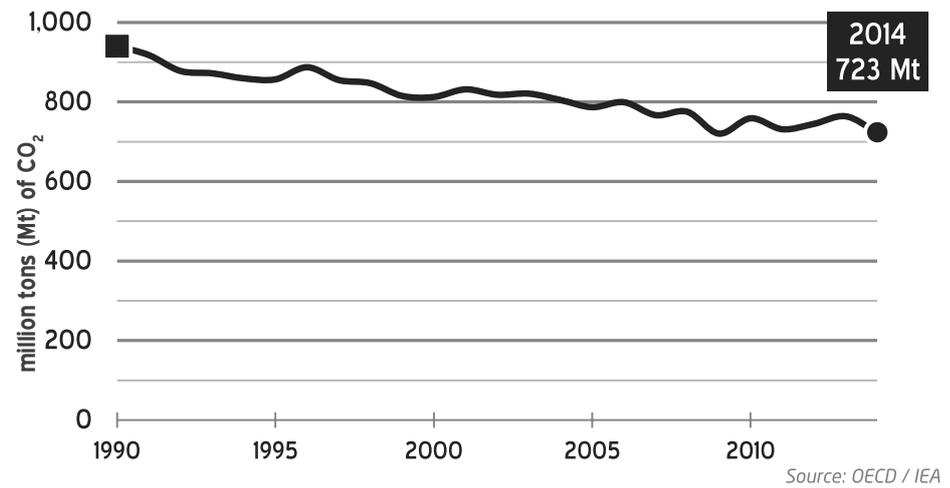
result of reunification up to 1995. Experts say the uptick in emissions in 2016 – the preliminary figure is an 0.4 increase – was the result of population growth and greater demand for heating. Germany is known for its strong wind and solar growth in the electricity sector, but that trend is slowing down as the government switches from feed-in tariffs to auctions to keep growth from exceeding the official corridor of 40% – 45% renewable power by 2025; in the first third of 2017, the country already had 37% and renewables had grown in recent years by more than 1.6% annually.

Nonetheless, current estimates suggest that Germany will miss its target to increase the share of renewables to 18% of final energy consumption – because of changes in the power sector and little progress in the heating and transport sectors.

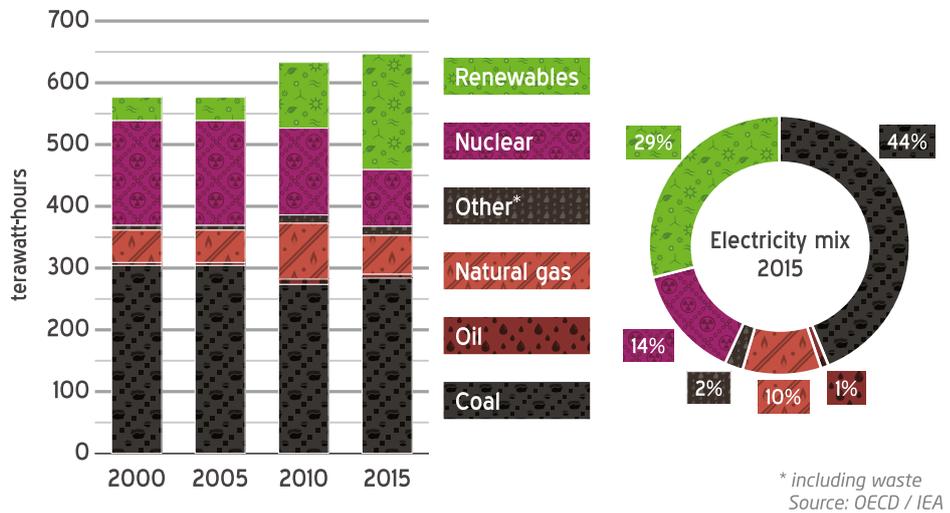
Greenpeace's recommendations

- ▶ **Germany urgently needs a coal phaseout plan to switch off coal power stations by 2030 at the latest.**
- ▶ **The Energiewende also needs to be initiated in the transport and heating sector. Germany needs to develop a phaseout plan for the internal combustion engine from 2025 on and fully supply transportation based on renewable energy by 2035.**
- ▶ **In the heating sector Germany needs a similar instrument as in the power sector to scale up the share of renewables.**
- ▶ **All fossil fuel subsidies must be abolished by 2020 at the latest. After two decades of negotiating with Brussels, Berlin will finally phase out domestic subsidies for hard coal mining in 2018. But other subsidies are still provided for lignite mining. For instance, groundwater usage is artificially cheap, and large mining firms, as energy-intensive industries, are exempt from the renewable energy surcharge.**
- ▶ **Chancellor Merkel must lead**

Germany | CO₂ emissions from fuel combustion



Germany | Electricity generation by source



the G 20 - with or without Trump - towards a 100% renewable future, and speed up the implementation of the Paris Agreement by phasing out coal and other fossil fuels.

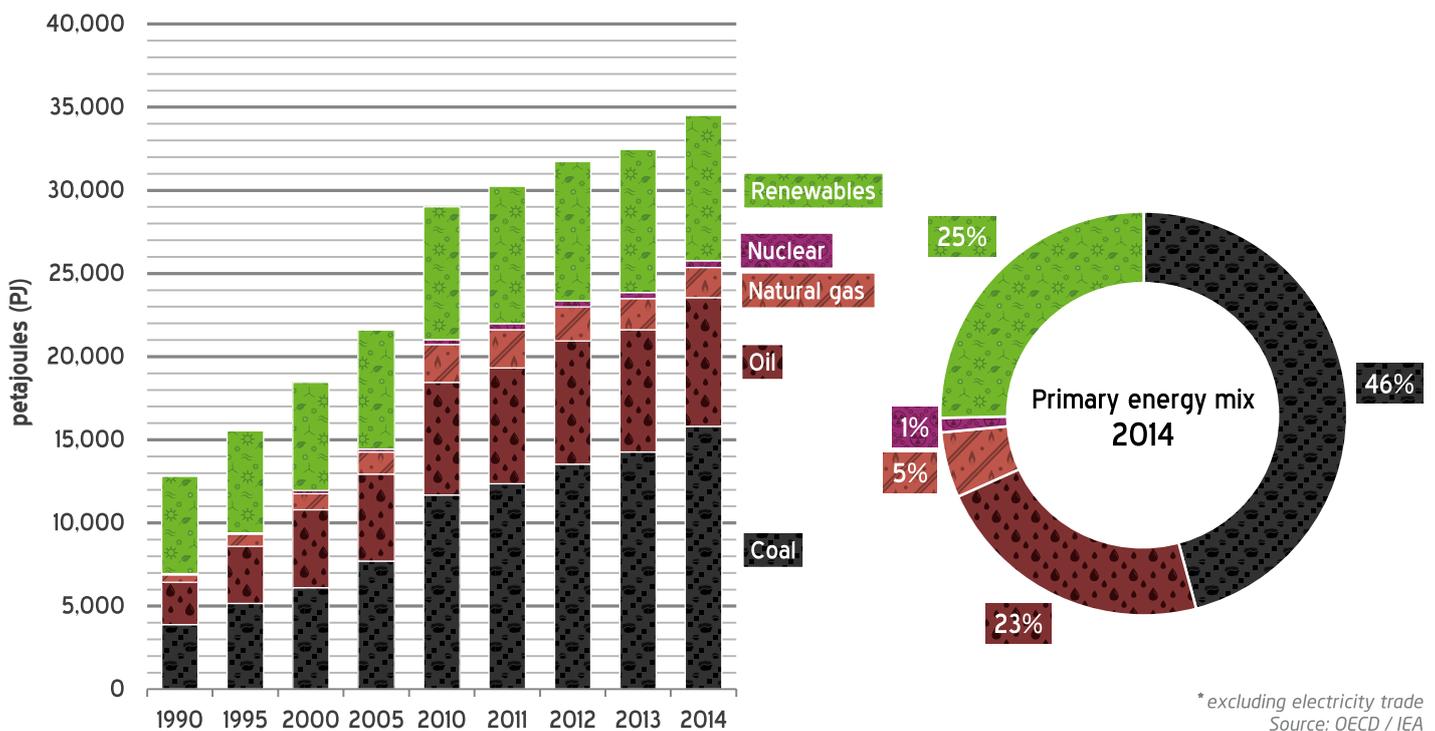


INDIA

In late 2016 India presented its draft National Electricity Plan, announcing that the country needs no additional coal plants for the next decade at least. The plan also predicts that 57% of the country's total electricity capacity will come from non-fossil fuel sources by 2027, with an estimated installed renewables capacity of 275 GW by 2027. The country's plans for new nuclear reactors remain behind schedule.

Climate target in Paris Accord	33% - 35% emissions intensity of GDP by 2030 below 2005 levels	Fossil fuel subsidies in 2015 (according to the IMF)	277 bn USD
CO₂ emissions from energy production, compared to 1990	+281% (2014)	CO₂ costs avoided due to renewable energies	14.5 bn EUR
Annual CO₂ emissions per capita	1.9 tons (2015)	Renewable energy jobs	331,100 (2015)
Share of renewable power	15% (2014)	Total CO₂ emissions from energy production	2,020,000,000 tons

India | Primary energy supply by source*



Since 1990, primary energy consumption in India has nearly tripled from 12,800 PJ to 34,500 PJ in 2014. Coal consumption, which now makes up more than 40% of the total, has roughly tripled in that time, as has oil, with gas roughly quadrupling. Nuclear has also grown fivefold but remains marginal at just over 1%. The country's carbon emissions have risen 3.5-fold since 1990. The country planned to add some

243 GW of coal power but stepped away from 50 GW of that recently. Much of the rest is also unlikely to be completed, partly because capacity factors at existing coal plants began to fall last year. India still aims to have 14.6 GW of nuclear online by 2024; the target of 63 GW for 2032 is now referred to as an "intention," not an official goal, at India's Department of Atomic Energy. The country currently has 6.8 GW

online with another 4.3 GW spread across five projects in the pipeline. Toshiba was planning to look into investing in six reactors, but its US nuclear subsidiary Westinghouse filed for bankruptcy at the end of March 2017. Popular resistance is an obstacle when choosing new sites. The country has yet to complete any reactor on time and originally aimed to have 20 GW built by 1987. The country is an example of how nuclear

power cannot be built fast even in countries with decades of support for the technology.

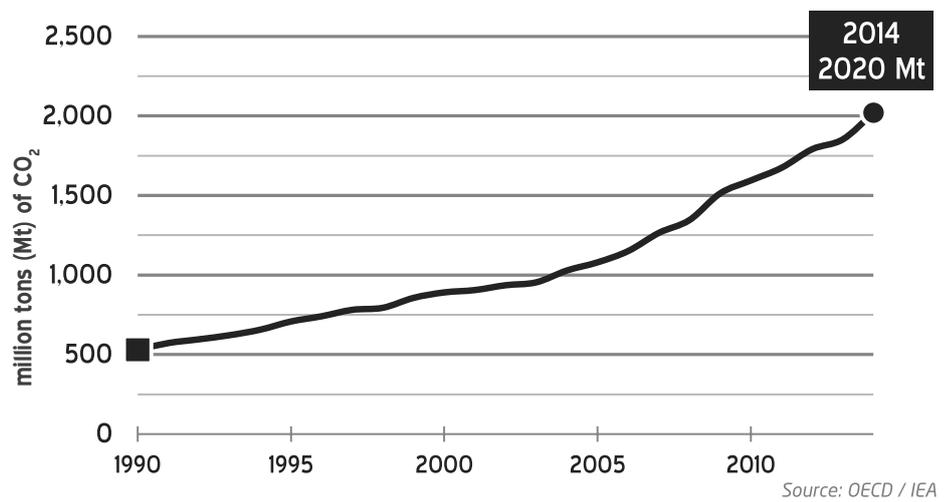
By 2014, the country already had more terawatt-hours from wind turbines (37) than from nuclear (36). In fiscal 2016-17, 5.4 GW of new wind capacity were installed, eclipsing the official target of 4 GW.

Solar is now poised to follow suit; more than 10 GW were installed in 2016, a sign that the 100 GW target for 2022 is likely to be met. If so, India would have more electricity from solar than nuclear at the beginning of the next decade. The country has a target of 175 GW for all renewable power sources by 2022.

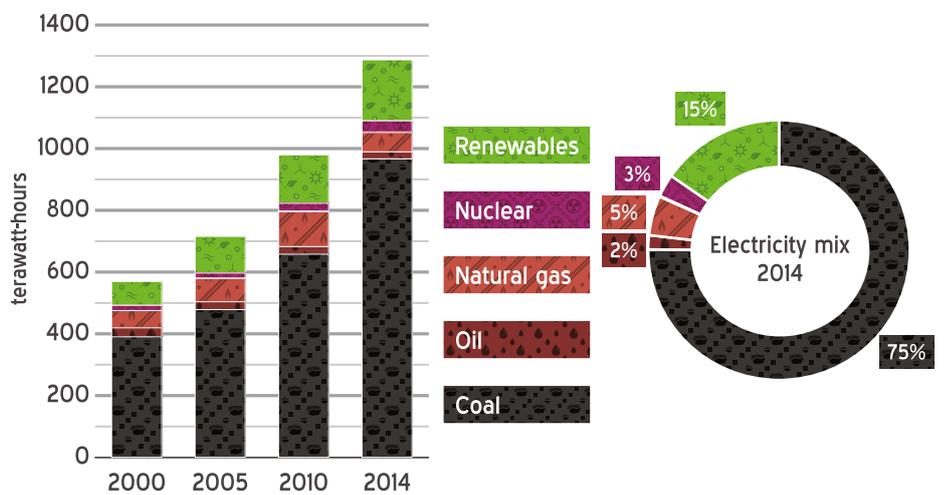
Greenpeace's recommendations

- ▶ Focus climate negotiations on the creation of effective financing frameworks for energy access. 1.2 billion people worldwide still lack basic access to modern, sustainable energy. A fourth of them live in India.
- ▶ Air pollution is a major health issue in India, and much of that is linked to fossil fuel use. India's new emission controls on coal power plants must be enforced as soon as possible.
- ▶ Transport-related emissions are another future growth area, with consequences for the climate, air pollution and India's dependence on oil imports. India has a goal of 100% EV sales by 2030, which is ambitious and commendable. It must be allied with a focus on clean mass mobility options in towns and cities and an electrification of existing transport infrastructure for long term benefits.
- ▶ India still has a pipeline of over 200 GW of proposed and under construction coal plants. Given that solar and wind are now cheaper than coal, the government should send a clear market signal that no more coal power construction will be permitted, and seek to divert financial resources to meeting

India | CO₂ emissions from fuel combustion



India | Electricity generation by source



its renewable energy goals instead.

- ▶ The government has pledged to provide "24/7 power to all households by 2019." Distributed renewable energy is an effective way of ensuring energy access for all. While amazing progress has been made in the utility-scale solar sector, the rooftop or decentralised sector has not made much progress. This should be an area of focus going forward.
- ▶ Forests should be off-limits for coal mining. India must impose a moratorium on coal mining in forest areas or the impact on the climate will double.
- ▶ India's prime minister says his RE ambitions are an effort to ensure universal access for

India's poor. He must ensure his government supports a long-term goal of a fossil fuel and nuclear phaseout by 2050 to ensure a just transition to renewable energy for all.

