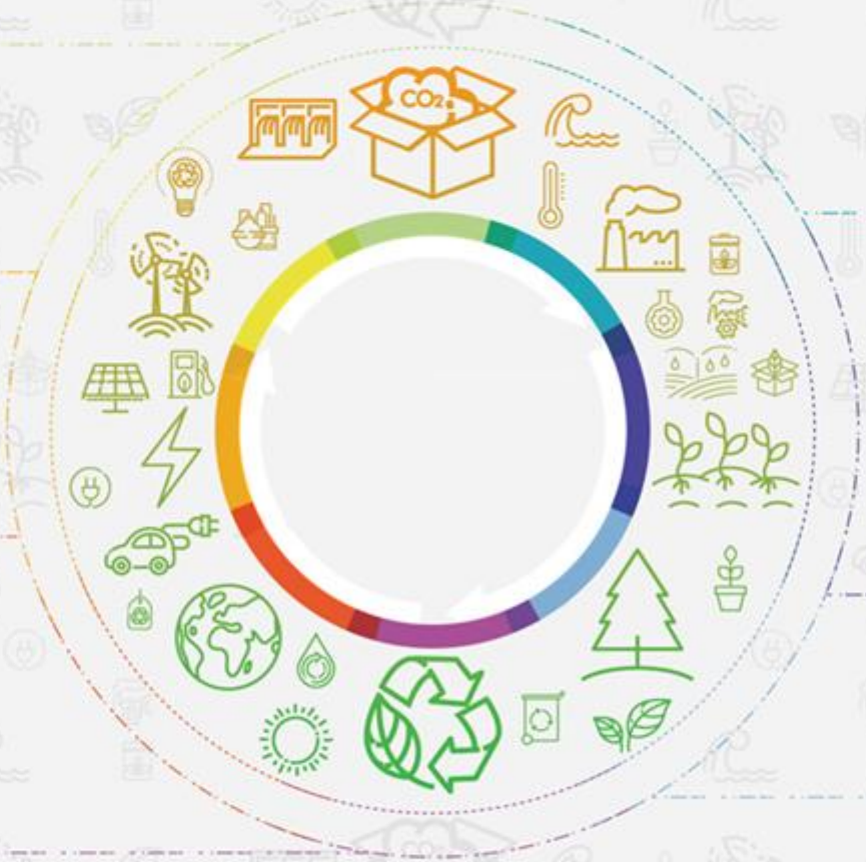
European Commission

A Clean Planet for all

A European strategic long term vision for a prosperous, modern, competitive and climate neutral economy



Riga, 4 June 2019
Artur RUNGE-METZGER, Director, European Commission

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Climate challenges

- Global warming already reached at 1°C
- 18 of the warmest years in the last 2 decades and extreme heat waves in EU for 4 of the last 5 years
- Real impact on EU economy & environment
- IPCC warns about global eco-systems in danger already at 2°C
- Climate change undermines security and prosperity in the broadest sense

Arctic region
Temperature rise much larger than global average
Decrease in Arctic sea ice coverage
Decrease in Greenland ice sheet
Decrease in permafrost areas
Increasing risk of biodiversity loss
Some new opportunities for the exploitation of natural resources and for sea transportation
Risks to the livelihoods of indigenous peoples

Coastal zones and regional seas
Sea level rise
Increase in sea surface temperatures
Increase in ocean acidity
Northward migration of marine species
Risks and some opportunities for fisheries
Changes in phytoplankton communities
Increasing number of marine dead zones
Increasing risk of water-borne diseases

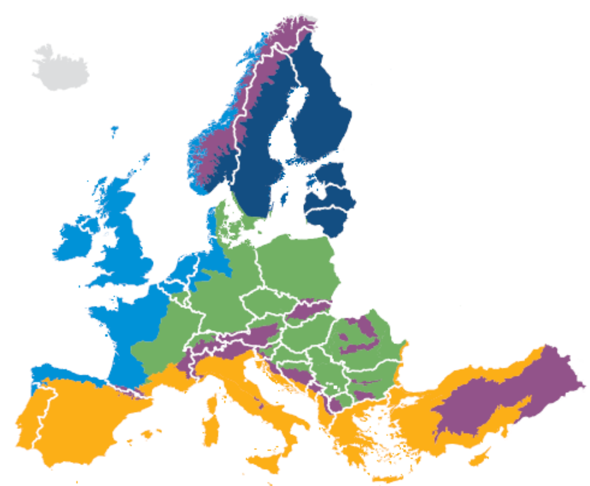
Mediterranean region
Large increase in heat extremes
Decrease in precipitation and river flow
Increasing risk of droughts
Increasing risk of biodiversity loss
Increasing risk of forest fires
Increased competition between different water users
Increasing water demand for agriculture
Decrease in crop yields
Increasing risks for livestock production
Increase in mortality from heat waves
Expansion of habitats for southern disease vectors
Decreasing potential for energy production
Increase in energy demand for cooling
Decrease in summer tourism and potential increase in other seasons
Increase in multiple climatic hazards
Most economic sectors negatively affected
High vulnerability to spillover effects of climate change from outside Europe

Atlantic region
Increase in heavy precipitation events
Increase in river flow
Increasing risk of river and coastal flooding
Increasing damage risk from winter storms
Decrease in energy demand for heating
Increase in multiple climatic hazards

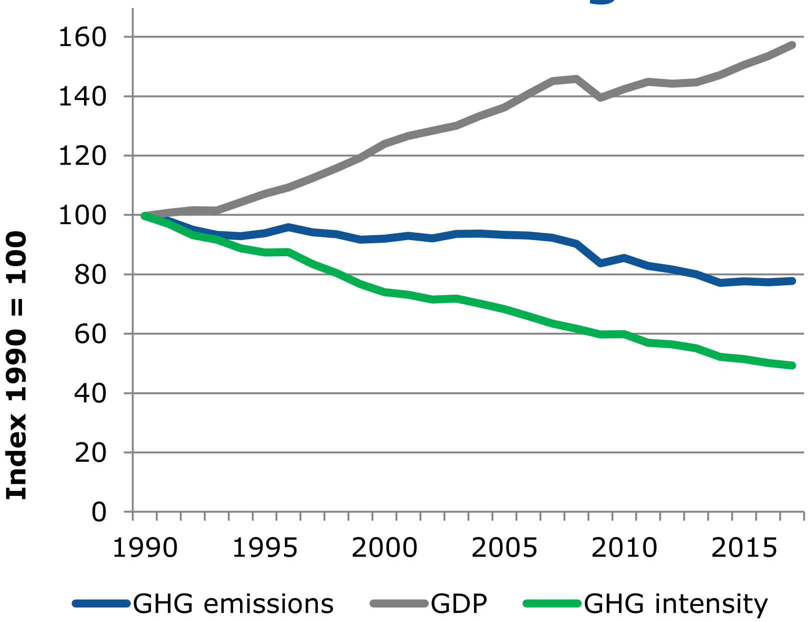
Boreal region
Increase in heavy precipitation events
Decrease in snow, lake and river ice cover
Increase in precipitation and river flows
Increasing potential for forest growth and increasing risk of forest pests
Increasing damage risk from winter storms
Increase in crop yields
Decrease in energy demand for heating
Increase in hydropower potential
Increase in summer tourism

