



# Scaling up climate action

Key opportunities for transitioning to a zero emissions society

## EXECUTIVE SUMMARY

CAT Scaling Up Climate Action series

# EUROPEAN UNION

November 2018

## CAT Scaling Up Climate Action series

The Climate Action Tracker (CAT) strives to support enhancing climate action in the context of the Paris Agreement implementation. This analysis contributes to the Talanoa Dialogue at COP24 and future revisions of mitigation targets, and aims at spurring an increase in climate mitigation actions, to close the gap between current emissions projections and required Paris-compatible pathways.

As part of this, we have been researching the potential for countries to scale up climate action in different focus areas. The analysis in this report is relevant to Parties considering revisions to their Nationally Determined Contributions (NDCs) to be submitted under the Paris Agreement by 2020, and also to their submission of long-term low greenhouse gas development plans, also due by 2020.

The result is our **Scaling Up Climate Action** country series, which identifies options for increased sectoral action that would move a country towards a pathway compatible with the Paris Agreement's long-term temperature limit and estimates the impact of those actions on emissions and other benefits.

The first round of our analysis covers **South Africa**, the **European Union**, **Indonesia**, **Turkey**, **Argentina**, and **Australia**.



The consistent method and similar structure for all six reports allows for country-specific insights, while enabling a cross-country comparison to draw general research findings and lessons learnt on global potentials.



### KEY FINDINGS

- ⇒ The European Union's targets and policies are not yet compatible with the Paris Agreement's 1.5°C limit. This report analyses areas where the European Union could accelerate its climate action.
- ⇒ Scaling up climate action in the European Union's electricity supply, residential building and passenger road and rail transport—covering around 60% of the EU's current energy related emissions—can decarbonise these sectors by 2050.
- ⇒ The reductions in these three sectors alone are enough to reduce EU28 total greenhouse gas emissions by up to 52% below 1990 levels in 2030. This shows that the EU can and needs to ratchet up its 2030 target to make it consistent with the Paris Agreement.
- ⇒ To get on track toward Paris Agreement-compatible emissions reductions, the EU needs to urgently scale up climate action in the transport and buildings sectors, decarbonising them by 2050, with decarbonisation of electricity generation and electrification of transport, heating and cooling as essential steps.



#### Electricity supply

- ⇒ With the recently adopted EU policies including a binding target of 32% for the share of renewable energy in total energy demand (not just the power sector), the EU would reach a share of renewable energy in electricity generation of 55% by 2030. This is a step in the right direction, but not enough to be consistent with the Paris Agreement-compatible pathway, which according to our analysis, would require increasing the share of renewable energy sources for electricity (RES-E) to between 60 and 75% in 2030 and full decarbonisation by 2050.
- ⇒ To be Paris Agreement-compatible, the EU needs to deploy renewable energy faster than Denmark, the "best in class" country with the highest growth rate of renewables between 2009 and 2015. Applying Denmark's rate of growth to the whole of the EU would lead to the share of RES-E reaching between 49–59% in 2030 and 76–95% in 2050.
- ⇒ An essential step to decarbonising electricity generation is phasing out coal: globally by 2050, and in the EU by 2030. There are steps being taken in the right direction: by mid-2018, ten out of 28 EU member states—accounting for 26% of EU coal capacity—have already set phase-out goals for 2030.
- ⇒ The Paris Agreement 1.5°C-compatible scenario would create, on average, around 350,000 more direct jobs between 2020 and 2030 in the electricity sector alone than the reference scenario, particularly in wind and solar energy.



#### Residential buildings

- ⇒ Paris Agreement-compatibility requires the renovation rate of the building sector to increase significantly from the current 1%—ideally to around 5%—with the energy demand per square meter decreasing by between 75% and 100%.  
Together with electrification, and phasing out fossil fuels for space heating and cooling, and replacing these with renewable energy, this would result in an almost complete decarbonisation of the sector. It implies higher renovation rates and more efficiency improvements than those achieved if "best in class" policies applied in Denmark were to be adopted in all EU member states.
- ⇒ Apart from improving quality of life and helping to reduce energy poverty affecting between 50 and 125 million Europeans, improving efficiency and replacing fossil fuels for heating would significantly decrease energy dependency in the EU by reducing gas imports and reduce air pollution.



## Passenger road and rail transport

- ⇒ The CAT Paris Agreement-aligned benchmark requires the EU to increase its share of electric vehicles (or other emissions-free vehicles) in new sales from today's 2% to 100% in 2035 resulting in full decarbonisation by the middle of the century. The EU also needs to apply stringent standards for CO<sub>2</sub> emissions intensity of new vehicles. Member states also need to increase their share of public transport, and follow the example of frontrunner member states such as the Czech Republic and Austria.
- ⇒ Decarbonising the transport sector would significantly decrease reliance on energy imports and help reduce air and noise pollution. Road transport is responsible for 30% of NO<sub>x</sub> emissions in the EU28.

## Executive summary

### Introduction and objectives

Under the Paris Agreement, governments have committed to holding temperature increase well below 2°C above pre-industrial levels and to pursue efforts to limit this to 1.5°C. Current efforts globally are by far insufficient: aggregate mitigation targets, according to Climate Action Tracker (CAT) estimates, result in global warming of about 3.2°C (Climate Action Tracker, 2017c). Implementation of the targets is falling short, with greenhouse gas (GHG) emissions under implemented policies leading to an estimated warming of around 3.4°C.