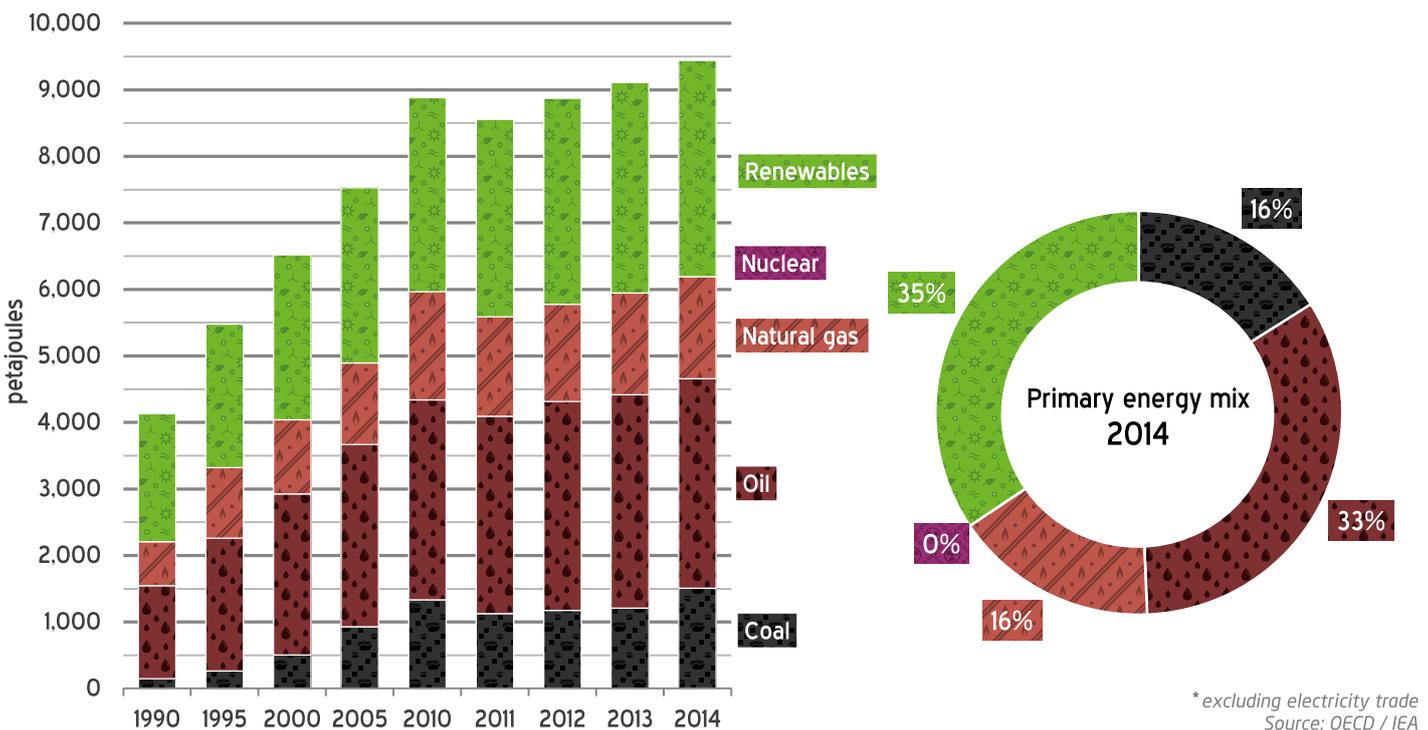


INDONESIA

Indonesia has a relatively large amount of non-hydro energy, but nearly 40% of the population (almost 100 million people) rely on traditional biomass and waste, which makes up 18% of the country's energy supply. One in seven Indonesians lack grid access. A transition to sustainable renewable energy is thus crucial for the climate, environment and human health. The country plans to build more new coal plants than any other country worldwide. Deforestation remains a central challenge.

Climate target in Paris Accord	unconditional 29% below business as usual by 2030 (including LULUCF emissions) 41% conditional	Fossil fuel subsidies in 2015 (according to the IMF)	69.2 bn USD
CO₂ emissions from energy production, compared to 1990	+226% (2014)	CO₂ costs avoided due to renewable energies	2.2 bn EUR
Annual CO₂ emissions per capita	2.0 tons (2015)	Renewable energy jobs	101,800 (2015)
Share of renewable power	11% (2014)	Total CO₂ emissions from energy production	437,000,000 tons

Indonesia | Primary energy supply by source *



Since the financial crisis of 1998, Indonesia's economy has rebounded, leading to a roughly 50% increase in primary energy consumption. The majority of this increase stems from coal power, which grew more than threefold during those years. Oil demand grew by some 50%, while natural gas increased by a third. Indonesia has no nuclear power but

continues to revisit the option after its former energy minister stated in December 2015 that nuclear would not be pursued "before 2050" because „we still have many alternatives and we do not need to raise any controversies." The current research minister has stated that popular opposition to nuclear is the main obstacle to the technology in his country.

Indonesia's carbon footprint has nearly quadrupled since 1990; indeed, the economic downturn of 1998 is just a blip on the trend line. But the chart only shows emissions from energy. Indonesia has the dubious distinction of being the worst case worldwide for deforestation, which – along with land use change – accounts for more carbon emissions than the

country's entire energy consumption. In the Paris Agreement, Indonesia pledged to reduce its total emissions (including LULUCF = Land Use, Land-Use Change and Forestry) by 29% or, conditionally, 41% by 2030.

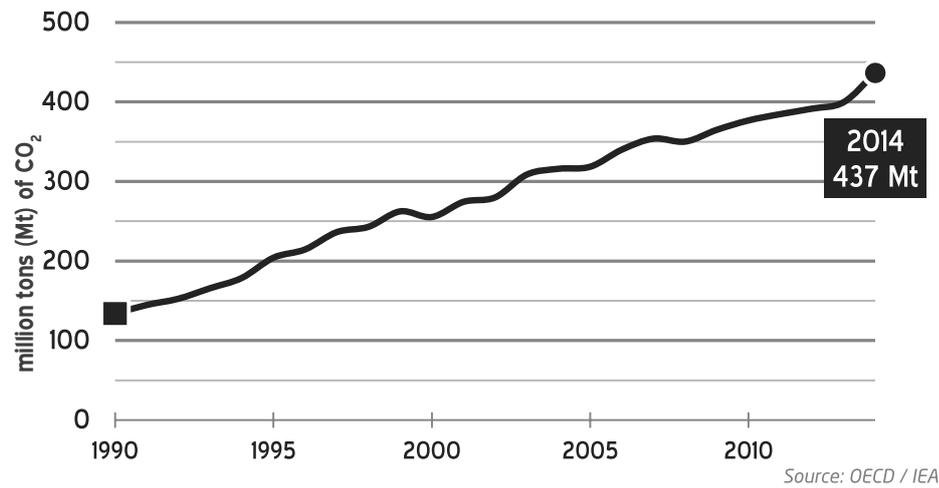
Indonesia is also unique in that geothermal is its largest source of non-hydro renewable power. The amount has doubled since 2000 to roughly 10 TWh, just behind hydropower at 15 TWh in 2014. That year, the country had practically no solar or wind power, but feed-in tariffs were adopted in 2016 with a goal of 5 GW by the end of this decade. Likewise, the country began developing its first wind farm that year and others are now in the pipeline.

The government has set a target of 23% renewable power by 2025, compared to 11% (4% geothermal and 7% hydropower) in 2014.

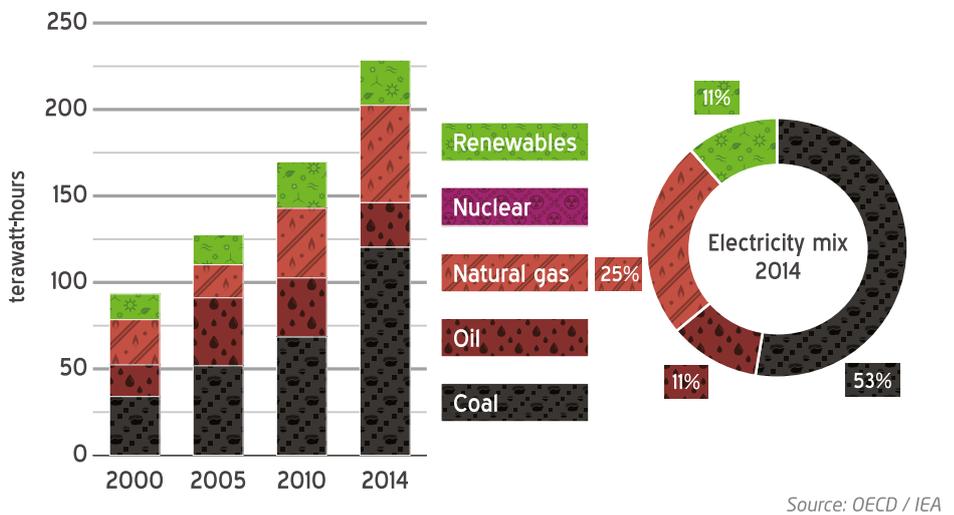
Greenpeace's recommendations

- ▶ Stop biofuel exports, particularly palm oil. To be sustainable, biomass must be used locally.
- ▶ Clamp down on deforestation. Much of the clearing is being done for energy crops and meat production.
- ▶ Divest from coal to avoid stranded assets. Conventional facilities built now will not be competitive with wind and solar in 2030 and afterwards. Constructing a plant with a life-cycle of 40 years that will become uneconomical in 12 years makes no sense.
- ▶ Realize solar potential: Indonesia has up to 4.8 kWh/m² of solar energy daily on average. The country can easily secure a large share of its electricity demand with rooftop solar cells.

Indonesia | CO₂ emissions from fuel combustion



Indonesia | Electricity generation by source



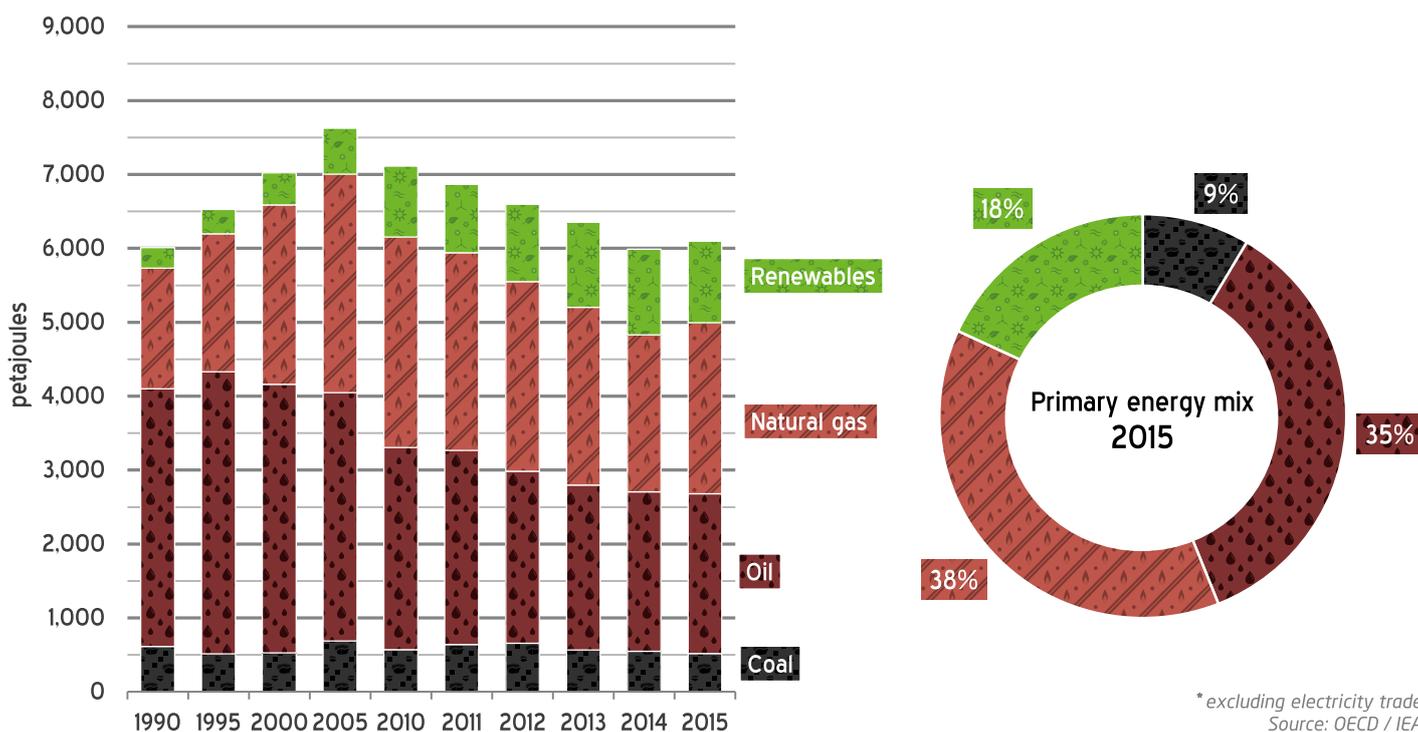
ITALY

Italy made great strides with renewables after 2005, but the country has slammed on the brakes in recent years. The rise of green electricity led to divestment from coal, and coal appears no longer to be an option for the future of the national energy system. In June 2017, the Ministry for Economic Development presented the draft of the National Energy Strategy. It proposes a coal phaseout by 2030 at the latest. Now the country needs to raise its targets for renewables after its past success.

Climate target in Paris Accord	at least 40% below 1990 level by 2030 within EU
CO₂ emissions from energy production, compared to 1990	-18% (2014)
Annual CO₂ emissions per capita	5.9 tons (2015)
Share of renewable power	38% (2015)

Fossil fuel subsidies in 2015 (according to the IMF)	13.27 bn USD
CO₂ costs avoided due to renewable energies	6.2 bn EUR
Renewable energy jobs	82,500 (2015)
Total CO₂ emissions from energy production	320,000,000 tons

Italy | Primary energy supply by source*



Primary energy demand plummeted by around a fifth from 2005 to 2015 as renewables replaced oil in the power sector and the economy contracted after the economic crisis of 2008 by up to 10% in that time frame, depending on the metric used. As a result, carbon emissions from energy fell by an impressive 30% in that decade. Non-hydro renewable power more than doubled from 2010 to 2015,

but new additions ground to a halt after 2013. Solar grew from some 3,400 megawatts of installed capacity in 2010 to around 19,000 megawatts today, but additions are currently counted in the hundreds of megawatts, not thousands. Likewise, wind power capacity has almost doubled since 2010, but the country has switched to auctions to prevent growth from exceeding the government's modest

expansion plans. Italy is one of the few countries to have a healthy mix of biomass (6%) along with wind (5%) and solar (8%) in its power sector (all figures for 2014). The capacity of plants fired with biomass also nearly doubled from 2010 – 2015. Add in 2% geothermal power, and non-hydro renewables made up 21% of supply – along with 22% hydropower that year. The government currently aims to

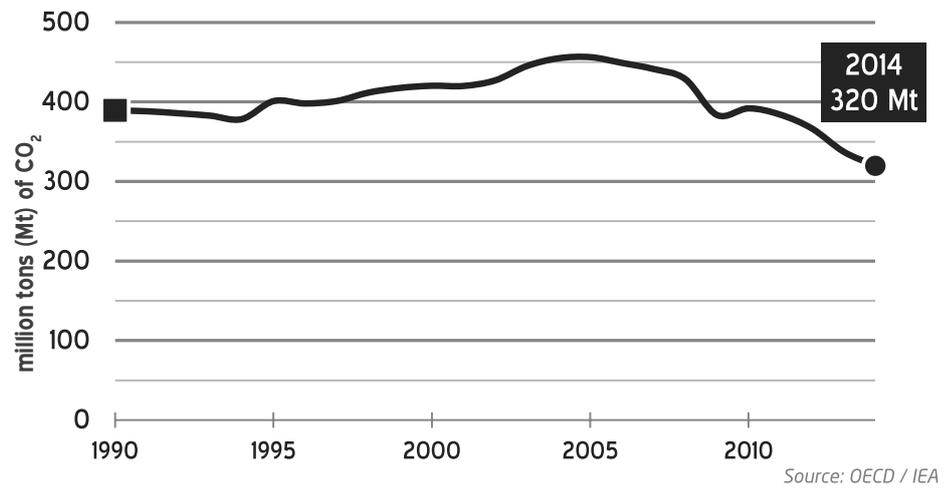
make Italy a “natural gas hub.”