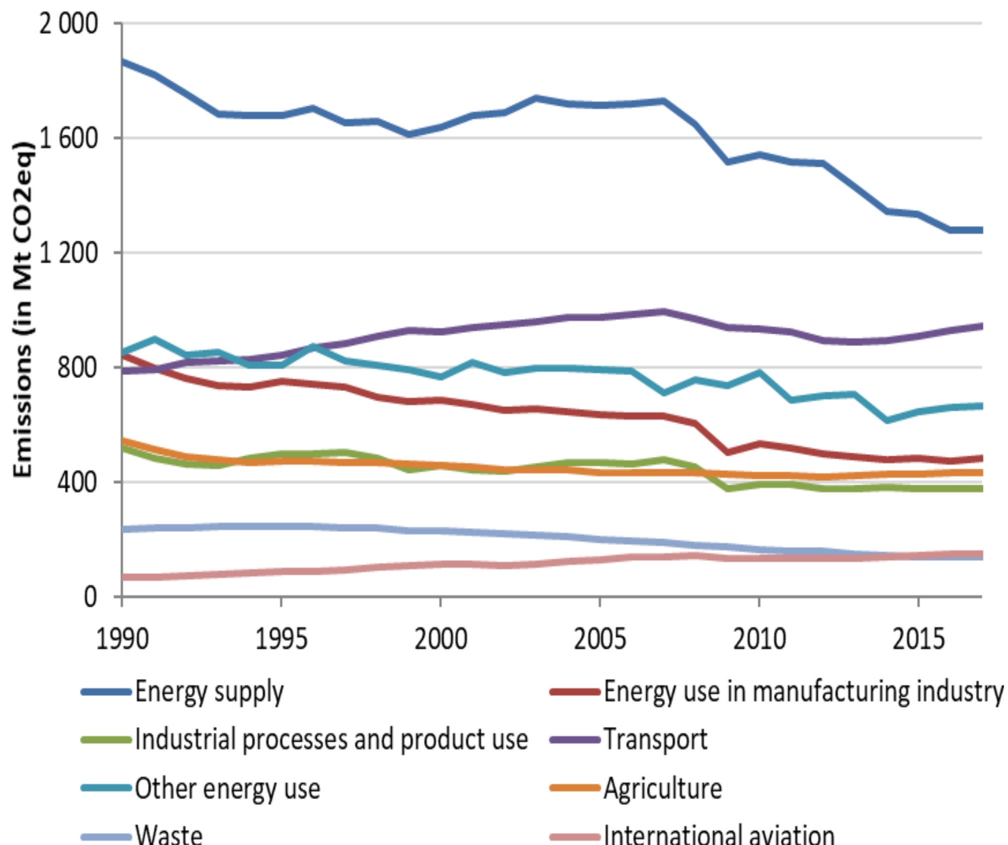
Mountain regions
Temperature rise larger than European average
Decrease in glacier extent and volume
Upward shift of plant and animal species
High risk of species extinctions
Increasing risk of forest pests
Increasing risk from rock falls and landslides
Changes in hydropower potential
Decrease in ski tourism

Continental region
Increase in heat extremes
Decrease in summer precipitation
Increasing risk of river floods
Increasing risk of forest fires
Decrease in economic value of forests
Increase in energy demand for cooling



Europe since 1990: Growing its economy and reducing its greenhouse gas emissions





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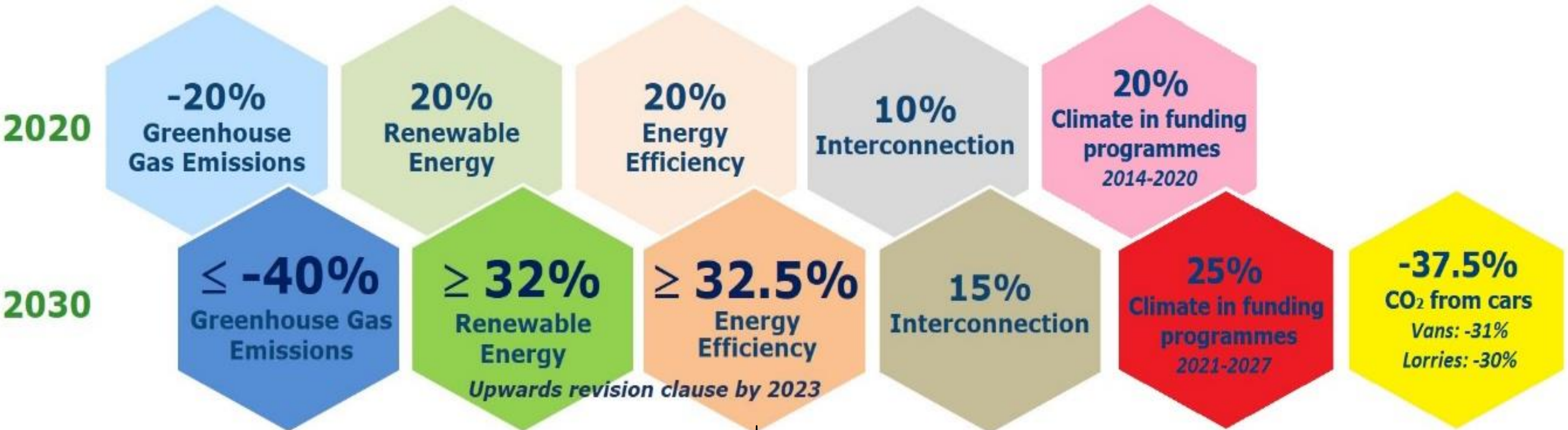
2030 Energy Union: key legislative framework implementing its Paris Agreement pledge enacted