To stay below the Paris Agreement's 1.5°C limit, the IPCC Special Report on 1.5°C finds that a very substantial increase in effort is required to peak global GHG emissions as soon as possible, reduce CO<sub>2</sub> emissions to net-zero around 2050 and total GHG emissions shortly thereafter (IPCC, 2018a).

This limit is highly relevant also for the EU: the IPCC Special Report on Global Warming of 1.5°C found that limiting warming to 1.5°C will reduce the negative impacts, e.g. from heat extremes (including heat waves and droughts) especially in Southern and Eastern Europe, or heavy precipitation in Northern European countries.

Rapidly falling technology costs, as well as increased awareness for other benefits, such as air quality improvements and employment benefits in low-carbon-oriented sectors, have made measures to reduce GHG emissions more attractive to policy makers and private investors.

We no longer live in a world where climate change mitigation is a burden per se, but where it increasingly becomes the most feasible option when considering all socio-economic aspects. For cost-efficient global mitigation, it will be essential to make those mitigation actions accessible to and overcome remaining barriers in all countries.

**This report, the second country assessment in the Climate Action Tracker's Scaling Up Climate Action Series, analyses areas where the European Union could accelerate its climate action. The report illustrates GHG emissions reductions from such actions, along with other benefits.**

Our analysis starts with an in-depth review of the European current policy framework and sectoral developments, comparing them with the comprehensive policy packages and the progress for sector indicators required under Paris Agreement-compatible pathways.

The report then focuses on three areas we have identified with promising potential to increase mitigation efforts and achieving a wide range of benefits: electricity supply, residential buildings, and passenger road and rail transport.

It identifies different options of accelerated climate action in each sector informed by insights from three categories: (1) studies and scenarios from EU institutions and EU based research institutes ("National Scenarios"), (2) practices implemented by regional or international frontrunners, and (3) sectoral developments in line with the Paris Agreement's long-term temperature limit.



## Sector transitions towards zero-carbon

In the EU, there is tremendous potential to scale up climate action in the three focus areas analysed in this report: electricity supply, residential buildings, and passenger road transport. Increasing climate action would initiate sectoral transitions towards a zero-emissions society relying on existing technologies while reducing reliance on energy imports, reducing air pollution, and creating additional employment.



### Electricity supply

A swift transition away from fossil fuels towards renewables in the EU is essential for EU climate policy to be compatible with efforts to limit global warming to 1.5°C below pre-industrial levels, as established in the 2015 Paris Agreement.

Our findings for the EU show that under scenarios developed by European research institutions the share of renewables in the electricity sector could increase to between 45–60% in 2030 and 63–98% in 2050, leading to emissions reductions of between 77–99% below 1990. Accelerating the deployment of renewables in the sector to levels similar to that in Denmark between 2009 and 2015 would result in increasing the share of RES-E to 76%–95% in 2050 with corresponding emissions reduction by 89–98% in comparison to 1990.

The recent projections show the share of RES-E increasing to only 43% in 2030 and 55% in 2050. However, these projections don't yet reflect the most recent policy changes, especially the reform of the EU ETS and the adoption of the renewable energy directive (RED II).

**The importance of the electricity sector as an enabler of decarbonisation in other sectors, combined with the decreasing costs of renewables, requires accelerated action leading to full decarbonisation of this sector by the middle of the century at the latest, with coal phased out by around 2030 in all EU member states.**

Strengthening the EU Emissions Trading Scheme (EU ETS) post 2020, combined with the adoption of the Renewable Energy Directive II, as well as important developments in many EU member states to phase out coal in electricity generation, are steps in the right direction.

**To be compatible with the Paris Agreement, the EU needs to exceed its renewable energy goal of 32% for 2030, which would result in increasing the share of RES-E to 55%, to allow for the share of renewable electricity to reach between 59–75% levels by 2030 and reach full decarbonisation by 2050.**