Back in 2000 Italy got almost a third of its electricity from oil, but that share fell to just over 5% in 2014. Unfortunately, coal power also increased from 11% to 17% of supply from 2000 to 2014. Since then, coal power has come under price pressure. Civil society, including Greenpeace Italy, has challenged coal successfully, including in court. Now the government needs to join in and implement a plan for a coal phaseout as proposed by the Ministry of Economic Development – taking advantage of favorable market conditions and social support.

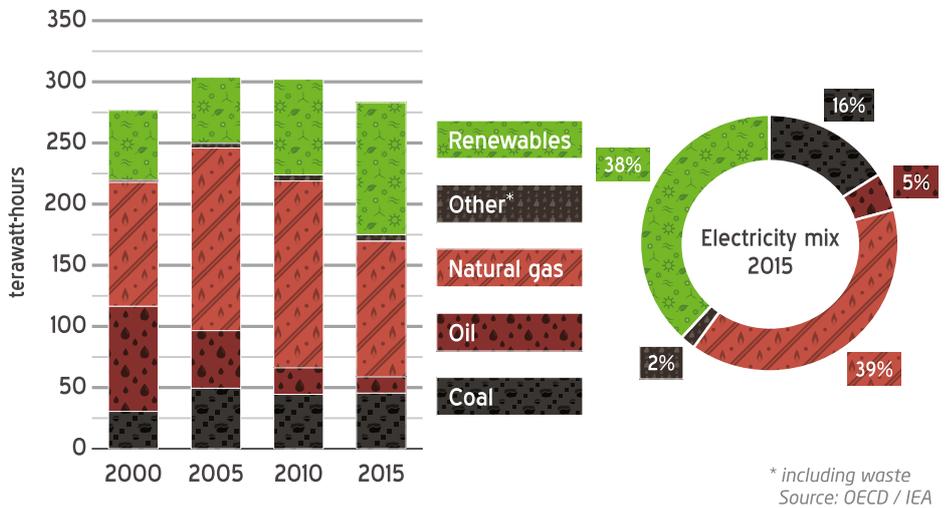
Greenpeace's recommendations

- ▶ Use domestic renewables to increase independence. With one of the highest levels of net power imports, Italy could continue to expand wind and solar power in order to offset demand for electricity from abroad. In doing so, Italy would also reduce its reliance on nuclear power in particular, an energy source the population rejects.
- ▶ Italy should adopt more ambitious targets. When a country reaches its energy targets, the goals then become a stopping point if not properly designed. Over the next few years, the Italian renewable energy market might stall unnecessarily. The goal should be “at least” a certain percentage by a certain year to allow growth and progress to continue.
- ▶ Implement a coal phaseout by 2025.
- ▶ Investments in natural gas infrastructure could become stranded assets and divert funding from renewables.

Italy | CO₂ emissions from fuel combustion



Italy | Electricity generation by source

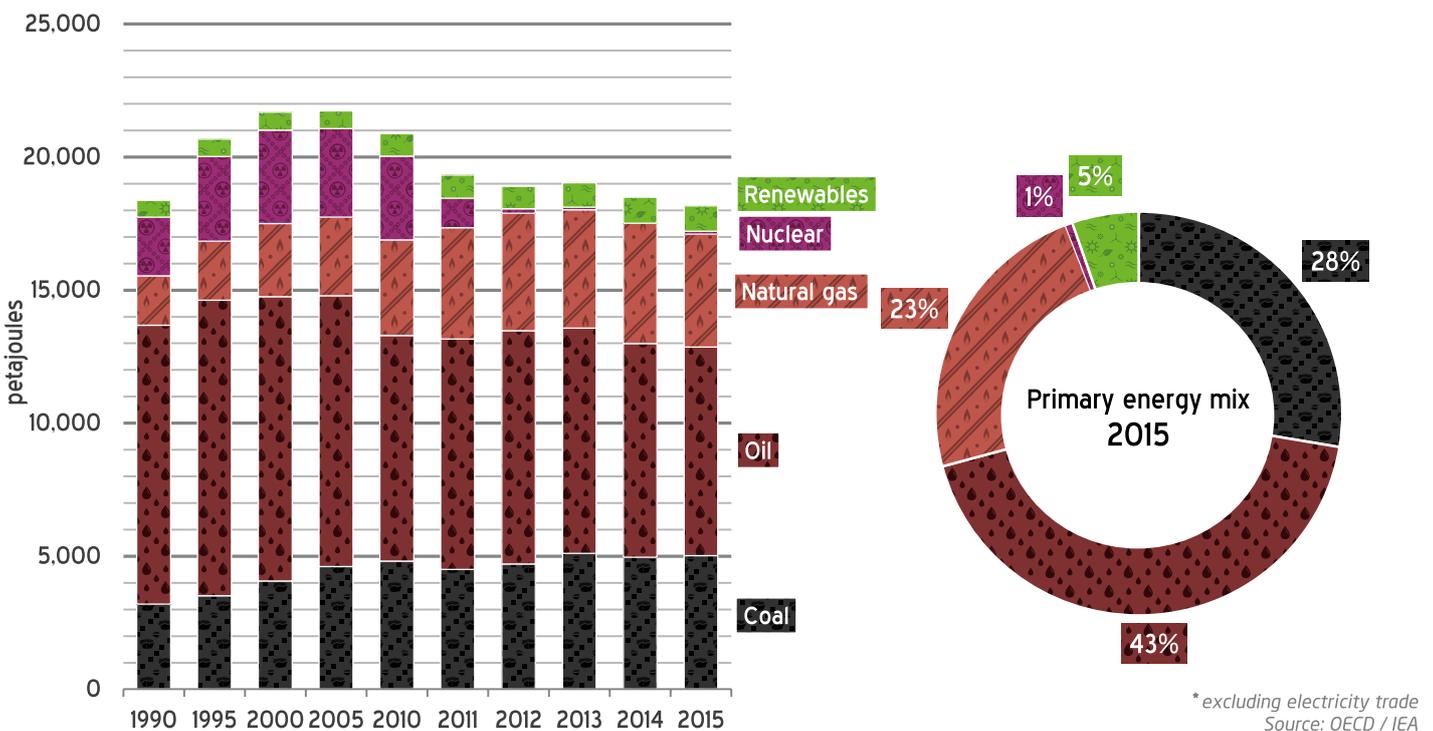


JAPAN

All of Japan's nuclear power plants were shut down after the accident in Fukushima, with only five reactors currently operating. In addition to a reduction in energy demand through efficiency measures, much electricity was replaced with power from fossil fuels. While the country has expanded solar power production, nuclear and fossil utilities are trying to slow down growth in renewables. And the wind sector has yet to get going properly.

Climate target in Paris Accord	26 % below 2013 levels by 2030	Fossil fuel subsidies in 2015 (according to the IMF)	157 bn USD
CO₂ emissions from energy production, compared to 1990	+14 % (2014)	CO₂ costs avoided due to renewable energies	9.0 bn EUR
Annual CO₂ emissions per capita	9.9 tons (2015)	Renewable energy jobs	388,500 (2015)
Share of renewable power	16 % (2015)	Total CO₂ emissions from energy production	1,189,000,000 tons

Japan | Primary energy supply by source*



In reaction to Fukushima, Japanese citizens and industry significantly reduced their energy consumption. Electricity output declined from 1,150 TWh in 2010 to 864 TWh in 2016. The accident has fundamentally challenged conventional government energy policy in the country, which in 2010 adopted a plan for 70% “zero-emission” nuclear and renewable power by 2030, implying 23 new reactors by 2030. In 2015, the

government reduced the target share of nuclear for 2030 to 20% – 22%. Renewables are now to make up only 22% – 24% by 2030. In 2015 the Japanese government adopted a long-term energy mix for 2030, which at the time was widely seen as unrealistic. Two years on and the prospects for achieving its targets have only declined further. The crisis in energy policy remains. While the government is determined to support

the return to significant nuclear power generation, the reality is that the future of the industry is even more precarious. Recent developments have further exposed the wholly unrealistic basis for Japan's energy policy. Historic lawsuits against nuclear reactor operation have profoundly destabilized the nuclear power utilities with many reactors facing safety problems and political opposition that will stop restart; 195 states at the 21st

UN climate change conference in Paris in 2015 recognized that we cannot afford the risk of global temperatures rising by more than 1.5°C; and on 1 April 2016, households and businesses with a connection of less than 50 kW were able to freely choose their electricity supplier in Japan. For the Paris Agreement, Japan pledged a 26% carbon reduction by 2030 relative to 2013 (or 25.4% relative to 2005).

2014 was Japan's first year without nuclear power in four decades. In 2017, five reactors are operating, with another 21 awaiting approval. It thus seems likely that more than half of the country's nuclear facilities with more than 38 reactors will never restart. Likewise, new reactor construction projects are unlikely given public opposition, the crisis within nuclear utilities and the bankruptcy of Toshiba's nuclear division.

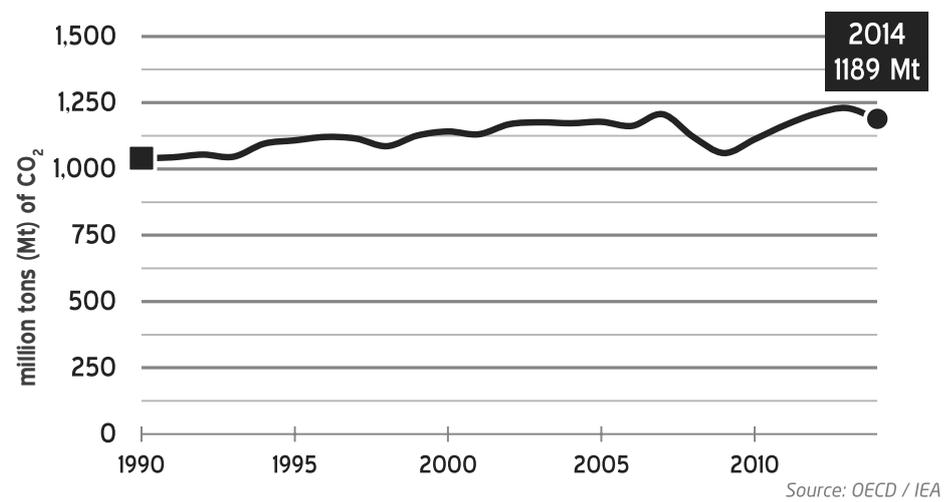
Solar grew from 2 TWh in 2011 to 31 TWh in 2015. Last year, that figure was probably closer to 40 TWh. The country has, however, a backlog of solar projects; a new policy that took effect on 1 April 2017 is intended to clear out the pipeline.

Unfortunately, Japan has yet to tap its massive potential for wind power, which Japanese expert Haruki Tsuchiya has estimated at some 620 TWh (equivalent to more than nearly two-thirds of total power demand at present) onshore alone; the offshore potential is several times greater. In 2014, the country only generated 5 TWh of wind power, and the figure was only marginally higher in 2015 at 5.4 TWh. A similar level is expected to be reported for 2016.

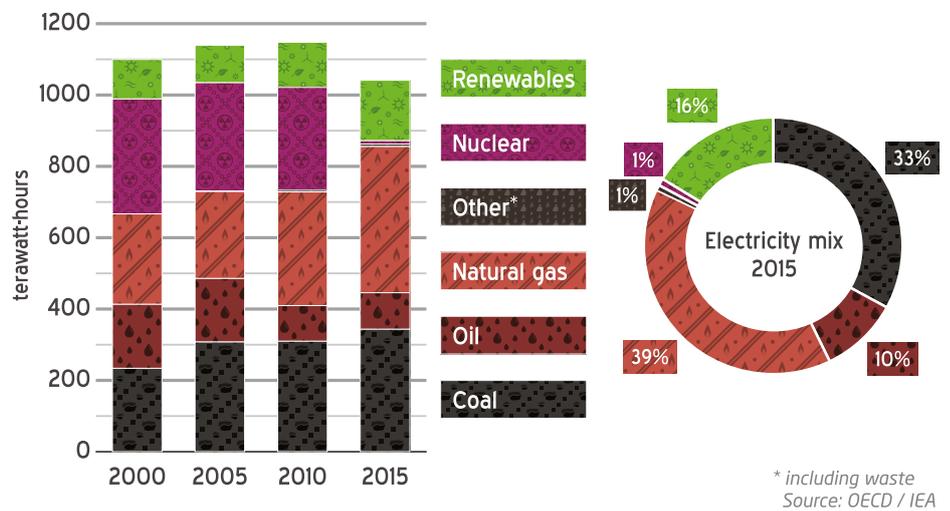
Greenpeace's recommendations

- ▶ Japan needs an ambitious and binding climate target - not the one being proposed by the Abe government. Current energy policy will not secure major emission reductions, therefore a revision of policy is essential.
- ▶ No more nuclear reactor restarts - Japan has the potential to

Japan | CO₂ emissions from fuel combustion



Japan | Electricity generation by source



generate 56% of its electricity from renewables by 2030, which would secure large reductions in carbon emissions. Japanese energy policy will fail to secure a significant restart of nuclear reactors in coming years. Ignoring this reality will lead to a failed energy policy that spells disaster for the climate.

- ▶ Japan needs a balanced renewable energy mix - not just photovoltaics. Unjustified planning obstacles to wind power need to be removed at the same time support for offshore wind power increases. In light of the recently plummeting prices for wind energy in Europe (around six cents per kWh in the Netherlands and Germany), Japan would be well advised to

look into offshore development more closely.

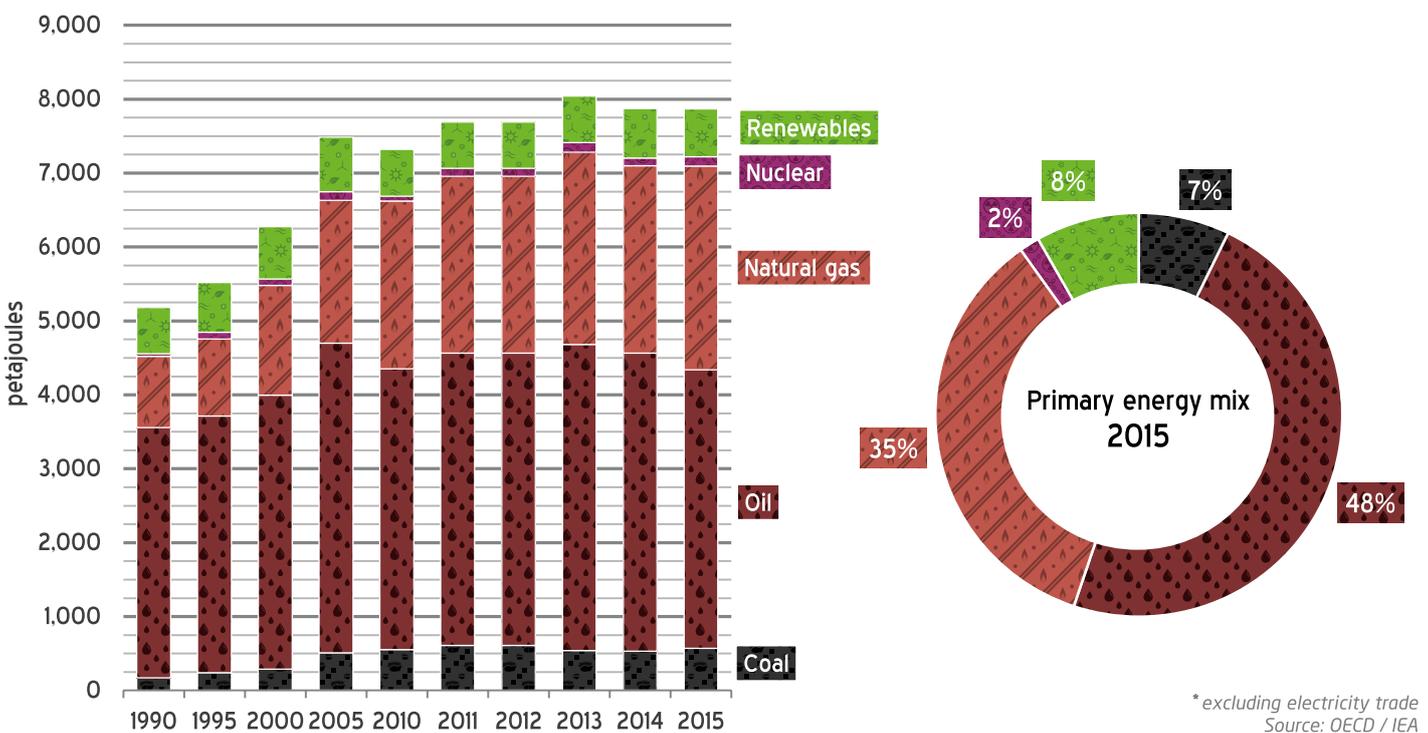


MEXICO

Mexico is just discovering how inexpensive wind and solar power are. As an oil-exporting country, Mexico remains loyal to oil and gas, though its oil production is falling fast. Soon it may drop to the level of domestic demand. In late 2015 Mexico adopted an Energy Transition Law promoting clean energies.