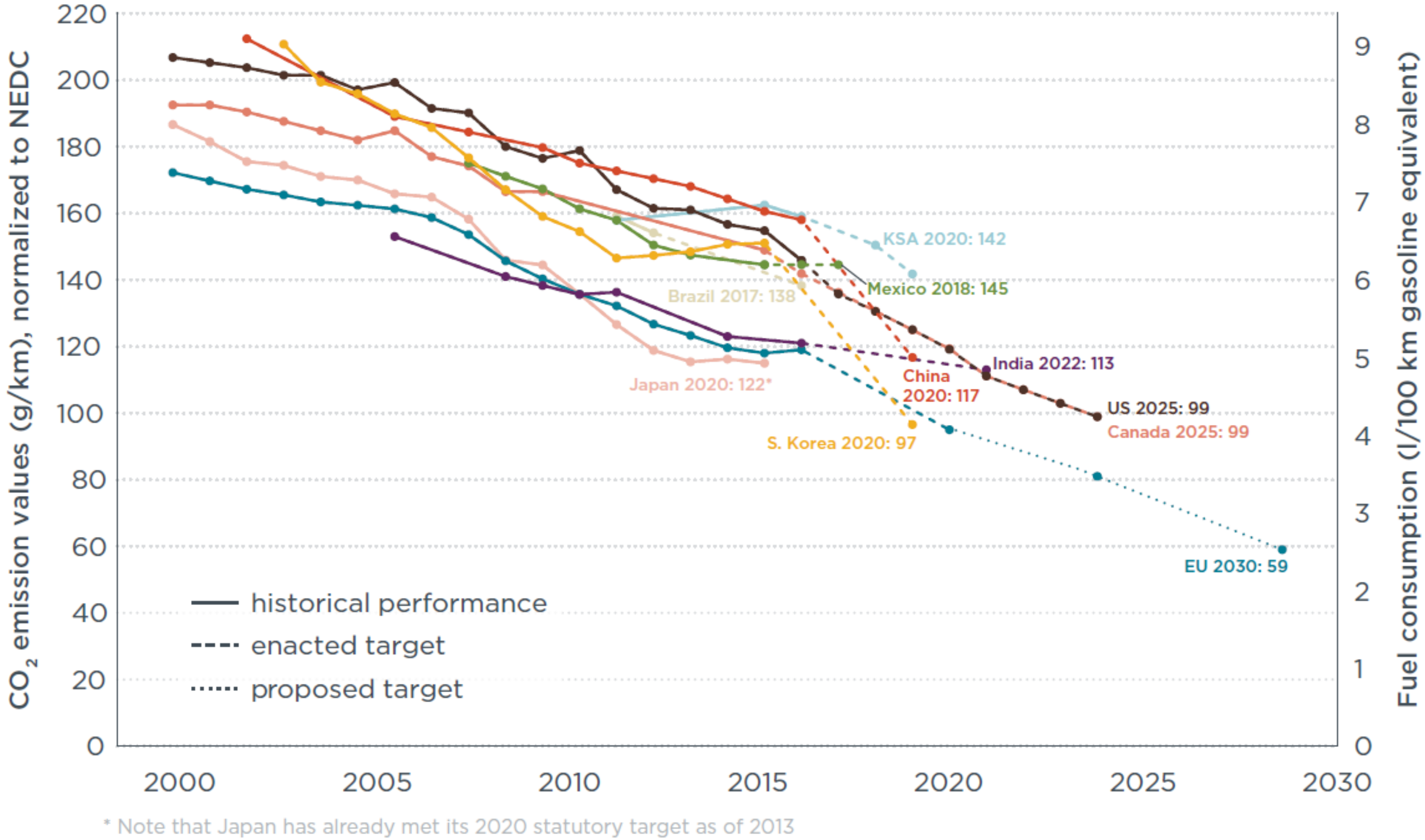


- EE Directive
- Buildings
- Ecodesign

Energy Union Governance

Climate Action

Reaching the 2030 objectives: Putting the EU ahead of the game, e.g. vehicle efficiency standards



Source: ICCT, 2019

Climate Action

Vision 2050:
IPCC pathways to global net zero CO_2 by 2050

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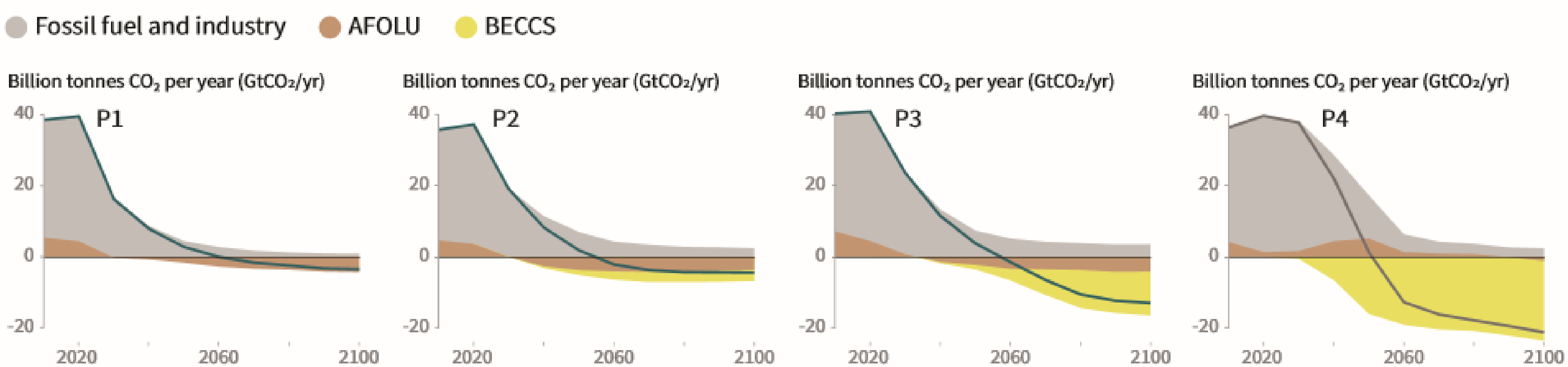
Breakdown of contributions to global net CO_2 emissions in four illustrative model pathways



P1: A scenario in which social, business and technological innovations result in lower energy demand up to 2050 while living standards rise, especially in the global South. A downsized energy system enables rapid decarbonization of energy supply. Afforestation is the only CDR option considered; neither fossil fuels with CCS nor BECCS are used.

P2: A scenario with a broad focus on sustainability including energy intensity, human development, economic convergence and international cooperation, as well as shifts towards sustainable and healthy consumption patterns, low-carbon technology innovation, and well-managed land systems with limited societal acceptability for BECCS.