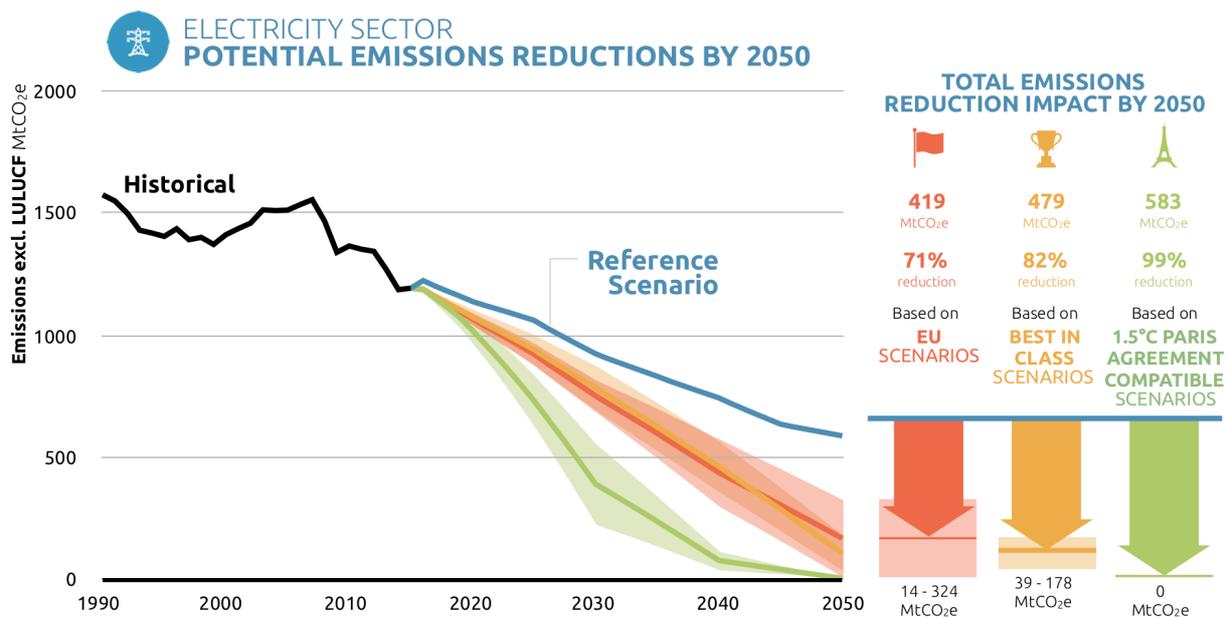


Figure 1: Overview of sectoral emission pathways under reference scenario and different levels of accelerated climate action in the European electricity supply. All sectoral projections towards 2050 done with the CAT PROSPECTS EU scenario evaluation tool. The electricity-related emissions from end-use sectors are included.

While replacing fossil fuels with renewables is essential for decarbonising the transport and buildings sectors, sectoral integration would also make it easier to increase a significantly larger share of variable renewables in the electricity sector. For this reason, accelerated action in this sector must be accompanied by stepping up action in the passenger road transport and residential buildings sectors.

## Residential buildings

It is essential that the EU reduces emissions in the buildings sector in line with the Paris Agreement temperature limit. This is due to the long-term impact of existing buildings on future emissions, and the overall volume of emissions from this sector. With the renovation rate at around 1%, a variety of different Nearly Zero Emissions Buildings (NZEBS) standards for new buildings in different member states, and different depths of renovation, the EU needs to scale up action in this sector.

**Applying best-in-class levels, currently adopted in Denmark, for energy consumption in new buildings at 20 kWh/m<sup>2</sup>/year, renovation rates of between 1.5%–2%, efficiency improvement of renovated buildings between 45% and 89%, and average efficiency improvement of appliances between 1.5% and 1.8%, would result in emissions from the buildings sector decreasing by 52%–62% in 2030 and 76%–87% in 2050 below 1990 levels. Similar results can be found in a range of scenarios from EU research institutions.**

**Compatibility with the Paris Agreement requires going significantly beyond these parameters: we have estimated that it means increasing renovation rates to 5% annually, all new and renovated buildings being carbon neutral, and full electrification/phase out of fossil fuels for water and space heating.**

The recast of the EU's Energy Performance of Buildings Directive (EPBD) adopted in 2018 requires that in 2050—in addition to all new buildings—all existing buildings are NZEBs. However, the suggested renovation rate of 3% is not sufficient to reach this goal and is below the level that is considered by CAT to be compatible with the Paris Agreement. At the same time the Eco-design Directive and the Energy Labelling Regulation make it possible for the Commission to accelerate improvements in the energy efficiency of domestic appliances.

## RESIDENTIAL BUILDINGS SECTOR POTENTIAL EMISSIONS REDUCTIONS BY 2050

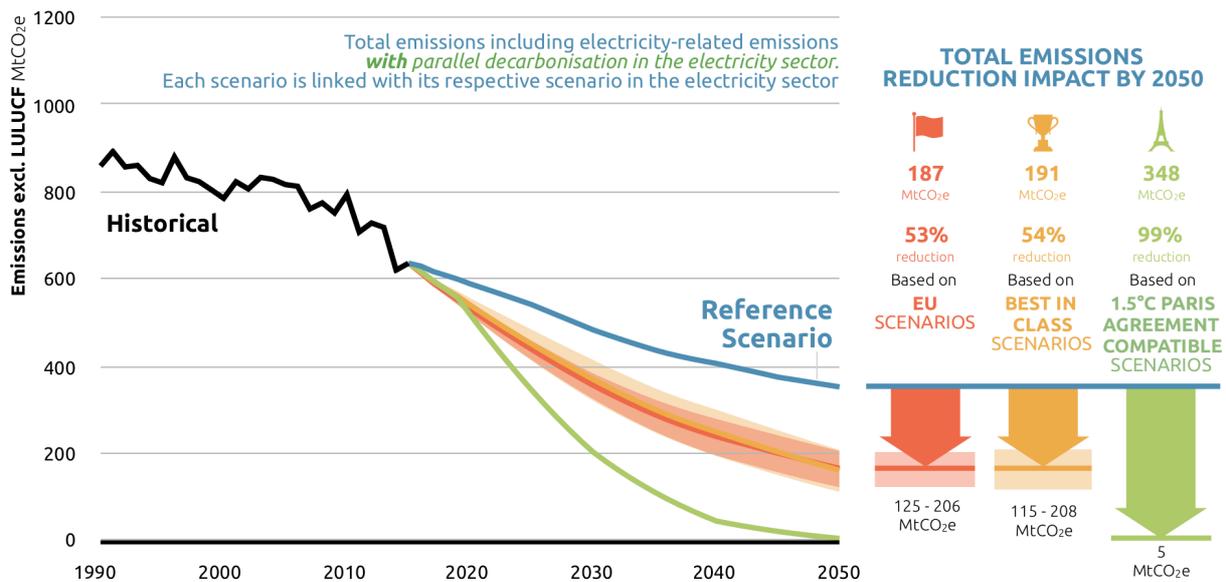


Figure 2: Overview of sectoral emission pathways under reference scenario and different levels of accelerated climate action in residential buildings sector in the European Union. All sectoral projections towards 2050 done with the CAT PROSPECTS European Union scenario evaluation tool.