Climate target in Paris Accord	25% greenhouse gas reduction below "business as usual" unconditionally, 40% conditionally by 2030	Fossil fuel subsidies in 2015 (according to the IMF)	30.9 bn USD
CO₂ emissions from energy production, compared to 1990	+68% (2014)	CO₂ costs avoided due to renewable energies	2.5 bn EUR
Annual CO₂ emissions per capita	3.7 tons (2015)	Renewable energy jobs	45,600 (2015)
Share of renewable power	15% (2015)	Total CO₂ emissions from energy production	431,000,000 tons

Mexico | Primary energy supply by source *



Roughly three-quarters of Mexico's energy supply come from oil and gas, and that percentage has remained stable since 1990. The country has two nuclear reactors from 1989 and 1994, but no plans to add more; nuclear power currently makes up 1% of energy demand. In late 2015, the country adopted its Energy Transition Law, which re-implemented some old (abandoned) goals and added new ones. By 2024, the country is

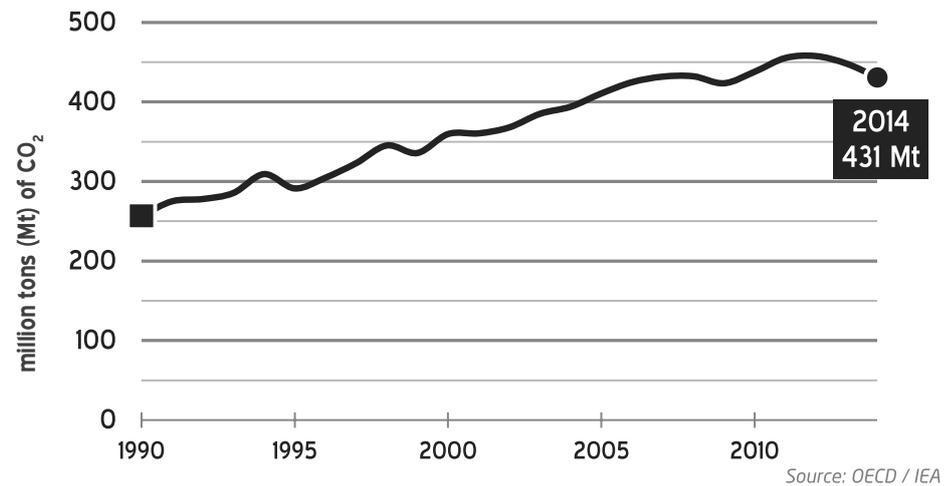
to have 35% "clean energy", which the renewables sector is interpreting to mean "renewable energy" for a lack of nuclear plans. For the Paris Agreement, Mexico has pledged an unconditional 25% reduction in emissions of "Greenhouse Gases and Short Lived Climate Pollutants" along with a conditional pledge of a 40% reduction. More than 99% of Mexican households have grid access, but a quarter of the renewable energy

used in buildings is still traditional biomass, whose sustainability is questionable. In 2016 Mexico held its first auctions for renewable power. In a reversal of previous auctions in other countries, solar won three-quarters of the volume, with the lowest price coming in at an impressive 0.035 USD per kWh – a record at the time. The remaining fourth of the projects were wind farms.

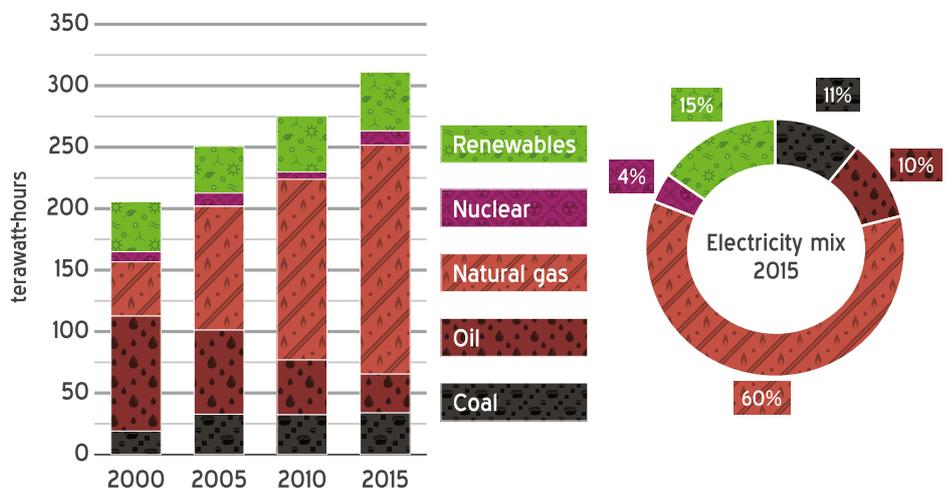
Greenpeace's recommendations

- ▶ Foster renewable energy. Mexico could have 81% renewable power by 2050. Create jobs related to renewables and efficiency. Mexico could create half a million jobs linked to aggressive plans to boost solar water-heating systems, wind power and biomass. Another 1.1 million could come if efficiency measures become mandatory by 2050.
- ▶ Reduce emissions from the power sector. Mexico is extremely vulnerable to climate change, which increases poverty and worsens the social exclusion problems faced by millions of Mexicans. Mexico needs to speed up greenhouse gas emissions reduction from its power sector in accordance with international commitments regardless of what other countries do.
- ▶ Reinforce the implementation of energy efficiency measures. According to projections of population development, GDP growth, and energy intensity, total energy demand will increase by 103% by 2050 - business as usual.
- ▶ Successively phase out fossil fuel subsidies. Around 750 billion MXN (pesos) (37 billion EUR) go to fuel subsidies, resources that can be allocated to social programs like public health, education and poverty reduction.
- ▶ Stop investments in deep water oil exploration and exploitation.

Mexico | CO₂ emissions from fuel combustion



Mexico | Electricity generation by source

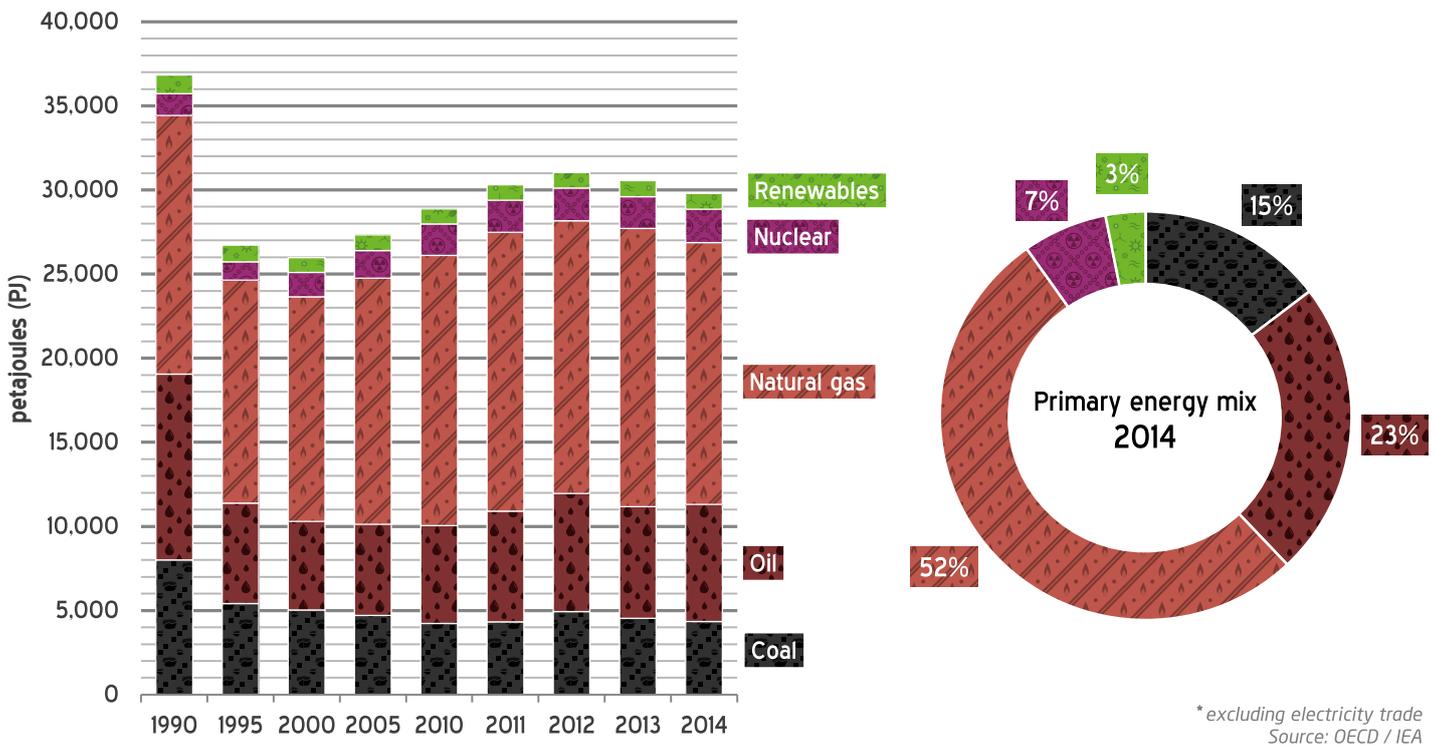


RUSSIA

Russia is both a large consumer of fossil fuels at home and a major exporter of oil, gas and coal. In addition, the country is behind some of the few remaining nuclear projects worldwide. Despite Russia's enormous potential for CO₂ reductions, it has yet to develop solar, wind and bioenergy significantly. Russia, together with Turkey, is the only G20 member not to have ratified the Paris Agreement.

Climate target in Paris Accord	[NOT RATIFIED] 25% - 30% below 1990 levels by 2030	Fossil fuel subsidies in 2015 (according to the IMF)	335 bn USD
CO ₂ emissions from energy production, compared to 1990	- 32% (2014)	CO ₂ costs avoided due to renewable energies	8.3 bn EUR
Annual CO ₂ emissions per capita	12.3 tons (2015)	Renewable energy jobs	n/a (2015)
Share of renewable power	17% (2014)	Total CO ₂ emissions from energy production	1,468,000,000 tons

Russia | Primary energy supply by source*



The substantial decline of fossil fuel prices since 2014 along with economic sanctions have dramatically affected Russia's economy. According to World Bank data, the country's GDP fell from 2.23 trillion USD in 2013 to 1.28 trillion USD in 2016.

Coal, oil, natural gas and nuclear have made up 97% of the country's primary energy supply since 1990. Hydropower makes up most of the rest; in fact, the amount of non-hydro renewables fell

from some marginal 500 EJ (exajoules) in 1990 to around 300 EJ by 2000, where it has remained since. Coal and oil consumption fell throughout the 1990s, but otherwise there has been no major shift in energy shares. Nuclear has only increased slightly from 6% to 7% of total energy demand from 2000 to 2014.

In its Energy (R)evolution Russia study of 2009, Greenpeace highlighted

the country's vast renewable resources. Starting from nearly 30,000 PJ of primary energy consumed by Russia in 2010, efficiency would lower demand to 22,000 PJ by 2050. Just over 7,000 PJ would still come from natural gas, with coal and crude oil bringing the total up to 9,500 PJ – instead of 27,000 PJ in 2010. Renewables would constitute 12,500 PJ. Russia would then progress from a mere 4% renewable energy in

primary energy demand to 57% by mid-century. Note that recent price reductions in wind power and solar have been considerable, so the modest estimates of eight years ago – 1,700 PJ of wind and 700 PJ of solar – would need to be revised upwards.

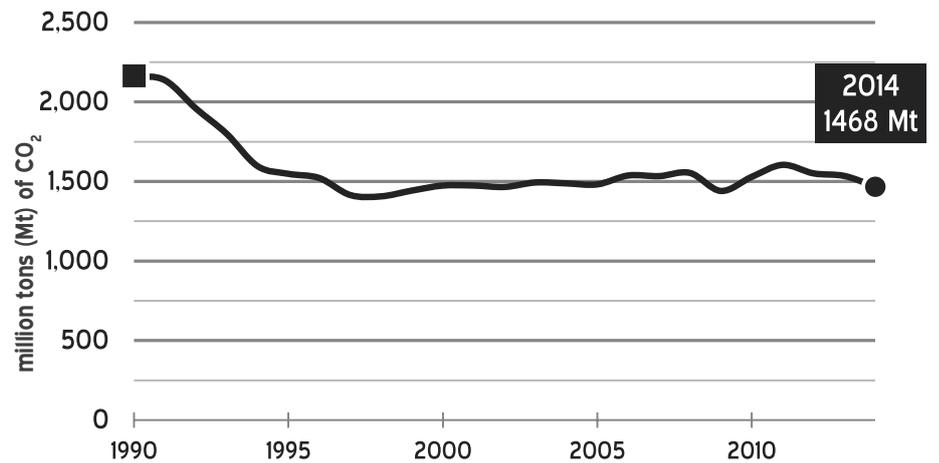
Aside from the extended economic downturn in the 1990s, carbon emissions from the energy sector have remained roughly the same at around 1500 Mt or 5% of global emissions from the energy sector. For the Paris Agreement, Russia pledged a reduction of 25% – 30% in emissions by 2030.

In the power sector, Russia is now holding its first auctions for onshore wind power, PV and small hydro (about 6 GW by 2024). In comparison, existing power capacity in Russia is more than 200 GW.