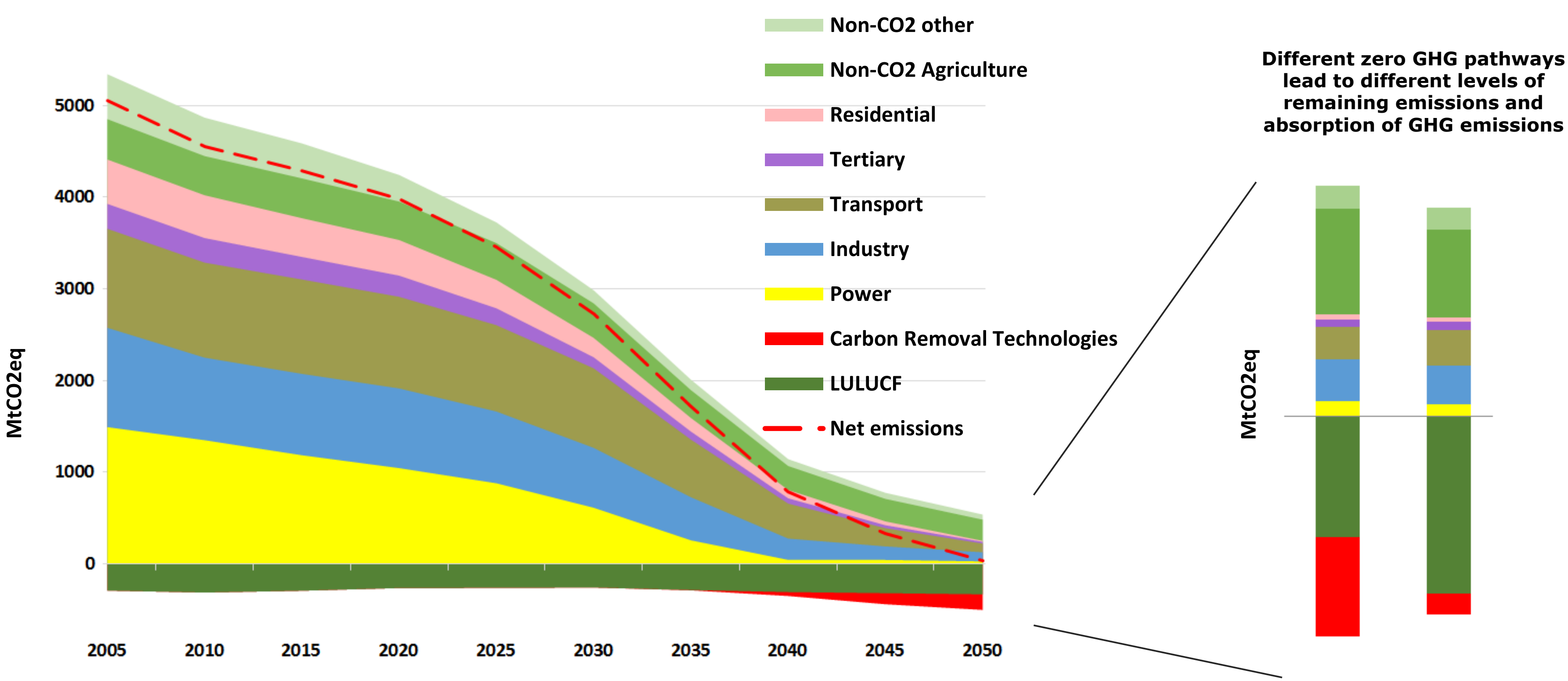
P3: A middle-of-the-road scenario in which societal as well as technological development follows historical patterns. Emissions reductions are mainly achieved by changing the way in which energy and products are produced, and to a lesser degree by reductions in demand.

P4: A resource- and energy-intensive scenario in which economic growth and globalization lead to widespread adoption of greenhouse-gas-intensive lifestyles, including high demand for transportation fuels and livestock products. Emissions reductions are mainly achieved through technological means, making strong use of CDR through the deployment of BECCS.

Source: IPCC Special Report on 1.5 degrees, 2018

Vision for a Clean Planet by 2050

There are a number of pathways for achieving a climate neutral EU, challenging but feasible from a technological, economic, environmental and social perspectives.



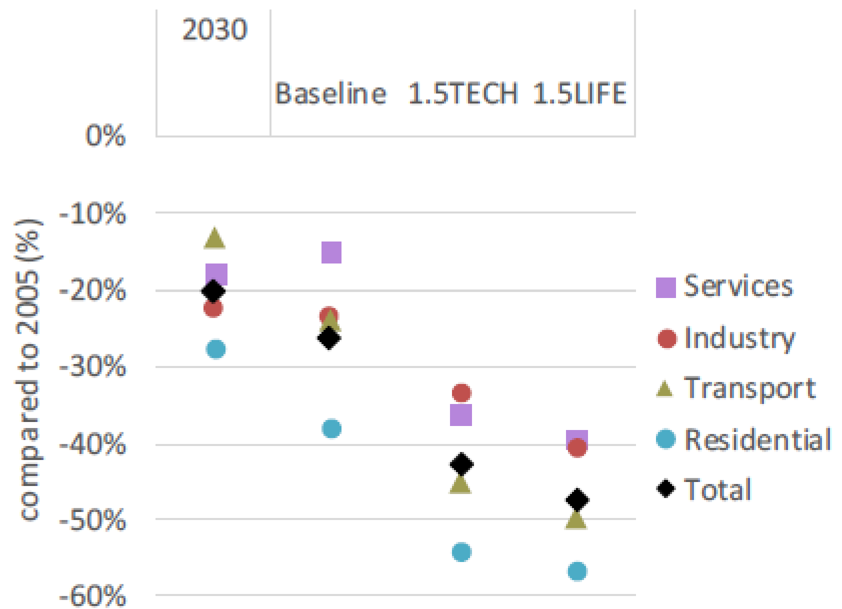
7 Building Blocks

1. Energy efficiency
2. Deployments of renewables
3. Clean, safe & connected mobility
4. Competitive industry and circular economy
5. Infrastructure and inter-connections
6. Bio-economy and natural carbon sinks
7. Tackle remaining emissions with carbon capture and storage

Building Block 1 - Energy efficiency

- Will play a central role
- Energy consumption to be reduced by as much as half in 2050 compared to 2005
- Buildings key, most of the housing stock of 2050 exists already today
- Requires adequate financial instruments and skilled workforce to sustain significantly higher renovation rates

Changes in sectoral final energy consumption (% change vs 2005)