An energy efficient, decarbonised building sector can also be instrumental in decarbonising the transport sector by powering passenger cars with clean electricity generated on the building's roof, and can also assist in providing advanced electricity management capabilities.



## Passenger rail and road transport

The recent trends of increasing greenhouse gas emissions from the transport sector in the EU defy the need to decarbonise the transport sector by mid-century to be compatible with the Paris Agreement. The focus area analysed here looks at emissions from passenger road and rail transport. The main focus is on the impact of transport electrification. While the share of electric vehicles among new sales has been steadily increasing, in the first half of 2018 it remained close to only 2%.

**To be compatible with the Paris Agreement, we estimate that the EU's passenger road and rail transport sector needs to be almost fully electrified using low carbon electricity by 2040, with the last new internal combustion car sold before 2035. Such a rapid uptake of electric vehicles will require faster action than scaling up experiences of the zero-carbon transport leader—Norway—to the European level. Decreasing costs of electric vehicles, along with the declaration of some member states to ban the sale of combustion cars, offer an opportunity to meet the Paris Agreement-compatible CAT benchmark. However, electrification of the transport sector needs to be accompanied by full decarbonisation of the electricity sector.**

The reference scenario reflects the already adopted emissions standards for 2021 as well as announced policies and targets. The currently discussed target of reducing average emissions from new passenger, and small utility vehicles by at least 35% between 2021 and 2030, complemented with a quota for sales of electric vehicles of 35%, is a step in the right direction, with more stringent targets needed to support a faster transition to zero emissions transport.

Adoption of the proposed Clean Vehicles Directive, which includes minimum targets for clean vehicle procurement (e.g. buses, light duty vehicles) in 2025 and 2030, will accelerate electrification of public transport with benefits going beyond emissions reductions to areas such as health. However, keeping in mind the rapidly changing circumstances, the EU should keep the

door open to increasing the respective goals similarly to the upward revision clause in RED II. Additional policies in member states to increase the share of public transport will also contribute to faster emissions reductions in line with the Paris Agreement.

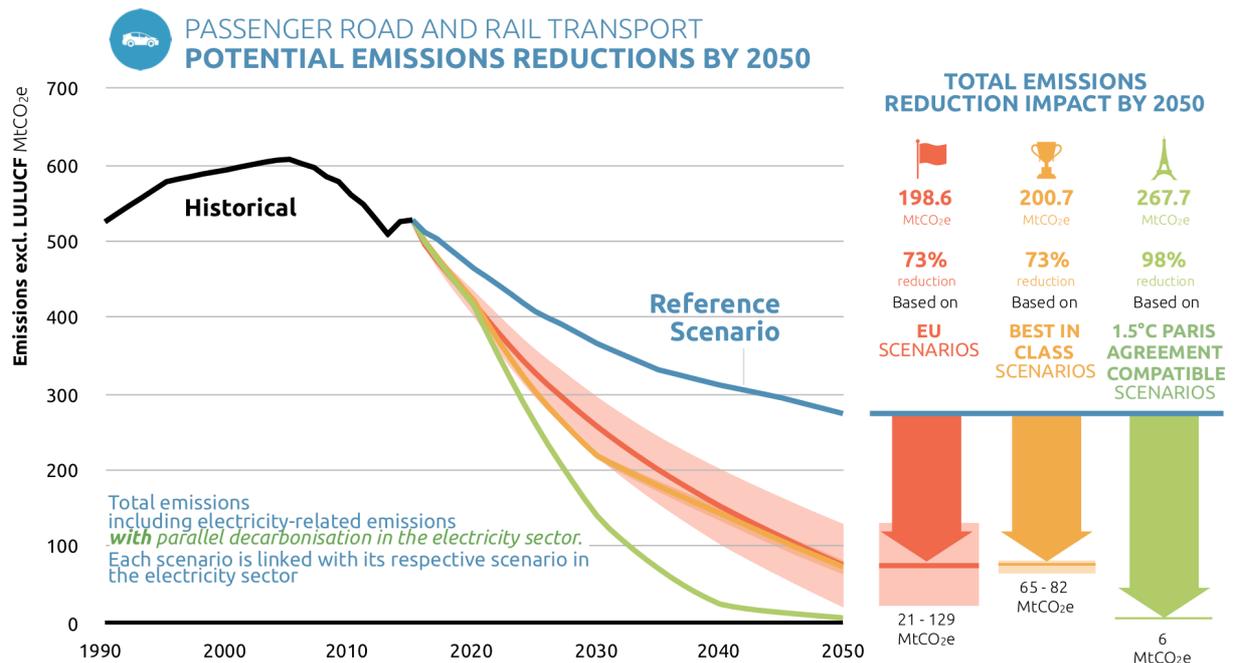


Figure 3: Overview of sectoral emission pathways under reference scenario and different levels of accelerated climate action in passenger road and rail transport sector in the European Union. All sectoral projections towards 2050 done in the CAT PROSPECTS European Union evaluation tool.