Greenpeace's recommendations

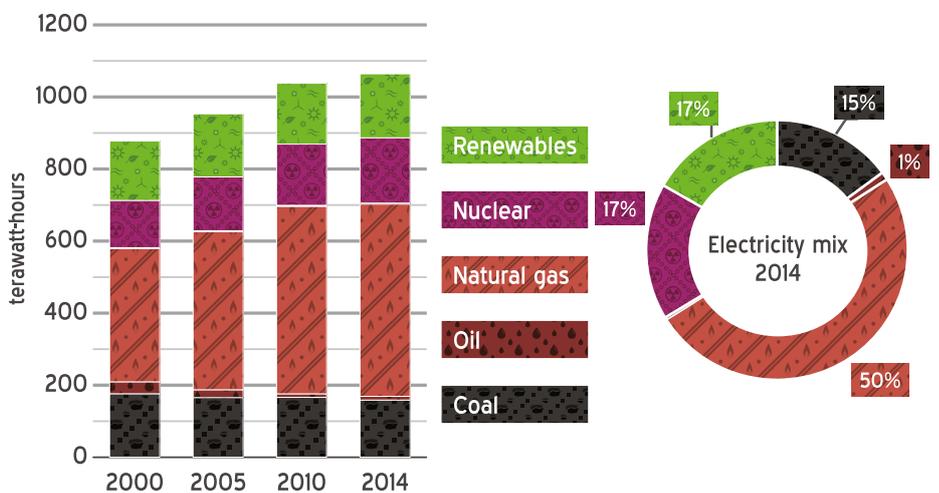
- ▶ **Ratification of the Paris Agreement as soon as possible.**
- ▶ **Russia should develop ambitious targets for renewable energy and remove legal barriers for its development.**
- ▶ **Remove legal barriers against implementing energy efficiency technologies.**
- ▶ **Phase out subsidies for new oil and gas extraction as well as nuclear and coal industries.**
- ▶ **Speed up development of a domestic system of accounting for greenhouse gas emissions, and further develop a mechanism for regulating greenhouse gases.**
- ▶ **Initiate international non-hydro renewable energy projects with neighboring countries like China, Mongolia, or Kazakhstan.**
- ▶ **In remote agriculture regions, bioenergy should be deployed using agriculture residues.**
- ▶ **In remote northern and other regions with decentralized energy systems, wind and PV should be deployed to shift away from expensive fossil fuels.**

Russia | CO₂ emissions from fuel combustion



Source: OECD / IEA

Russia | Electricity generation by source



Source: OECD / IEA

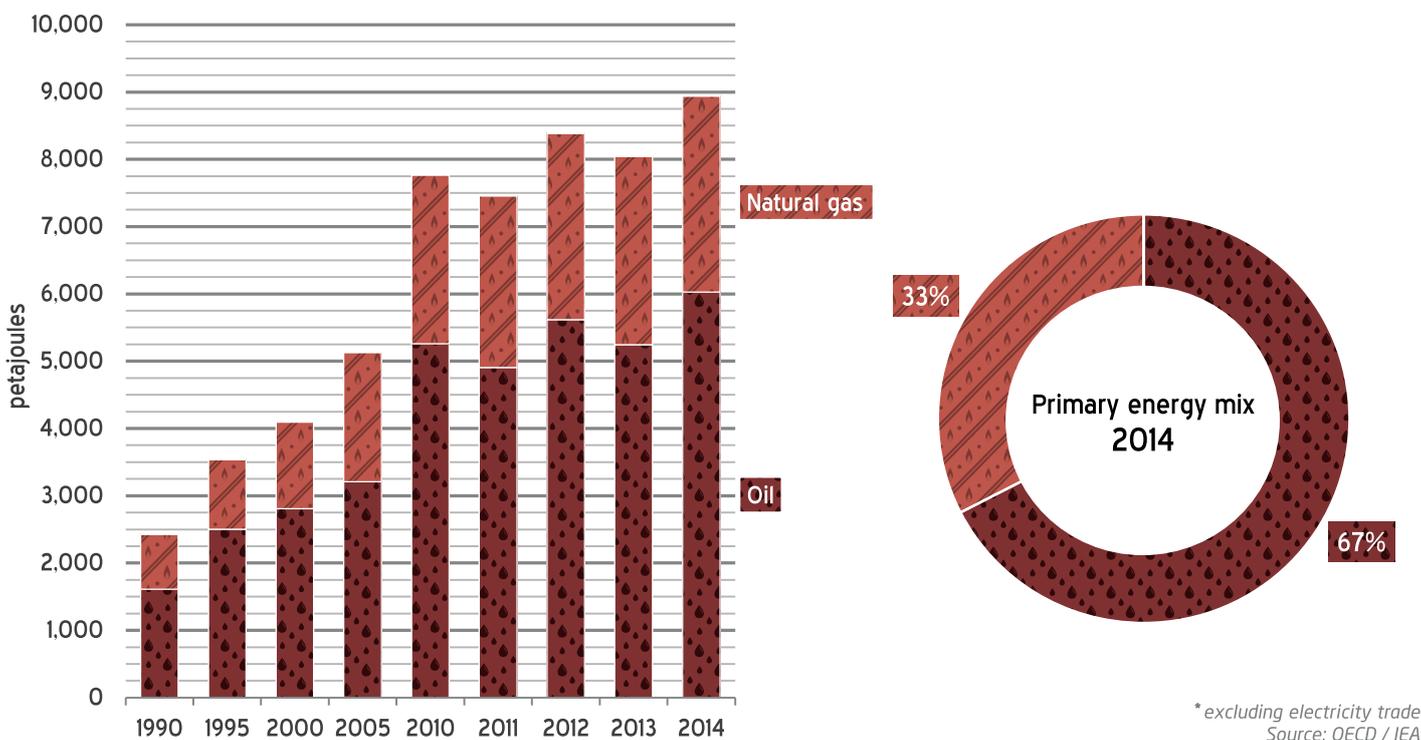


SAUDI ARABIA

Until 2014, Saudi Arabia generated all of its electricity from oil and gas, making it unique worldwide. Its carbon footprint per capita is one of the largest in the world. It is now discovering that it can produce some of the cheapest solar power in the world. Nonetheless, it is also one of the few countries with significant nuclear plans.

Climate target in Paris Accord	vague reference to "avoidance" without clear baseline	Fossil fuel subsidies in 2015 (according to the IMF)	107 bn USD
CO₂ emissions from energy production, compared to 1990	+ 235 % (2014)	CO₂ costs avoided due to renewable energies	2.0 bn EUR
Annual CO₂ emissions per capita	16.0 tons (2015)	Renewable energy jobs	n/a (2015)
Share of renewable power	negligible (2014)	Total CO₂ emissions from energy production	507,000,000 tons

Saudi Arabia | Primary energy supply by source*



Saudi Arabia's primary energy supply is easy to describe: it's all gas and oil. The share of each has remained stable over the past quarter century as demand has risen 3.5-fold: two-thirds oil and one-third gas.

Falling oil prices on global markets have led to a substantial decrease in the country's GDP, which fell from around 750 billion USD in 2015 to some 650 billion USD in 2015. In 2016, market analysts began worrying

openly about a collapse of the Saudi economy, which could further destabilize an already tumultuous region.

In terms of carbon emissions, the country's main contribution, of course, comes via its enormous oil exports. Domestically, the trend only points in one direction: up.

Saudi Arabia's Paris pledge is vague. It speaks of the avoidance of 130 Mt of CO₂-equivalent emissions by 2030.

Since no percentage is given, it is possible that these reductions might be subtracted from a higher future level, resulting in an overall increase. Furthermore, Saudi Arabia's plans include carbon capture and storage/utilization which Greenpeace opposes as an unproven, risky and expensive technology. Renewables are not mentioned with any target. For electricity, the country launched its first auctions for renewables in

2017 worth 400 MW for wind and 300 MW for solar.¹ The plan is to have some 9.5 GW of renewable generation capacity by 2023, thereby freeing up more fossil fuels for export.

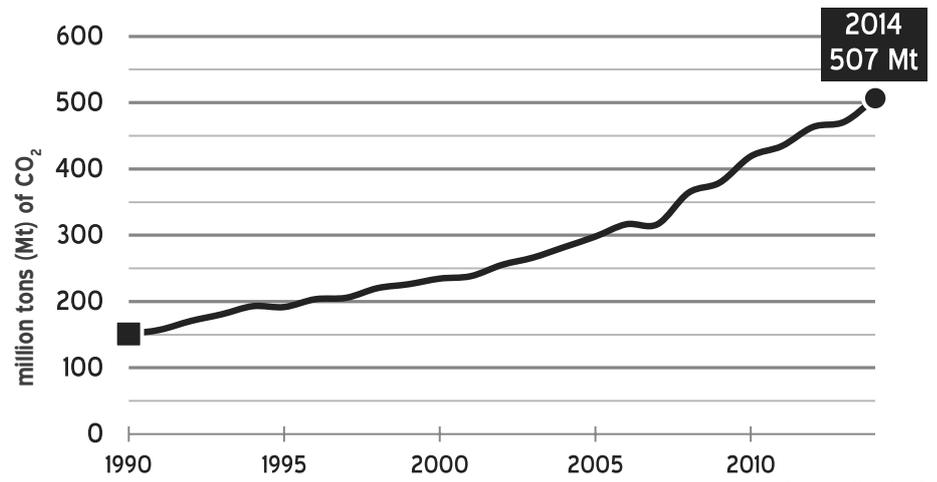
In January, the country also built its first commercial wind turbine. However, if the country bids only on price, solar will probably always be the winner given Saudi Arabia's unsurpassed solar conditions. If the government wants a mix of wind and solar, it should consider separate auctions specifying a certain volume of wind power.

The country is currently considering building up to 16 nuclear reactors, but the target date has been set back to 2040, effectively leaving these plans up in the air. However, a decision for the first reactor could be reached this year. Though Saudi Arabia is known as a rich country, it has mismanaged its oil revenues. In 2015, the country had a fiscal deficit of some 15%; it spends more than it takes in. That trend may continue as long as oil prices remain low. The government is currently pursuing a reform plan called Vision 2030 to mitigate the situation, but the reform may lead to unrest. By 2030, the volume of oil exports is expected to have decreased considerably, so even a higher price may not help much. Adopted in 2016, Vision 2030 aims to make the country less dependent on oil within 20 years.

Greenpeace's recommendations

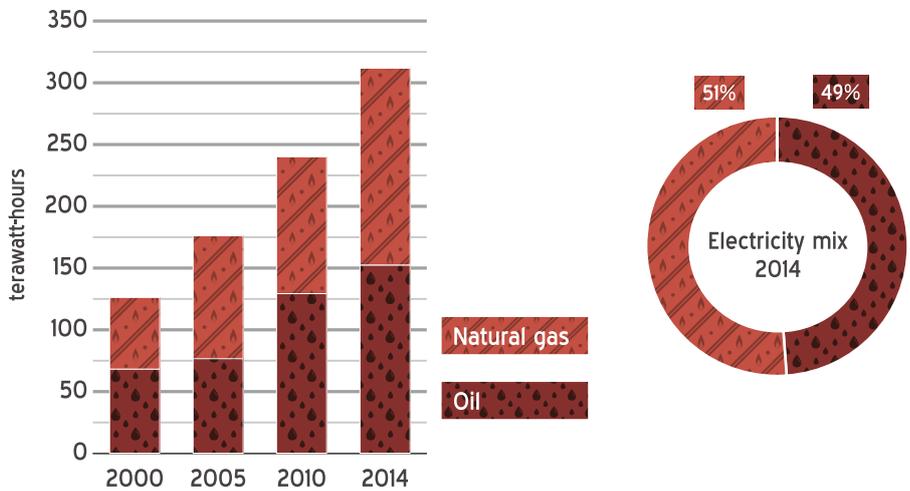
- ▶ Diversify the economy with distributed renewable energy projects along with utility-scale projects.
- ▶ Reinvest money from the IPO of Saudi Aramco into renewables.
- ▶ Abandon plans for nuclear power.
- ▶ PV in particular is excellent in countries with high demand for cooling as solar power generation then coincides with power demand.
- ▶ Focus on efficiency as energy consumption grows. Wasteful lifestyle habits from the days of abundant energy also need to change.

Saudi Arabia | CO₂ emissions from fuel combustion



Source: OECD / IEA

Saudi Arabia | Electricity generation by source



Source: OECD / IEA



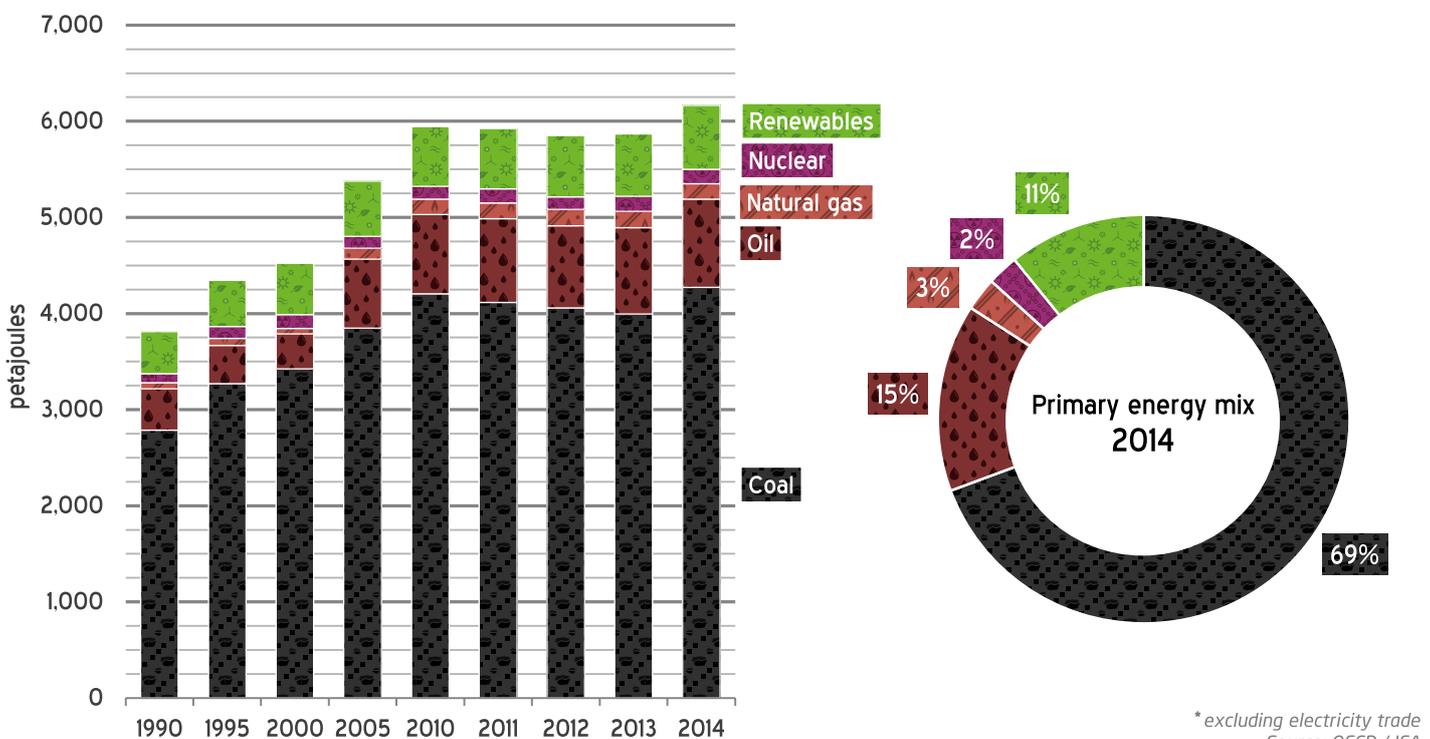
¹ <https://www.bloomberg.com/news/articles/2017-04-10/saudis-to-look-for-700-megawatt-wind-and-solar-projects>

SOUTH AFRICA

The South African government has just seen its unrealistic plans for a massive expansion of nuclear power challenged in court. The main obstacle towards cleaning up the country's energy sector, however, remains the overwhelming reliance on coal - despite great solar and wind potential. Mining is a major energy consumer.