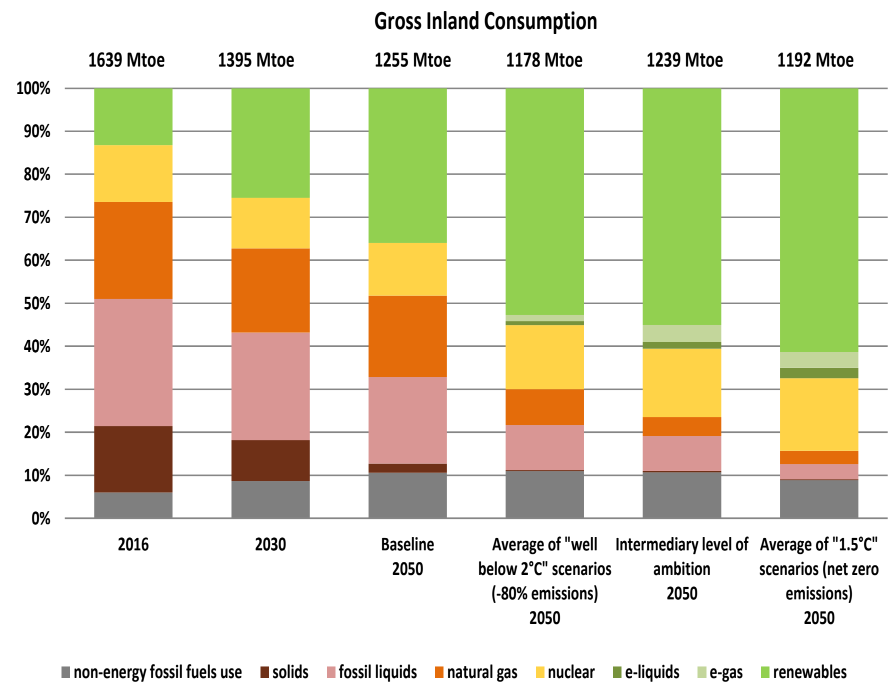


Note: "Services" includes here the agriculture sector.

Source: Eurostat (2005), PRIMES.

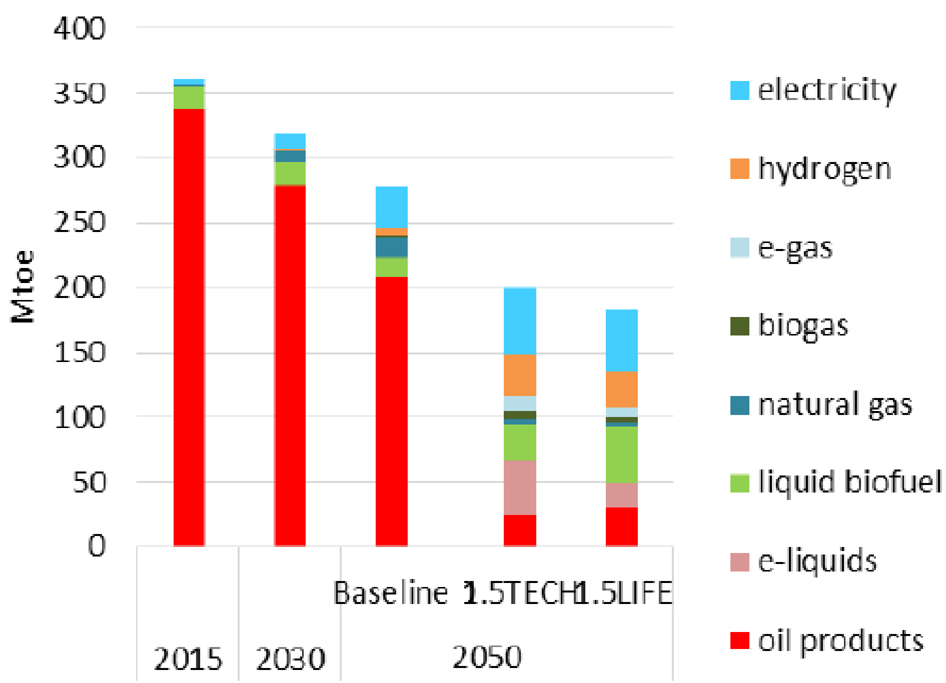
Building Block 2 - Deployment of renewables

- The share of electricity in final energy demand will at least double, more than 80% of it will be renewable.
- Renewable electricity allows production and deployment of carbon- free energy carriers such as hydrogen and e-fuels to decarbonize heating, transport and industry.
- Decentralized, smart and flexible power system.
- Reduction of energy import dependence, cumulative savings from reduced import bill of € 2-3 trillion over the period 2031-2050.



Building Block 3 - Clean, safe & connected mobility

Fuels consumed in the transport sector in 2050



Source: PRIMES.

- Cheaper, efficient and sustainable **batteries**, highly efficient electric powertrains, connectivity and autonomous driving offers prospects to decarbonise road transport.
- No single silver bullet for all transport modes with alternative fuels having a role in heavy duty or long distance transport modes (advanced biofuels, carbon-free e-fuels, hydrogen).
- Digitalisation, data sharing and interoperable standards leading to a more efficient mobility system.
- Innovative mobility for urban areas and smart cities, underpinned by changing behaviour, leading to improvement of quality of life.

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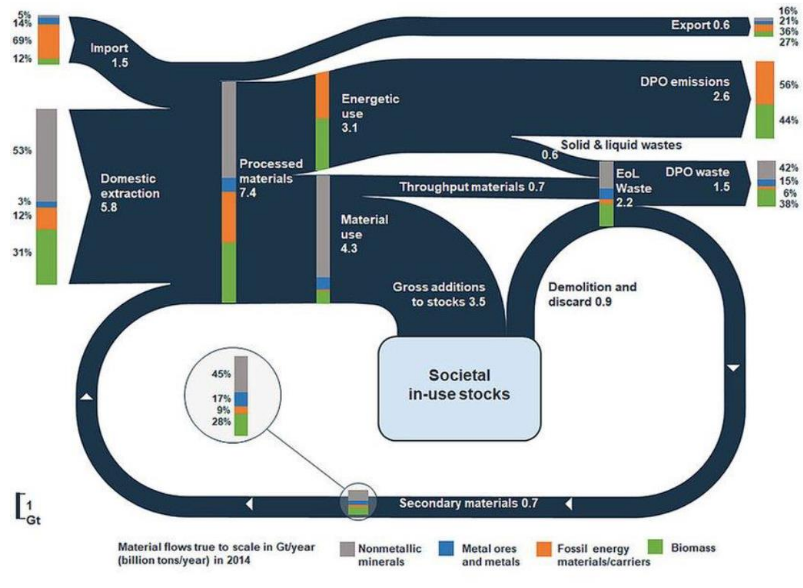
Building Block 4 - Competitive industry

- Competitive resource-efficient industry and circular economy, increased recovery and recycling of **raw materials (including critical materials)**, new materials and business concepts.
- Electrification, energy efficiency, hydrogen, biomass and renewable synthetic gas to reduce energy emissions in the production of industrial goods.