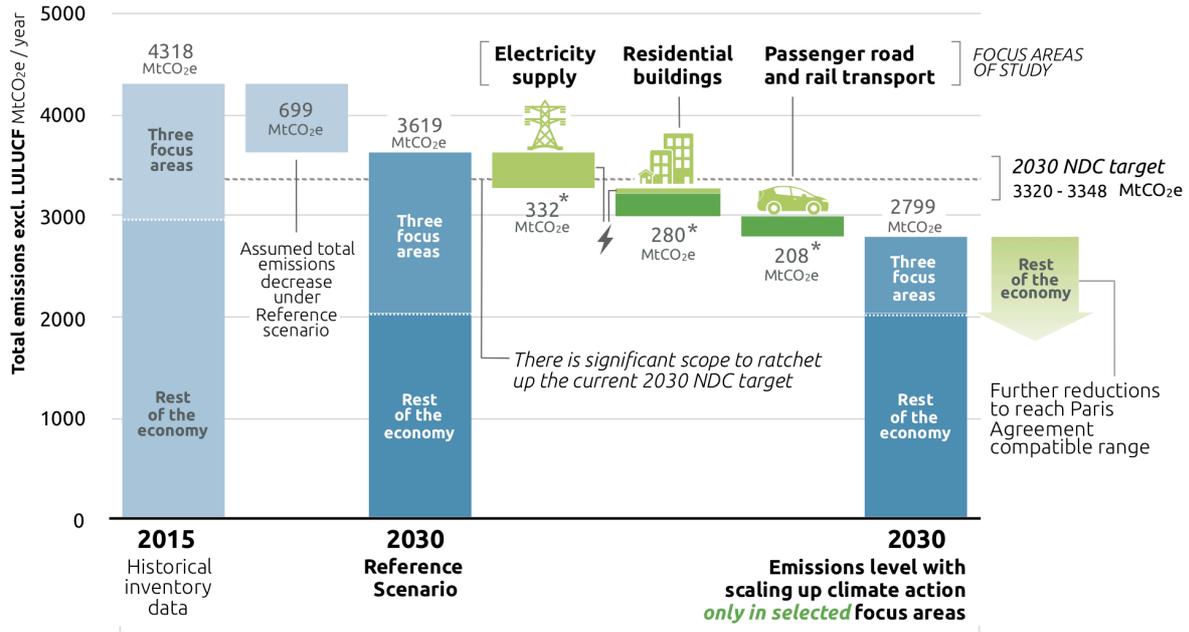
## Accelerated climate action and the EU's emission reduction targets

Scaling up climate action in the EU's electricity supply, residential building and passenger road and rail transport alone—covering around 60% of total emissions in the EU—can reduce the EU's total greenhouse gas emissions by up to 52% in 2030 below 1990 levels, and 68% in 2050. The report also shows that these three sectors can be fully decarbonised by 2050.

An important conclusion from these findings is that the EU can—and needs to—ratchet up its target for 2030 considerably to be consistent with the Paris Agreement and achieve a wide range of benefits. Corresponding scaled up action in other sectors not analysed in detail in this report is needed to achieve further reductions and a pathway toward an economy-wide decarbonisation by mid-century.

While the EU is already making good progress in the transition of its electricity sector, it will have to scale up action considerably in the buildings and transport sectors.

## EUROPEAN UNION'S CAPACITY FOR SCALED UP CLIMATE ACTION EMISSIONS REDUCTIONS POTENTIAL FROM THREE FOCUS AREAS IN 2030



\* Emissions reductions from electricity use are allocated to end use sectors, for example emissions from electricity use in buildings are allocated to the buildings sector and removed from the electricity supply sector total. The lighter green shade represents electricity related emissions. Total reductions from the electricity sector by 2030 equal 390 MtCO<sub>2</sub>e per year.