Climate target in Paris Accord	20% - 82% increase relative to 1990 levels excluding LULUCF	Fossil fuel subsidies in 2015 (according to the IMF)	46.4 bn USD
CO₂ emissions from energy production, compared to 1990	+79% (2014)	CO₂ costs avoided due to renewable energies	453 bn EUR
Annual CO₂ emissions per capita	7.7 tons (2015)	Renewable energy jobs	27,600 (2015)
Share of renewable power	3% (2014)	Total CO₂ emissions from energy production	437,000,000 tons

South Africa | Primary energy supply by source*



South Africa is a major coal producer and consumer: most of the country's electricity comes from coal. South Africa has significant renewable energy potential, and the government has held auctions for renewables. Some major renewable projects are being constructed, but substantial barriers to renewable energy remain. The country's state-owned utility, Eskom, is currently refusing to sign agreements with independent renewable power producers, seemingly in a bid to slow

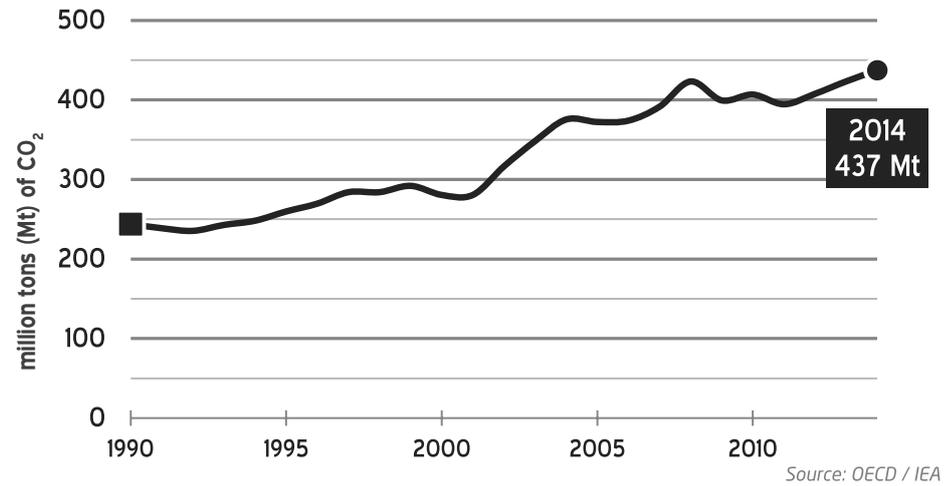
down renewable energy investments in the country. South Africa's Paris pledge states that its "emissions by 2025 and 2030 will be in a range between 398 Mt and 614 Mt CO₂-eq", which is too vague. The most ambitious target is for these emissions to peak by 2030. The INDC does not mention nuclear, despite the country's plans. Until April 2017, the government had plans to invest heavily in new nuclear reactors (the country already has Africa's only two commercial reactors). The price

tag for the 9.6 GW of new capacity was reported at 73 billion USD, almost a quarter of South Africa's GDP in 2015. But at the end of April, the Western Cape High Court ruled that the plan had unduly shut out public input and not adhered to parliamentary processes or followed the correct procedures. At present, the South African government has indicated that it accepts the ruling but plans to urgently restart the nuclear procurement process, which is now heavily delayed.

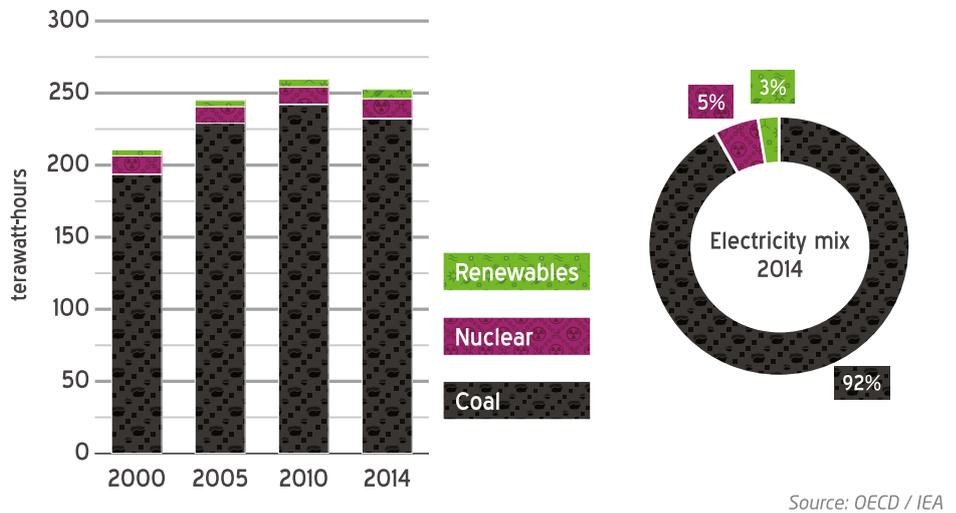
Greenpeace's recommendations

- ▶ The government must review and update its energy policy of 1998 as it is outdated, and the energy policy is key in driving energy planning.
- ▶ South Africa should embrace distributed renewables, not just utility-scale projects. Small projects will promote electrification and rural development and there are significant opportunities associated with removing the barriers to rooftop solar. These barriers include the lack of a regulatory framework for rooftop solar in South Africa, financing mechanisms, ambitious targets for the renewables sector, and a reliable grid.
- ▶ The South African government should immediately prioritize renewable energy investments ahead of water-hungry and polluting coal investments by significantly increasing the country's current target of 17,800 MW of renewable energy by 2030.
- ▶ The current expansion of the country's coal sector must be stopped through a just transition to renewable energy. No further coal-fired power stations should be built after Medupi and Kusile, and current coal-fired power stations should be retired at the end of their lifetimes without extensions.
- ▶ Any cost comparison for new power plants must include the environmental and health impacts of the country's alarming level of coal consumption.
- ▶ South Africa's state-owned utility Eskom should immediately sign pending renewable energy contracts with independent power producers, and begin to invest in renewable energy projects instead of new coal and nuclear projects.

South Africa | CO₂ emissions from fuel combustion



South Africa | Electricity generation by source

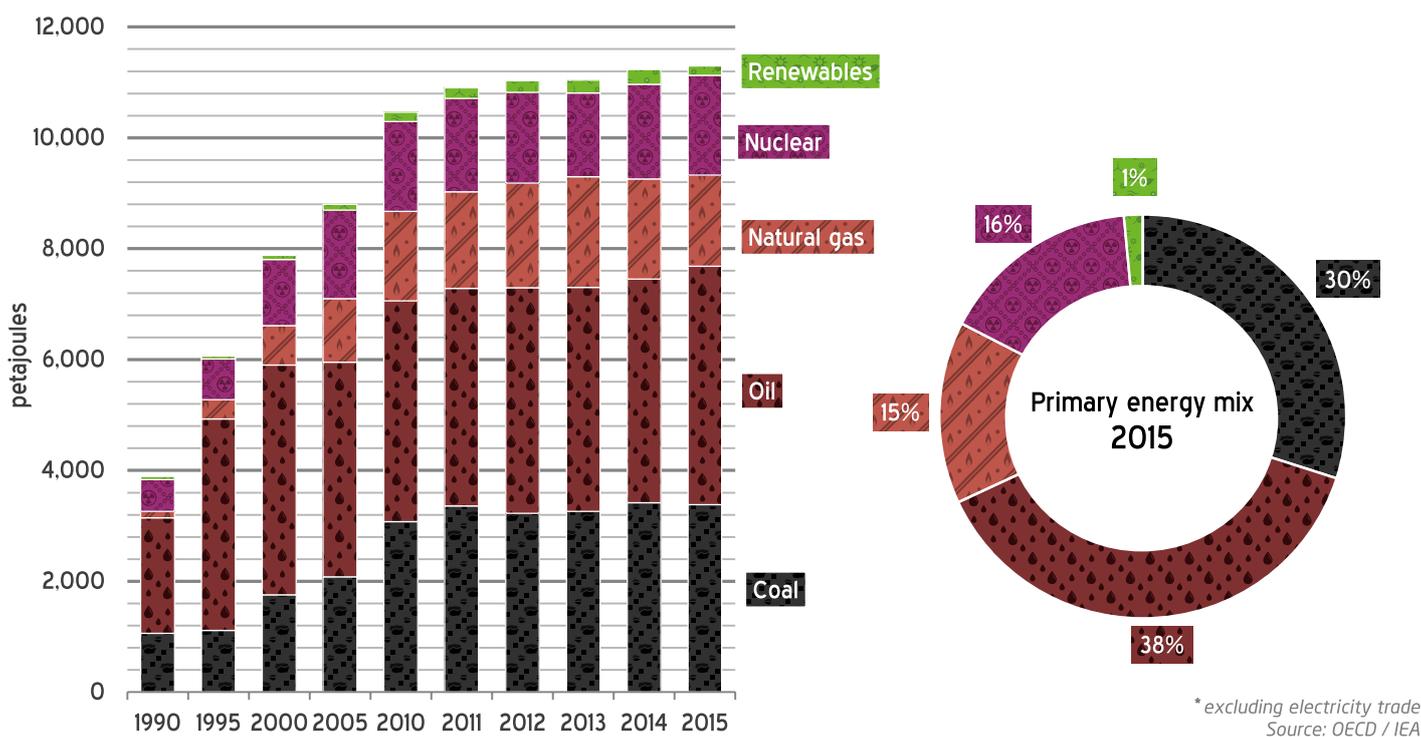


SOUTH KOREA

The Republic of Korea is a fast-growing economy - a classic "Asian tiger." Its energy use has skyrocketed since the 1980s, pushing South Korea up to the 8th rank globally in terms of total energy consumption. Energy use per capita and electricity consumption per capita of South Korea have already surpassed those of Germany, France and Japan. On 19 June, President Moon Jae-in announced a major shift towards renewable energies through the phaseout of nuclear and coal.

Climate target in Paris Accord	37% below BAU by 2030	Fossil fuel subsidies in 2015 (according to the IMF)	73 bn USD
CO₂ emissions from energy production, compared to 1990	+145% (2014)	CO₂ costs avoided due to renewable energies	1.6 bn EUR
Annual CO₂ emissions per capita	12.3 tons (2015)	Renewable energy jobs	36,500 (2015)
Share of renewable power	3% (2015)	Total CO₂ emissions from energy production	568,000,000 tons

South Korea | Primary energy supply by source*



South Korea's carbon footprint has hugely expanded since 1990 but remained the same in the past few years. The country is the 7th largest carbon emitter in the world, and its per capita emissions are also higher than those of Japan, Germany and the UK. Its INDC is disappointing, speaking of a 37% reduction in emissions by 2030, but relative to "business as usual," which foresees an

increase. Absolute emissions will thus drop only slightly overall, but even this calculation is net; a third of the reduction (11.3%) is to take place via international trading.

Little renewable power generation capacity has been built to date, but at a recent meeting of the Asian Infrastructure Investment Bank (AIIB), South Korea's new president, Moon Jae-in, suggested a 20%

renewable energy target by 2030. On 19 June, President Moon Jae-in announced a major shift in energy policy. He committed his country to phasing out all coal and nuclear power stations. In his ambitious speech, Moon promised to scrap existing plans for new nuclear plants, not to extend the lifetime of old reactors, to shut down ten old coal power plants and to cancel new coal projects. This

announcement is the first major international commitment away from coal since Trump announced his decision to pull out of the Paris Climate Agreement.

The announcement has international significance as South Korea counts as one of the top producers of nuclear power in the world and had been looking to export its technology and expertise – most recently to the United Kingdom.

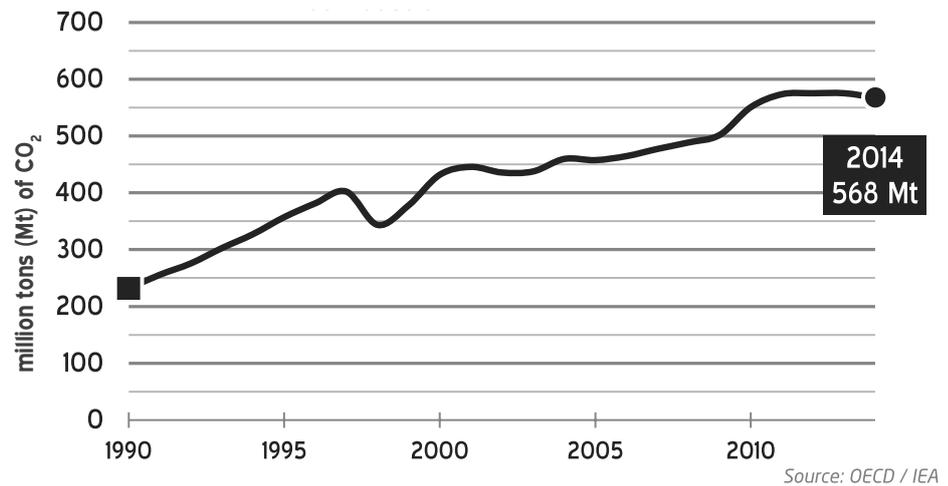
Coal accounts for a greater share of South Korea's energy mix than nuclear so the announcement is likely to lead to increases in both renewable and gas power.

In the power sector, South Korea has been a beacon of hope for proponents of nuclear power in recent years. The country is one of very few to build new reactors at relatively low prices. The country's INDC includes the statement: "Given the decreased level of public acceptance following the Fukushima accident, there are now limits to the extent that Korea can make use of nuclear energy."

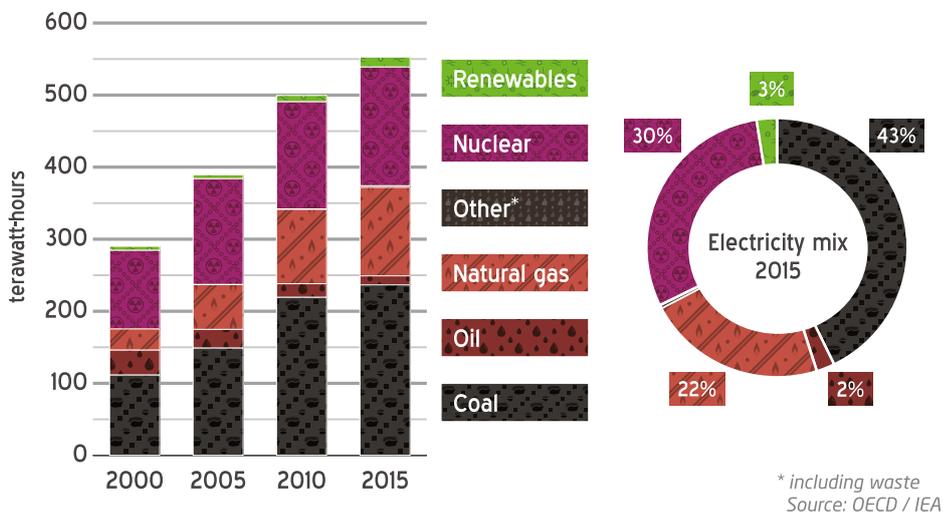
Greenpeace's recommendations

- ▶ **Cut off from the rest of Asia to the north, South Korea is effectively an island. As a major automotive manufacturer, it should promote electric vehicles, especially since range is hardly an issue on the peninsula. However, the renewable energy supply currently available is so low that a fast push for EV development could actually hold back a coal phaseout. Key corporate players such as Samsung, LG and Hyundai, plus the central government, are already interested in rapid electric vehicle and energy storage system development.**
- ▶ **Push for higher climate ambitions. With a planned energy transition, the new government will take more leadership in climate action. International recognition of a key role for Korea would encourage and cement domestic change as well - and may help**

South Korea | CO₂ emissions from fuel combustion



South Korea | Electricity generation by source



prevent false solutions such as "carbon capture and storage" and increasing LNG (liquified natural gas) capacity. In general, climate change is perceived as a serious issue by the Korean public, who also sees it as the responsibility of the central government.