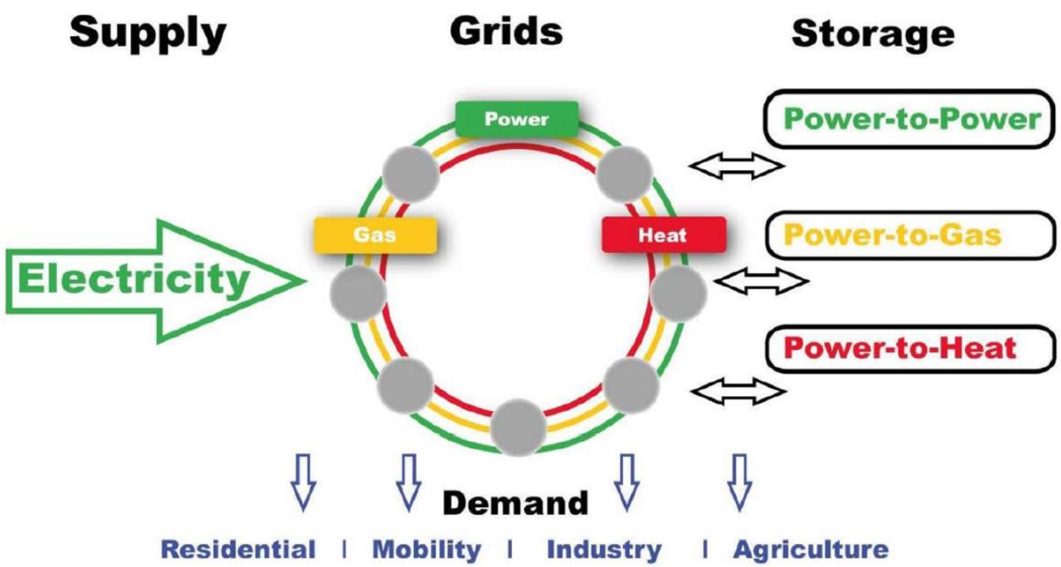


Source: Mayer et al (2018)[830].

- Process-related reductions more difficult. Biomass and **hydrogen** can reduce certain emissions (steel production, some chemicals), others will require CO_2 to be captured and stored or used.
- In the next 10 to 15 years, technologies that are already known will need to demonstrate that they can work at scale.

Building Block 5 - Network infrastructure

- Integrated and interconnected smart infrastructure.
- Completion of the Trans-European Transport and Energy Networks.
- Smart electricity and data/information grids, hydrogen pipelines, further sector integration.

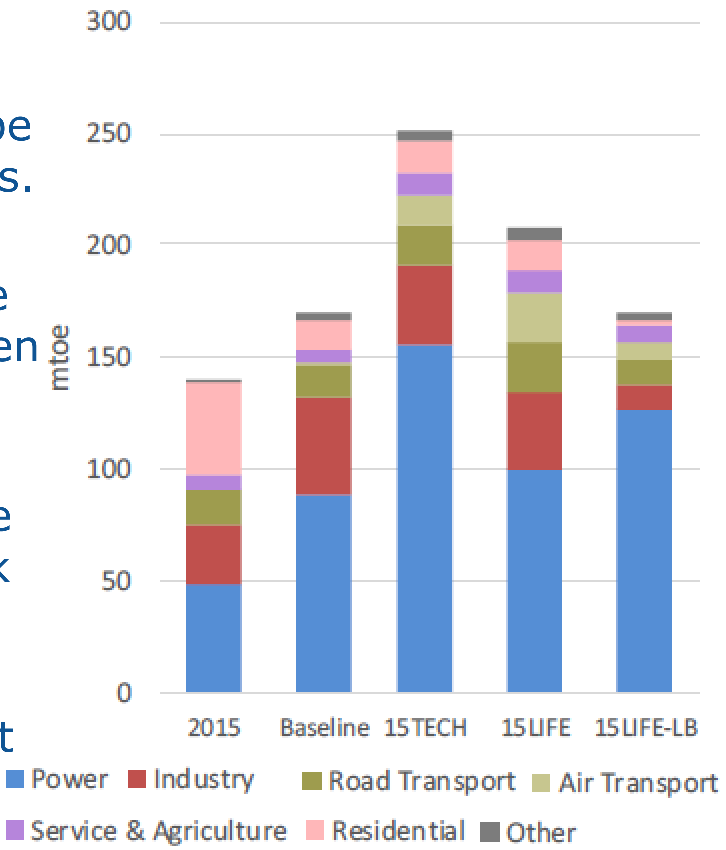


- Smart charging or refuelling stations for transport. Increased synergy between transport and energy systems.
- Retrofitting existing infrastructure and assets and timely replacement of ageing infrastructure compatible with the deep decarbonisation objective.