## SCALING UP CLIMATE ACTION IN THE EUROPEAN UNION POTENTIAL EMISSIONS REDUCTIONS IN THREE FOCUS AREAS BY 2050

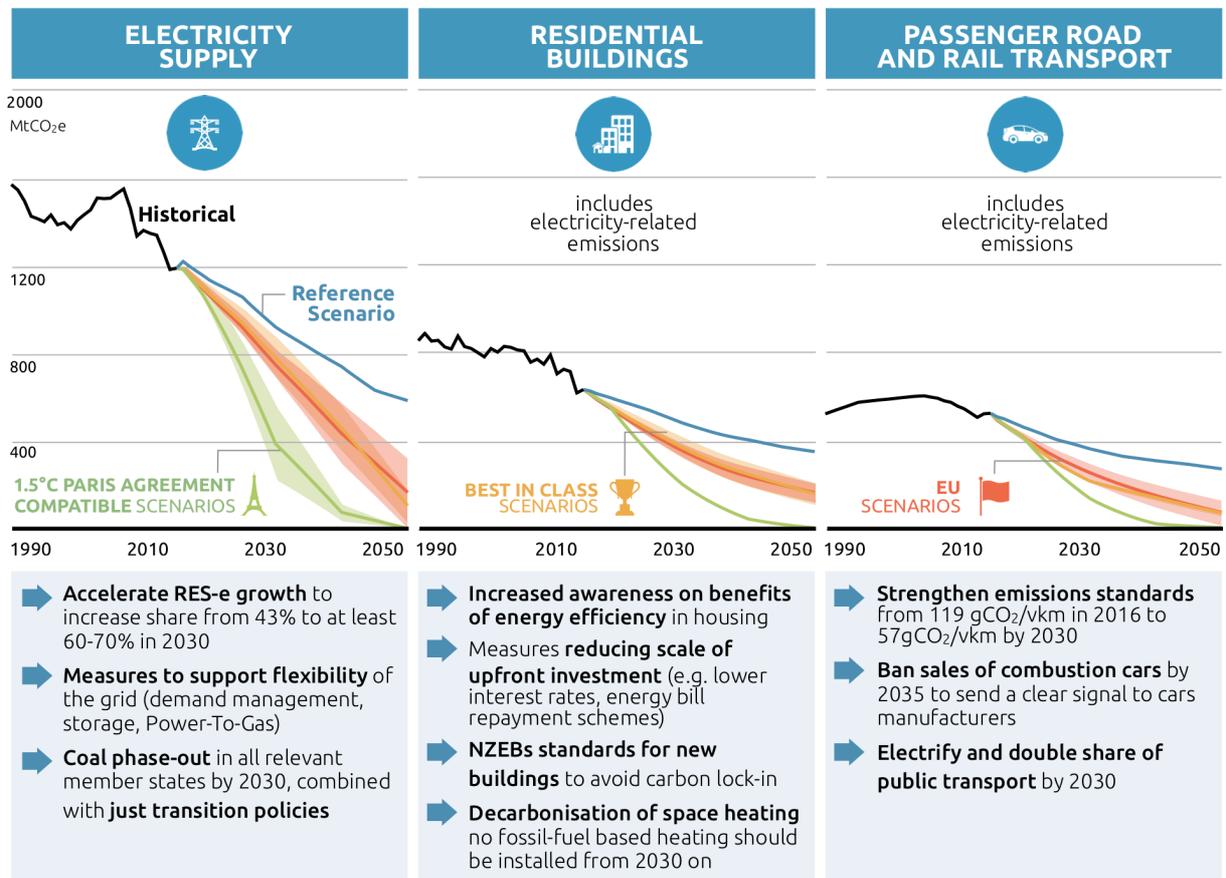


Figure 4: Overview of emissions levels under different scenarios for the three focus areas. All electricity-related emissions reductions from the residential buildings and urban transport sectors are allocated as emissions reductions under these two end-use sectors.

# The status of sectoral transitions: opportunities for accelerating climate action

The transitions towards zero-emissions in the EU's electricity supply, passenger road and rail transport and, residential buildings sectors have shown different levels of progress, with the decarbonisation of the former the most advanced, and transport and building sectors lagging behind.

Table 1 is an overview of this study's evaluation for the three sectors compared with sector-specific benchmarks. These benchmarks represent the most important short-term steps for limiting global warming to 1.5°C identified by the Climate Action Tracker (Kuramochi et al., 2018). The full results of this analysis for all sectors are detailed in the full report.

Sector	1.5 °C-consistent benchmark	Overall evaluation based on policy activity and gap analysis	Policy rating
 <b>Electricity supply</b>	<p>Sustain the global average growth of renewables and other zero and low-carbon power until 2025 to reach 100% by 2050</p>	<ul style="list-style-type: none"> <li>Based on the implementation of policies adopted before 2015, the share of electricity from renewables is projected to increase from 29% in 2015 to 43% in 2030 and 55% in 2050.</li> <li>The projections indicate a decreasing rate in the growth of low carbon sources of energy from 7% in the period 2010–2015 to 3.6% in the period 2045–2050.</li> <li>There is an increasing political will in some EU member states (e.g. Spain, Germany, France, the Netherlands) to accelerate the development of renewables.</li> <li>While the capacity increased, partly due to the decreasing unit costs, overall investment in renewables decreased in the EU in 2017 to the lowest level since 2006 (BNEF, 2018).</li> <li>Achievement of the recently-adopted target of 32% share of renewable energy requires increasing the share of renewable power in the EU to around 55% in 2030.</li> <li>While some EU countries have significantly increased the share of renewables, with Denmark the global leader in integrating variable renewable energy most EU countries need to accelerate action to prepare the power sector for significantly larger share of renewables.</li> </ul>	 <b>Partially Transitioned</b>
	<p>No new coal plants, reduce emissions from coal power by at least 30% by 2025</p>	<ul style="list-style-type: none"> <li>There are 288 coal-fired power plants in the EU, with combined installed capacity of around 150 GW. Germany and Poland concentrate 50% of the installed capacity, with Poland still planning to increase coal capacity.</li> <li>Many member states have a coal-free electricity mix and nine member states—Austria, Denmark, France, Finland, Italy, Portugal, Sweden, the Netherlands and United Kingdom—accounting for 26% of EU coal capacity—have announced phase out dates for coal ahead of 2030. The German government is expected to decide on a phase-out date by end of 2018, and the Spanish government is also discussing phasing out coal.</li> <li>According to current projections share of electricity from coal is set to decrease from 26% in 2015 to 19.1% in 2025 and 6.2% in 2050 (European Commission, 2016g)</li> <li>For a Paris Agreement-compatible pathway coal would need to be phased-out by 2030. Therefore, early retirement of current capacity and cancellation of planned capacity is required.</li> </ul>	 <b>Picking Up Speed</b>