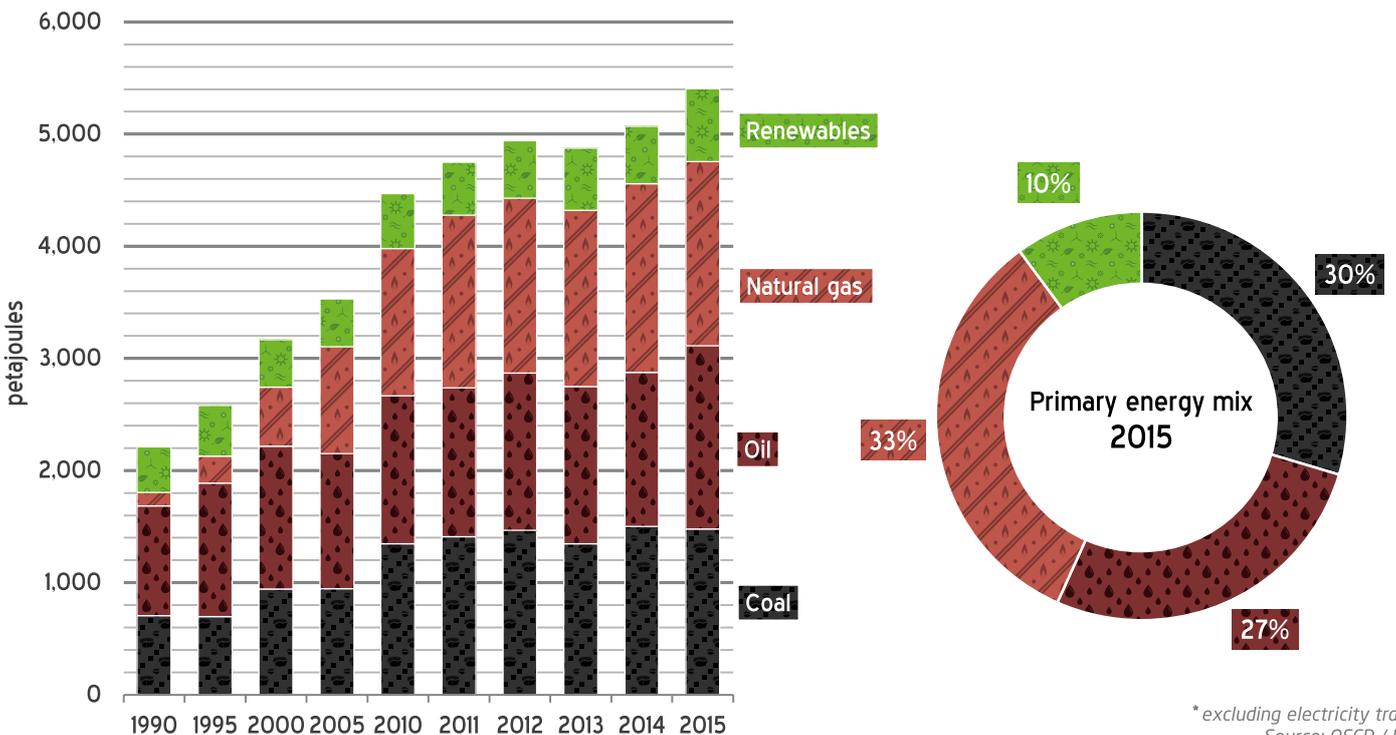


TURKEY

In 2014, fossil fuels made up some 90% of total supply in Turkey. The country plans to build as many as 65 new coal plants, aiming to double its coal capacity by 2020, and it also has nuclear plans. However it has hardly begun to tap its rich and varied renewable energy potential. Together with Russia, Turkey is the only G20 country that has not ratified the Paris Agreement.

Climate target in Paris Accord	[NOT RATIFIED]	21% below BAU by 2030	Fossil fuel subsidies in 2015 (according to the IMF)	38.9 bn USD
CO ₂ emissions from energy production, compared to 1990	+142% (2014)		CO ₂ costs avoided due to renewable energies	2.8 bn EUR
Annual CO ₂ emissions per capita	4.2 tons (2015)		Renewable energy jobs	36,500 (2015)
Share of renewable power	32% (2015)		Total CO ₂ emissions from energy production	307,000,000 tons

Turkey | Primary energy supply by source*



In 2011, President Erdogan announced Vision 2023, which included energy plans. It entails a near doubling of power generation capacity to 120 GW (2013: 64 GW), with coal power capacity rising from 15.9 GW to 30 GW. But at the end of 2016, enough coal projects were in the pipeline to bring the country up to 65 GW. Despite this overbuild, two nuclear plants are also in the works and expected to be completed by

2023. Turkey currently has no nuclear power. The Strategic Plan from the Ministry of Energy (2015 – 2019) and the draft “Electricity Energy Market Development Strategy Paper” maintain the “coal first” approach established in previous strategic policy documents. For lignite, for instance, the 2023 target is 20% – 25% of total power generation, a significant increase from the current 15% share. These targets are

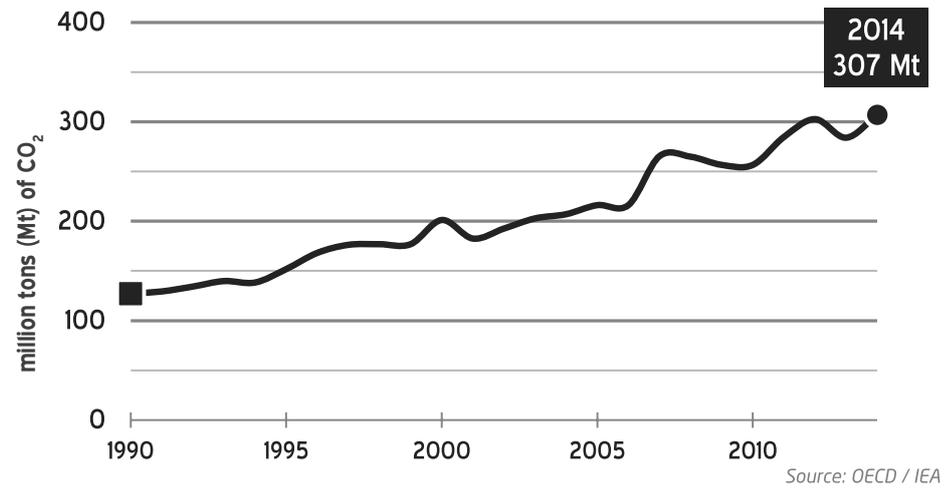
backed by strong policy tools such as exemption from environmental legislation, very lucrative subsidy schemes, and treasury guarantees that render financially questionable projects bankable. Stronger incentive mechanisms were approved with the new Electricity Market Law in June 2016, favoring lignite investments with an off-take agreement mitigating all the price risks arising from market prices as well as fixing the IRR

(internal rate of return) of lignite investment. The amended Electricity Market Law also introduces Article 8o, stating that projects identified by the cabinet as strategically important are eligible for additional subsidies and incentives, including mechanisms such as “exemptions from approvals, allocations, [and] permits imposed by other statutes on project-based investments and adjustments [that] may be statutory and administrative time periods for the purpose of accelerating and facilitating investments.” Targets for renewables have been changed since 2011. Vision 2023 originally aimed for 20 GW of wind and 3 GW of solar; in 2015, solar was increased to 5 GW. Still a modest goal given the massive potential: with about 2,700 hours of sunshine annually, Turkey holds second place among the sunniest countries in Europe. The government needs to ratchet up the country’s INDC which includes a target of 16 GW of installed wind power by 2030 – a full 4 GW less than the country aims to have by 2023. In its INDC, Turkey pledged to reduce emissions by 21 % relative to a business as usual scenario. The biggest share of renewable electricity is hydropower, which makes up three-quarters of green electricity and a sixth of total power supply in the country. The driver that carried the Turkish power market to its current point was the desire to meet the increasing energy demand and to reduce the country’s energy dependency. More than 60% of installed capacity (47,000 MW of the total 78,000 MW) was commissioned in just 13 years, from 2003 to 2016.

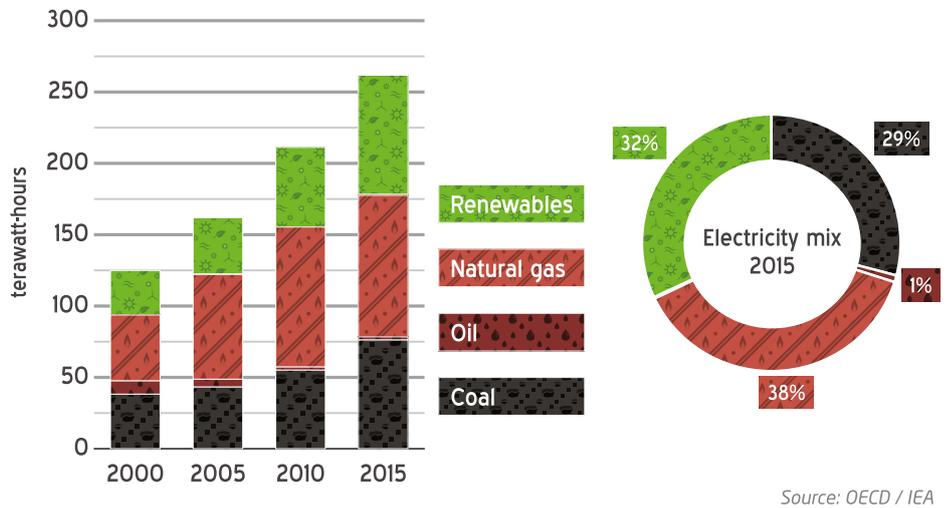
Greenpeace’s recommendations

- ▶ Stop new coal projects and start a transition of Turkey’s economy towards a renewable energy powered society.
- ▶ Adopt and implement true policies for renewable energy and energy efficiency.
- ▶ Ratify the Paris Agreement and submit a realistic greenhouse gas emissions reduction plan.

Turkey | CO₂ emissions from fuel combustion



Turkey | Electricity generation by source



- ▶ Adopt climate change adaptation and mitigation planning, which currently exist only on paper. Current policies are insufficient - and generally they are not being implemented at all.

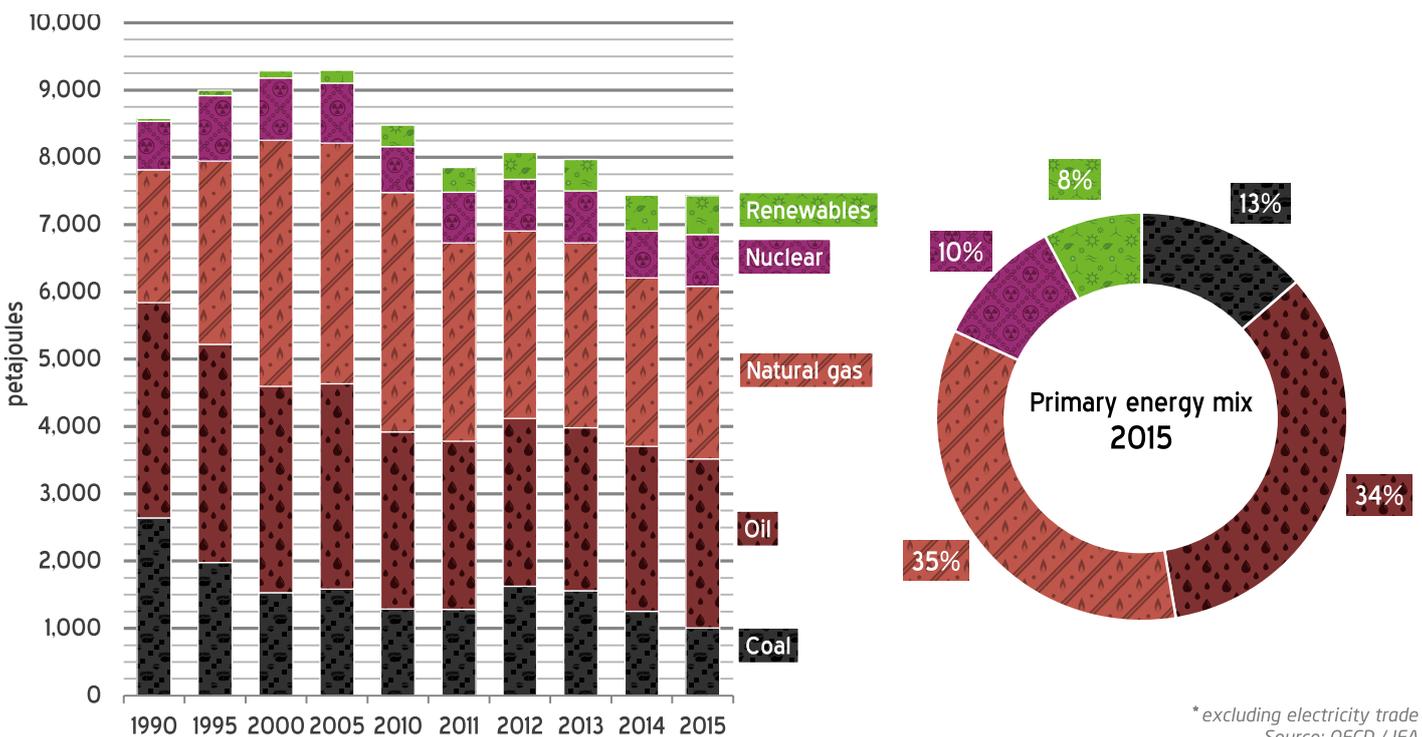


UNITED KINGDOM

The UK has posted the greatest reduction in carbon emissions within the G20. Going forward, the British government seems poised to slow down the growth of renewables, attempt to build more nuclear, and expand fracking. There has already been a drop in solar and onshore wind deployment in particular after the dramatic slashing of government support and unfavourable changes to the planning system since 2015. Brexit could postpone nuclear plans with an international consortium, however, and the UK's 2030 emissions targets may need to be confirmed.

Climate target in Paris Accord	at least 40% domestic reduction in greenhouse gas emissions by 2030 compared to 1990 within the EU	Fossil fuel subsidies in 2015 (according to the IMF)	41.2 bn USD
CO₂ emissions from energy production, compared to 1990	-26% (2014)	CO₂ costs avoided due to renewable energies	4.2 bn EUR
Annual CO₂ emissions per capita	6.2 tons (2015)	Renewable energy jobs	112,100 (2015)
Share of renewable power	25% (2015)	Total CO₂ emissions from energy production	408,000,000 tons

United Kingdom | Primary energy supply by source*



On 1 April 2013, the British government implemented a carbon floor price to remedy the ineffectiveness of the EU's Emissions Trading Scheme (ETS). It started out at 9 GBP per ton of CO₂ but rose to 18 GBP in 2015 – compared to generally less than 10 EUR (around 11 GBP) on the ETS during that time.

One effect has been a dramatic reduction of coal power, which fell by two-thirds from 2013 to 2016. As a result, carbon emissions in 2016 have fallen by 36% since 1990¹ – more than in any other G20 country, with Germany coming in a distant second. The UK's target for 2030 is a 40% reduction, and hence almost met

already. The country aims to be coal-free by 2025 – but most onlookers have overlooked the condition that this will work “only if” gas, nuclear and renewables can fill the gap. Carbon capture and storage (CCS) – an unproven, risky and expensive technology – is also not ruled out as an option. In addition,

¹ <https://www.carbonbrief.org/analysis-uk-cuts-carbon-record-coal-drop>

the successful implementation of the phaseout is contingent on wider policies – including the future of the carbon price floor in the UK (awaiting an announcement in autumn 2017) and the extent to which coal continues to be subsidized within the UK’s capacity market (a policy mechanism designed to guarantee against blackouts).

The country is planning not only new gas turbines and the establishment of a new fracking industry, but also new nuclear reactors.

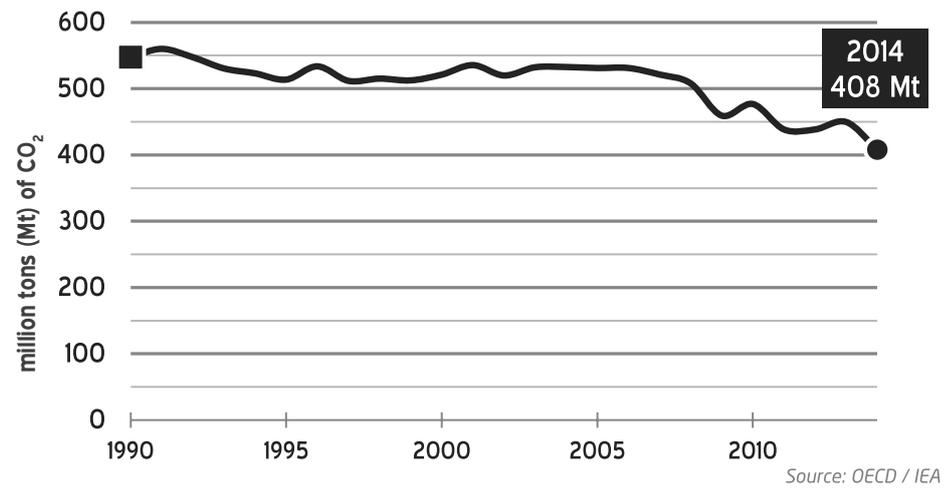
Transport sector decarbonisation is happening gradually, but not fast enough to meet the UK’s domestic 2050 target of 80% carbon emission reductions from 1990 levels. The government has a non-binding target of 100% new cars and vans running on electricity by 2040. There is also a major policy gap when it comes to the decarbonisation of heating – following the slashing of key policies such as zero-carbon building regulations since 2015.