Building Block 6 - Bio-economy

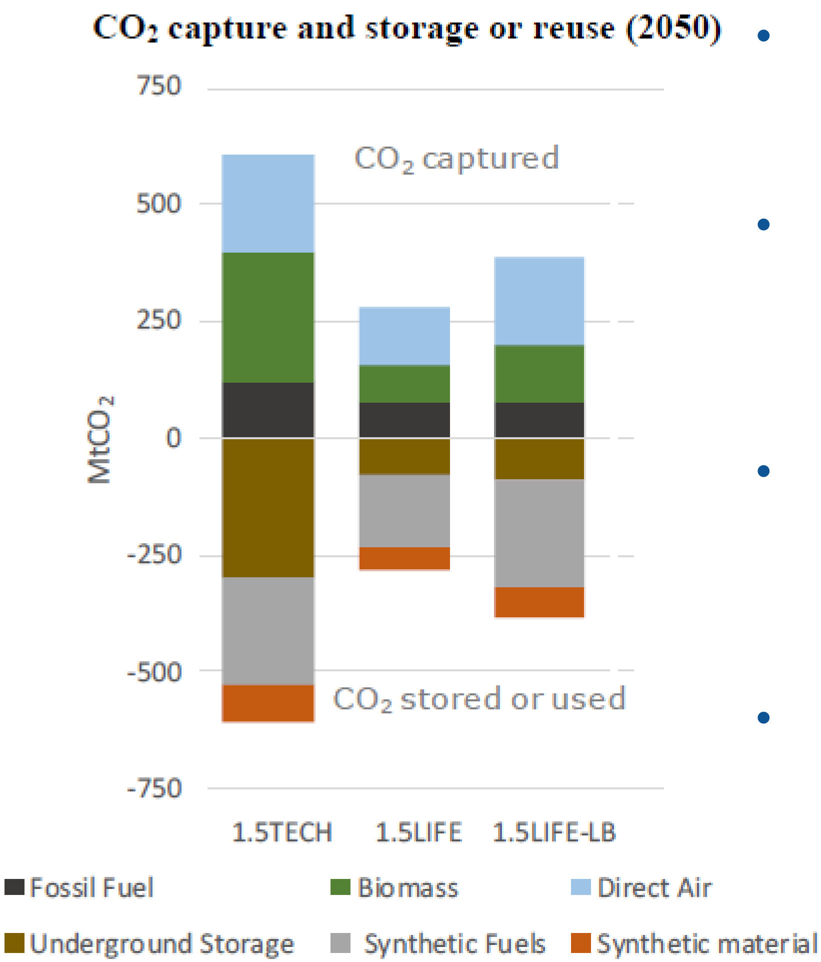
- Agriculture to provide sufficient food, feed and fibre. Agricultural non-CO_2 emissions can be reduced (but not to zero) and soil carbon can be increased through improved farming techniques.
- Biomass is multipurpose: supply direct heat, biogas, biofuels, alternative to carbon intensive materials and generate negative emissions when coupled with carbon capture and storage; therefore increased demand (up to 80%).
- Key role of energy crops to avoid unsustainable use of forests, maintain the natural carbon sink while preserving ecosystems.
- Natural carbon sink can be enhanced through afforestation and restoration of degraded forest lands and other ecosystems (benefiting biodiversity, soils and water resources and increase biomass availability over time).

Use of bioenergy by sectors and by scenario in 2050



Source: PRIMES.

Building Block 7 - Carbon Capture and Storage



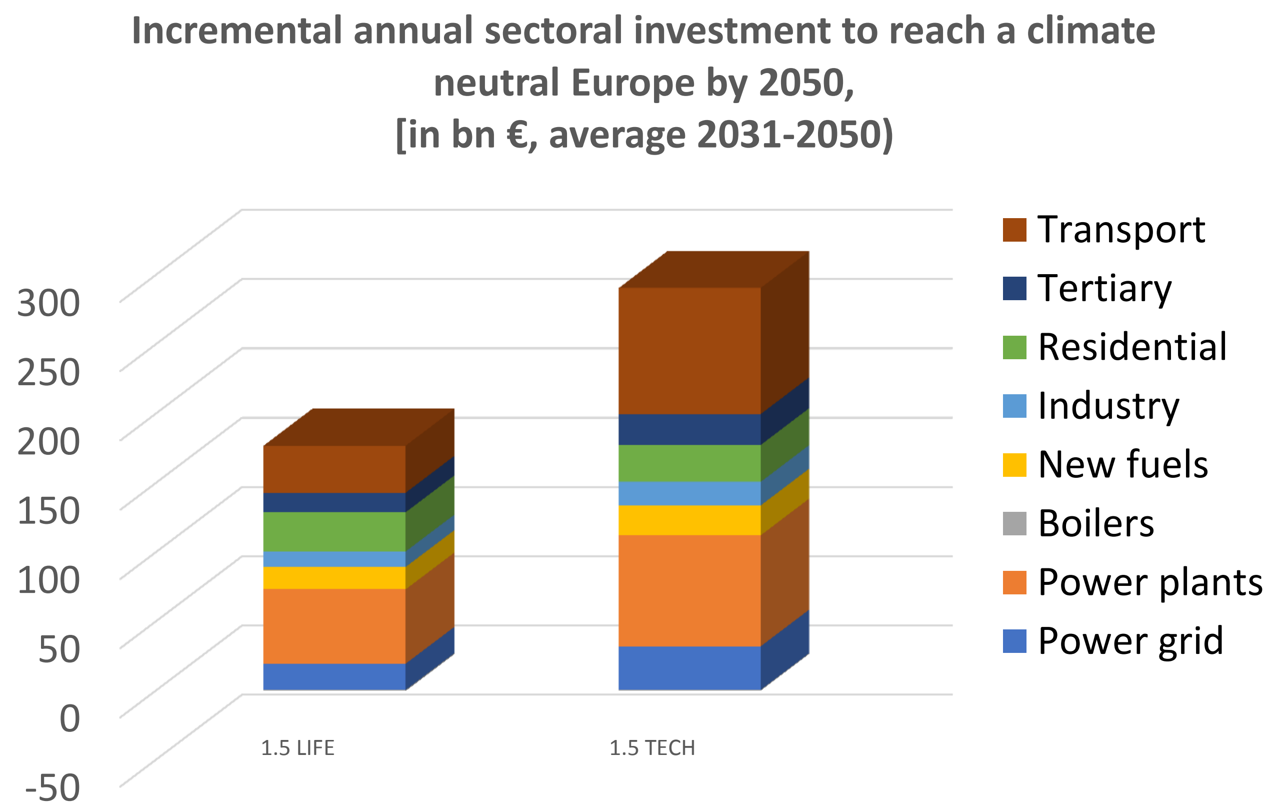
Source: PRIMES.

- Rapid deployment of renewable energy and new options to decarbonize industry reduced the need for CCS.
- But to achieve net-zero greenhouse gas emissions, CCS still required for certain energy-intensive industries and eventually to generate negative emissions.
- CCS today is facing barriers: lack of demonstration plant and proof of economic viability, regulatory barriers in some MS, public acceptance.
- An enabling framework is needed to spur research and innovation, scale up private investments, provide the right signals to the markets and reassure public opinion.