Sector	1.5 °C-consistent benchmark	Overall evaluation based on policy activity and gap analysis	Policy rating
 <p data-bbox="204 510 316 622">Passenger road and rail transport</p>	<p data-bbox="347 474 523 555">Last fossil fuel car sold before 2035</p>	<ul data-bbox="555 273 1209 757" style="list-style-type: none"> <li>• In the mid-2030s the EU is projected to be a global leader in terms of the share of electric vehicles, expected to reach around 68% of newly-sold cars in 2040.</li> <li>• Ambitious goals to phase out combustion cars introduced in some member states (e.g. Netherlands by 2030, the United Kingdom and France by 2040).</li> <li>• Legislation introducing obligation to install charging stations in all new and refurbished buildings with more than 10 parking spaces.</li> <li>• Increasing share of electric cars in new registrations, from 1.2% in 2015, 1.3% in 2016 to 1.7% in 2017 and projected 2.4% in 2018.</li> <li>• Inter-institutional negotiations on the adoption of stricter emissions standards for passenger cars and vans for 2030 that would also include quotas for the share of low carbon vehicles.</li> </ul>	
 <p data-bbox="204 1093 316 1146">Residential buildings</p>	<p data-bbox="347 900 523 1048">All new buildings fossil free and near zero energy by 2020</p>	<ul data-bbox="555 779 1209 1169" style="list-style-type: none"> <li>• Emissions from residential buildings are projected to decrease by 25% and 33% by 2030 and 2050 respectively below 2005 levels. Emissions from non-residential buildings are projected to decrease by 33% and 43%, respectively.</li> <li>• Legislation facilitating an increase in energy efficiency in the building sector (Energy Performance of Buildings Directive (EPBD), Energy Efficiency Directive, and Renewable Energy Directive) is in place.</li> <li>• Adoption of a requirement for all new buildings to be near-zero emissions buildings (NZEBs) by the end of 2020. A clear definition of the NZEBs is lacking—the specification was left to the member states.</li> </ul>	
	<p data-bbox="347 1205 523 1339">Increase building renovation rates from &lt;1% to 5% by 2020</p>	<ul data-bbox="555 1236 1209 1303" style="list-style-type: none"> <li>• Most estimates of current renovation rates for the EU are between 0.5% and 2.5% of the building stock/year.</li> </ul>	

## Co-benefits of upscaled climate action: employment in the electricity sector

Accelerated climate action in the European Union can generate significant socio-economic co-benefits. Decreasing reliance on—largely imported—fossil fuels will increase the EU's energy security and reduce cost of energy imports.

With over 400,000 Europeans dying prematurely annually due to air pollution, electrification of transport, higher energy efficiency of the residential buildings and coal-phase out will significantly improve air quality. Ambitious long-term emissions reduction goals will provide European companies with the necessary investment security and domestic market for their products, which can lead to development of new branches of industries, thus contributing to economic growth.

**This study's quantification of employment impacts for several electricity supply sector scenarios up to 2030 indicates that scaling up climate change action through increasing renewable energy shares in the electricity sector would also yield substantial employment benefits for the EU.**

In all analysed scenarios, the total number of direct jobs in the electricity sector from 2020 throughout 2030 is higher than the estimated total jobs under a reference scenario, with additional jobs created in renewable energy sectors outweighing job losses in fossil-fuel based electricity generation.

**ELECTRICITY SECTOR  
COMPARISON OF AVERAGE EMPLOYMENT (TOTAL AND NET IMPACT) BETWEEN SCENARIOS**

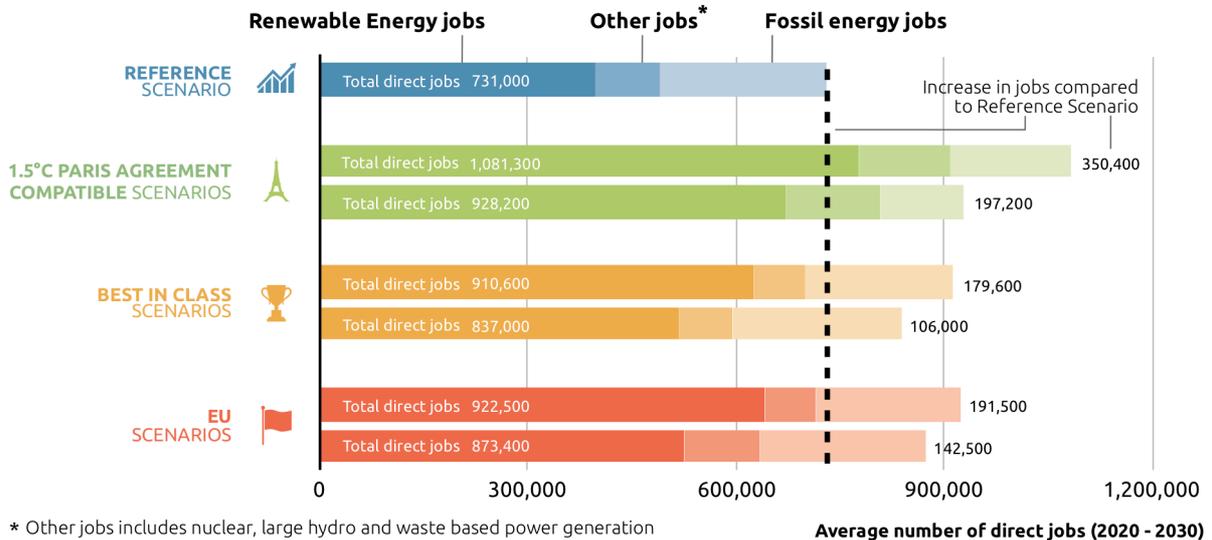


Figure 5: Average employment (total direct jobs) in the electricity sector for different scenarios analysed in this study, in period 2020-2030. The respective net direct employment impact compared to the reference scenario is also shown for each analysed scenario.

**The most ambitious scenario in terms of emissions reductions also yields the highest employment benefits over time.**

In the most ambitious climate policy scenario—the '1.5°C Paris Agreement compatible' ambitious end pathway—we estimate about 370,000 more direct jobs in 2025 and about 270,000 more direct jobs in 2030 in electricity generation than in the reference scenario. This number would be much higher if indirect jobs were taken into consideration.

For power generation from renewable energy (RE) (excluding large-scale hydro), we estimate almost 400,000 (in 2025) and about 375,000 (in 2030) more direct jobs than under reference scenario, far outweighing job losses in fossil-based technologies. In 2025, the estimated direct job creation in renewable energy is six times higher than the reduction in fossil-based jobs for the same year compared to the reference scenario.