Wind power reached some 12% of power supply in 2016, putting it ahead of coal for the first time in history.

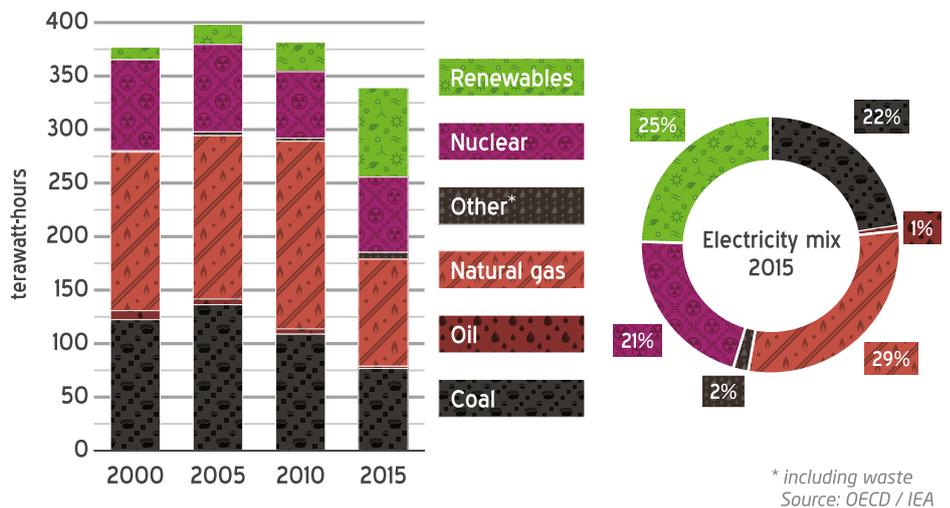
Greenpeace’s recommendations

- ▶ The UK should ensure coal is phased out by 2025 to continue showing its international climate leadership, to meet its decarbonisation commitments, and to create space on the grid for more low-cost, secure renewables.
- ▶ The UK should recognise the ongoing major technical and financial issues surrounding its new nuclear programme, such that it is unlikely to succeed in delivering 18 GW of new nuclear by 2030. Delays raise major concerns about security of supply, value for money for consumers, and decarbonisation. At the same time, the UK’s renewable industries are thriving, with high levels of public support. The energy transition is an opportunity for the UK government to provide

United Kingdom | CO₂ emissions from fuel combustion



United Kingdom | Electricity generation by source



further financial support for renewable technologies, the smart grid and battery storage now, and continue the trajectory of dramatically falling prices.

- ▶ Ban fracking, rather than boost it. It makes no economic or environmental sense to begin investing in a brand new fossil fuel industry at this time. The fracking industry causes enormous noise, air and light pollution, and it has low levels of public support, compared to renewables. Renewable energy prices are dropping dramatically, while battery storage solutions are advancing to address concerns about the security of supply. The government should back these homegrown industries instead.

- ▶ Stop co-firing imported wood pellets. Burning biomass imported from across the Atlantic is an accounting trick; the switch from coal to biomass reduces domestic emissions, but the process drastically worsens the sustainability of biomass. This worsening does not, however, show up in the count of carbon emissions. The UK is the main culprit within the EU for the co-firing of imported wood pellets.

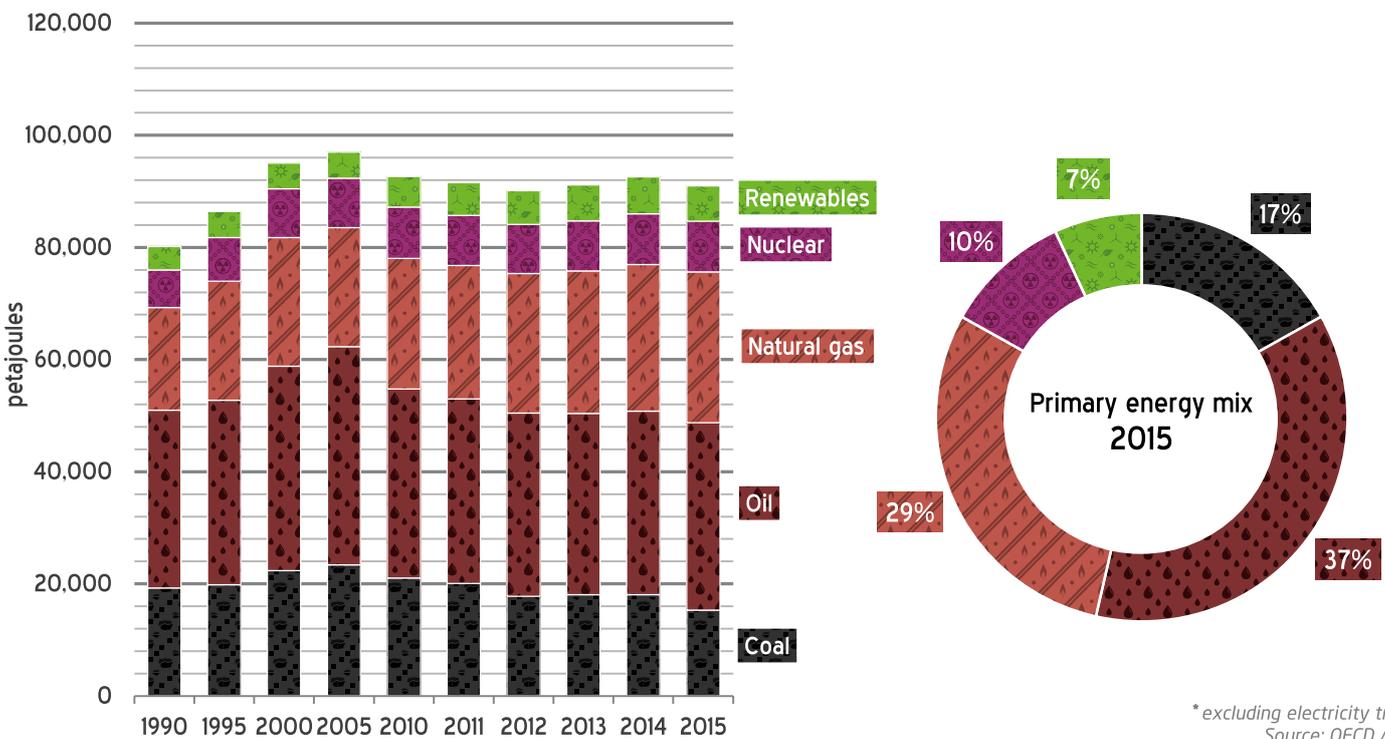


UNITED STATES

President Trump has implemented his campaign pledge to support the fossil fuel industry. However it is highly unlikely that he can save the declining American coal industry. Various states and local governments continue to promote renewables unabatedly - often simply based on costs.

Climate target in Paris Agreement [WITHDRAWAL ANNOUNCED] <small>below 2005 in 2025</small>		Fossil fuel subsidies in 2015 (according to the IMF)	699 bn USD
CO ₂ emissions from energy production, compared to 1990	+8% (2014)	CO ₂ costs avoided due to renewable energies	40 bn EUR
Annual CO ₂ emissions per capita	16.1 tons (2015)	Renewable energy jobs	768,900 (2015)
Share of renewable power	13% (2015)	Total CO ₂ emissions from energy production	5,176,000,000 tons

United States | Primary energy supply by source*



Shale gas has helped increase gas consumption in the United States in recent years; it rose by nearly a quarter from some 21 EJ (exajoules) in 2005 to 26 EJ in 2014. In contrast, non-hydro renewables increased by only 2 EJ to 5.6 EJ during the same time frame. Coal was down by 5.3 EJ in those years; oil, by some 4.2 EJ. Nuclear remains largely unchanged with a slight downward trend. The number of reactors stood at 104 a few years back but briefly fell to

99 before rising back to 100, when Watts-Bar 2 went online 43 years after construction began. In mid-2017, construction of two new AP1000 reactors (equivalent to the EPR design that France is, somewhat unsuccessfully, attempting to build at home and in Finland) was up in the air after Westinghouse's bankruptcy. The policy picture in the United States has always been fragmented, with numerous states (including many led by Republicans) pioneering

renewables. However, few states have a healthy balance of both wind and solar; most have either one or the other. President Trump says he wants to boost coal by rolling back regulations, but even aggressive government intervention is unlikely to reverse market trends. In its INDC, the Obama administration pledged a 26% - 28% reduction in emissions by 2025 (instead of 2030, as in most NDCs) relative to 2005. However, the Trump administration has announced

that it will pull the United States out of the Paris Agreement.

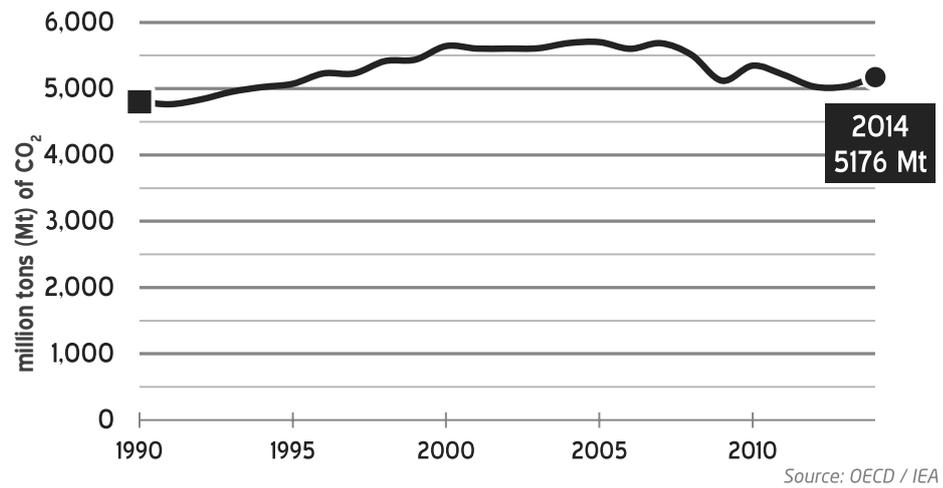
Solar statistics are unclear. The US Energy Information Administration (EIA) says that utility-scale solar accounted for 0.8% of power supply in 2016, but the amount of residential PV “behind the meter” is not officially counted. Actual solar power production thus may never be known precisely in the US, but it probably made up around 1.4% of supply in 2016.

Wind power also made up 5.5% of power supply in 2016. Collectively, wind and solar thus provide less than 7% of US electricity. There is room for improvement and many states, cities, and businesses are pursuing aggressive renewable energy policies to reduce costs, demonstrate US commitment to global climate action, and benefit from a booming industry. In recent years, solar and wind jobs have been growing by more than 20% annually.

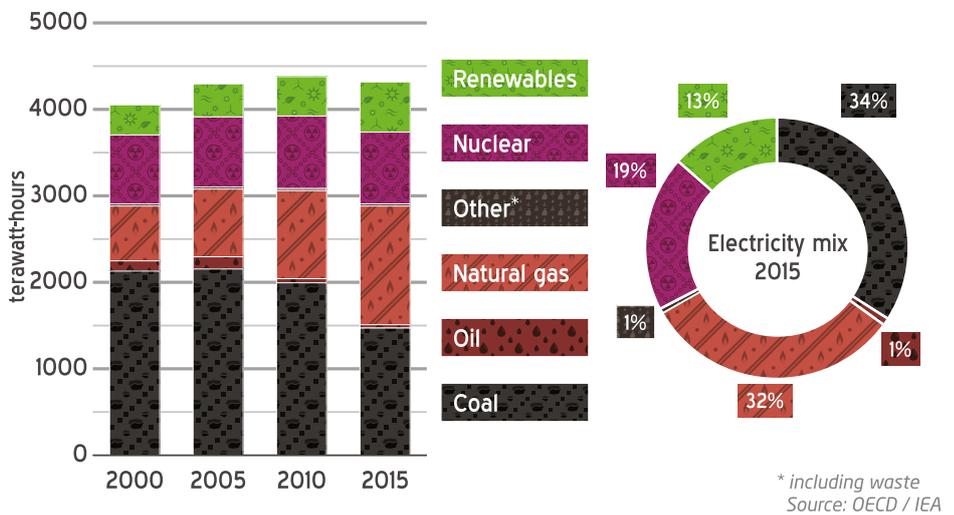
Greenpeace's recommendations

- ▶ **The US needs to leave its fossil resources in the ground. While the US has reduced its domestic emissions, the federal government continues to lease publicly owned lands with fossil fuel reserves and to support increased fossil fuel exports to the world. A proper divestment strategy, which climate change requires, requires leaving most current fossil fuel resources buried.**
- ▶ **People have the right to generate their own energy. Utilities are clearly turning towards renewable energy, especially as costs decline and major electricity customers like the IT sector demand 100% renewable energy options. However, these utilities are actively working to stall the rise of distributed rooftop solar in particular. Utility companies should not become a barrier to the energy revolution. It's time to open the market to new players, empowering**

United States | CO₂ emissions from fuel combustion



United States | Electricity generation by source



- ▶ **citizens and communities as energy producers on previously monopolized power markets.**
- ▶ **US cities and states should take up the leadership role that the Trump administration is abdicating. Nearly 1500 cities, states, and businesses have already pledged commitment to the Paris Accord targets, and we expect to see that activity grow.**
- ▶ **Major financial institutions must defund and cease financing increasingly risky fossil fuel projects, starting with controversial pipeline projects in the US.**



GREENPEACE ASKS THE G20 TO

- ▶ phase out coal, oil and natural gas
- ▶ speed up implementation of the Paris Climate Agreement
- ▶ phase out fossil fuel subsidies by 2020
- ▶ go 100% renewable
- ▶ limit the rise in global temperature to 1.5°C

References

NDC targets in the Paris Climate Agreement

Nationally determined contributions (NDCs) can be found here: <http://www4.unfccc.int/ndcregistry/Pages/All.aspx>

Annual CO₂ emissions per capita

Emissions Database for Global Atmospheric Research (EDGAR) provides "CO₂ time series 1990-2015 per capita for world countries"
http://edgar.jrc.ec.europa.eu/overview.php?v=CO2ts_pci1990-2015

Fossil fuel subsidies: International Monetary Fund (IMF)

<https://www.imf.org/en/News/Articles/2015/09/28/04/53/sonew070215a>
www.imf.org/external/np/fad/subsidies/data/codata.xlsx

Renewable energy jobs

http://www.irena.org/DocumentDownloads/Publications/IRENA_RE_Jobs_Annual_Review_2016.pdf and <http://resourceirena.irena.org/gateway/dashboard/?topic=7&subTopic=10>

CO₂ costs avoided due to the use of renewable energies

Calculations are based on data from the International Renewable Energy Agency (IRENA): <http://resourceirena.irena.org/gateway/dashboard/?topic=17&subTopic=55> and the German Federal Environment Agency (UBA) publication on "Best-Practice-Costs" of 80 €/tCO₂: https://www.umweltbundesamt.de/sites/default/files/medien/378/publikationen/hgp_umweltkosten_0.pdf

CO₂ emissions from fuel combustion

http://www.iea.org/bookshop/729-CO2_emissions_from_fuel_combustion

All non-referenced data comes from:

World Energy Balances 2016

http://www.iea.org/bookshop/724-World_Energy_Balances_2016

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International Energy Agency Statistics

<http://www.iea.org/statistics/>

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