## ELECTRICITY SECTOR

### TOTAL DIRECT JOBS PER SECTOR AND TECHNOLOGY

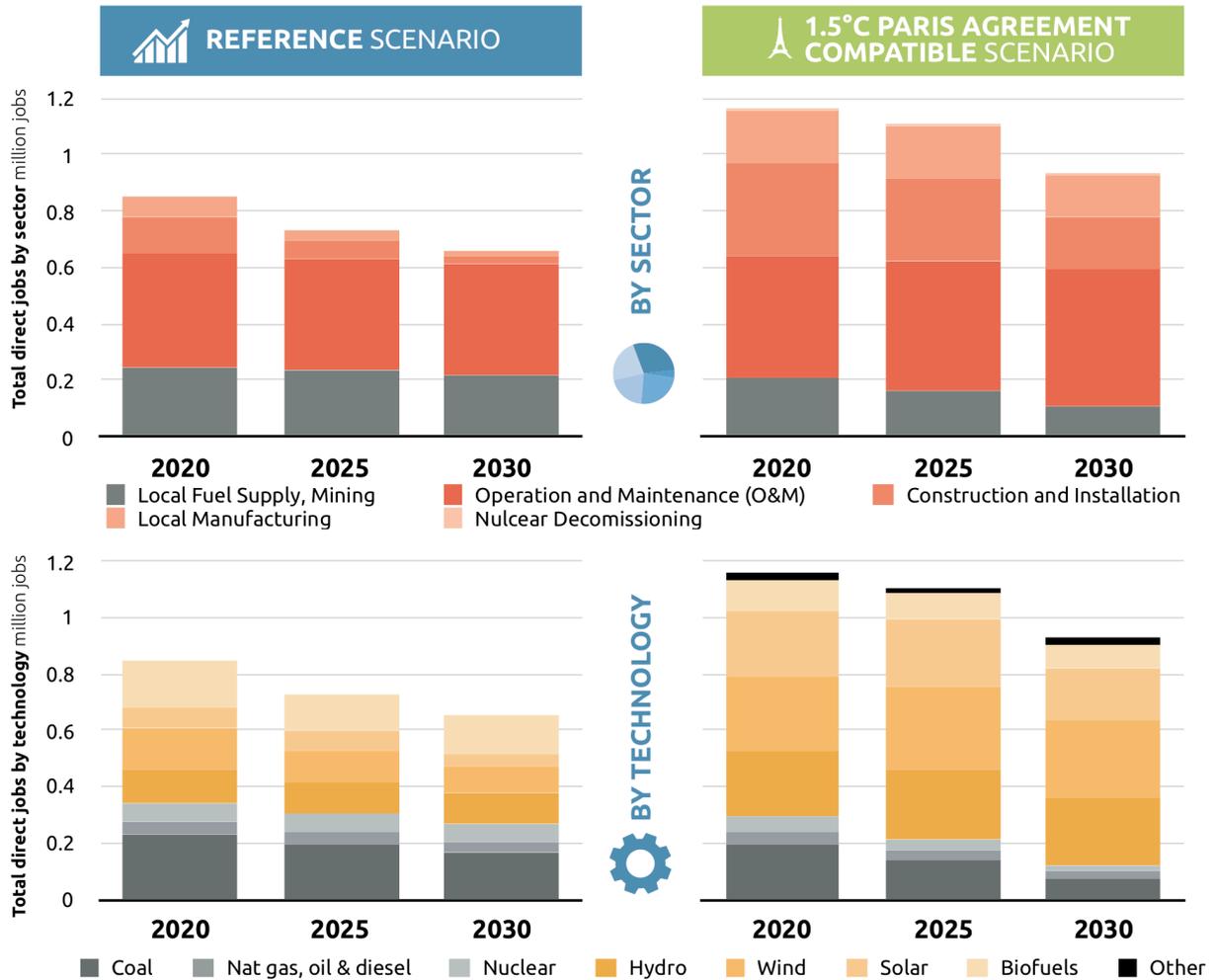


Figure 6: Total direct jobs per employment sector and total direct jobs per generation technology for the reference scenario (graphs on left) and the 1.5°C Paris Agreement compatible scenario (graphs on right) for the EU electricity supply sector. Note: 'other' comprises geothermal, marine and waste.

The benefits in job creation due to climate policy also depend on the choice of technologies to achieve decarbonisation. Wind and solar energy play an important role in both successful decarbonisation and in job creation. The construction and installation of renewable energy facilities is an important driver for job creation in the EU.

Scenarios with a stronger reliance on natural gas or nuclear power create fewer jobs than scenarios that are more ambitious in terms of building up new renewable energy capacities, especially in solar and wind energy, as manufacturing as well as construction and installation of renewable energy facilities is generally more job intensive.

While the number of *local* jobs depends on the share of local manufacturing and bioenergy supply, a sensitivity analysis shows that the employment impact would still remain substantial for lower local shares. At the same time, this also illustrates that measures supporting local expertise and skills for manufacturing and the development of a local manufacturing value chain could support the transition away from coal and the generation of local high quality jobs in the renewable energy sector. The distributed character of renewables may be expected to enhance the impact on the creation of local jobs, especially in rural areas.

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The Climate Action Tracker (CAT) is an independent scientific analysis produced by three research organisations tracking climate action since 2009. We track progress towards the globally agreed aim of holding warming well below 2°C, and pursuing efforts to limit warming to 1.5°C.

[climateactiontracker.org](http://climateactiontracker.org)

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