Stimulating clean investment into the EU economy

- Modernising the EU's economy will stimulate significant additional investment

- From 2% of EU GDP invested in the energy system today to 2.8% to achieve a net-zero greenhouse gas emissions economy



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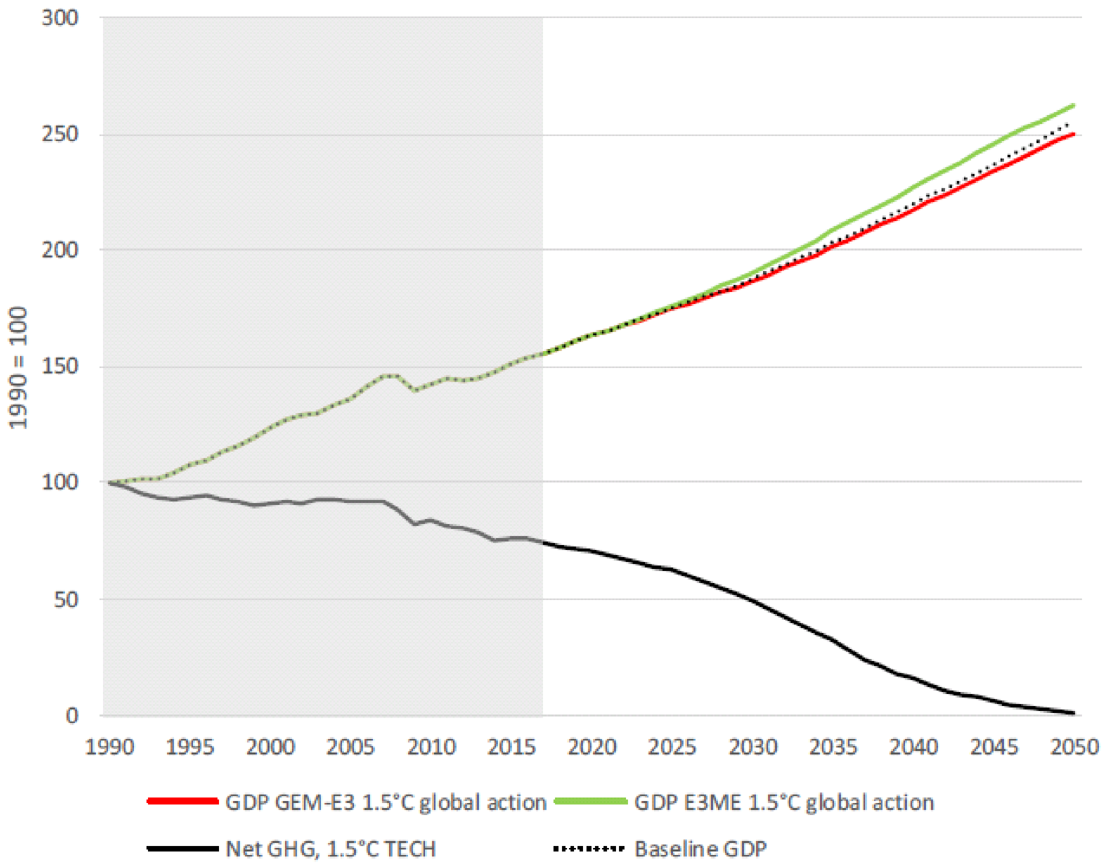
Modernisation with full decoupling of EU GDP growth and emissions by 2050



Sources: PRIMES, ESTAT, JRC-GEM-E3 and E3ME.

- Positive for growth and jobs, with GDP impact up to +2%
- Co-benefits: energy imports down, public health, etc.
- Caveat: This calculation does not take the damages caused by the adverse effects of climate change into account, nor the adaptation costs between baseline and 1.5° C as well as co-benefits of climate action.

Enabling framework crucial to deliver transformation

Taxation
Ensuring an effective pricing of externalities and a fair distribution of transition costs

Industrial Strategy and Circular Economy
Roll out of technologies, strategic value chains and increased circularity

Energy Union and Climate Action
Making the commercial rules fit for the deployment of new technologies in energy, building and mobility

Free but Fair Trade
Working towards a global level playing field for competitiveness

The Social Pillar
Empowering citizens with skills for new business models

EU Budget and Sustainable Finance
Preparing the rollout of key infrastructure and incentivising investments in sustainable business models

Digital Single Market
Creating the digital "operating system" to enable system integration and new business models

Local Action
Accompanying the transformation of regions and economic sectors

Research and Innovation
Identifying key technologies for the transition and accelerating demonstration

Competition Policy and State Aid
Ensure coherence with EU climate and environment goals

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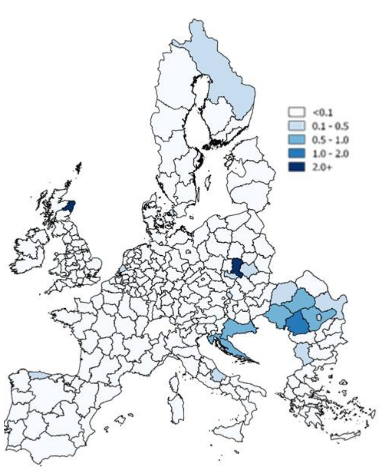
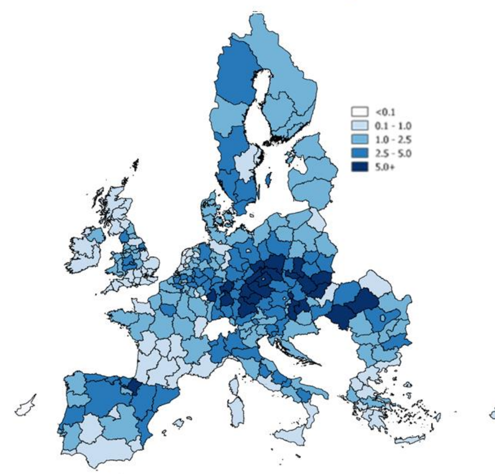
Just transition

- Overall economic impacts of the deep transformation are positive.
- The transition will spur growth in new sectors. 'Green jobs' already represent 4 million jobs in the EU.
- But some sectors will face challenges (e.g. coal mining and fuel extraction) and others will transform (e.g. energy-intensive industries and automotive sector).
- This will affect some regions more than others.
- Modernisation process has to be managed, no-one left behind, EU budget, employment and cohesion policies have a role
- Skill training is key

Share of employment
fossil fuel extraction and mining



Share of employment
Energy Intensive Industries &
Automotive Manufacturing



Role of citizens and local authorities

- Moving towards a net-zero greenhouse gas economy can only be successful with citizens that embrace change, get engaged and experience it as beneficial for their lives and that of their children.
- Increasing willingness of consumers to engage in sustainable activities. Personal lifestyle choices can make a real difference, while improving quality of life.
- Cities are already the laboratories for transformative and sustainable solutions with 75% of our population living in urban areas. City refurbishment and better spatial planning are drivers to renovate houses, improving living conditions, reducing travel time.
- Improved planning and public infrastructure to withstand more extreme weather events will be imperative.
- The EU should capitalise on and expand the role of regions, cities and towns.

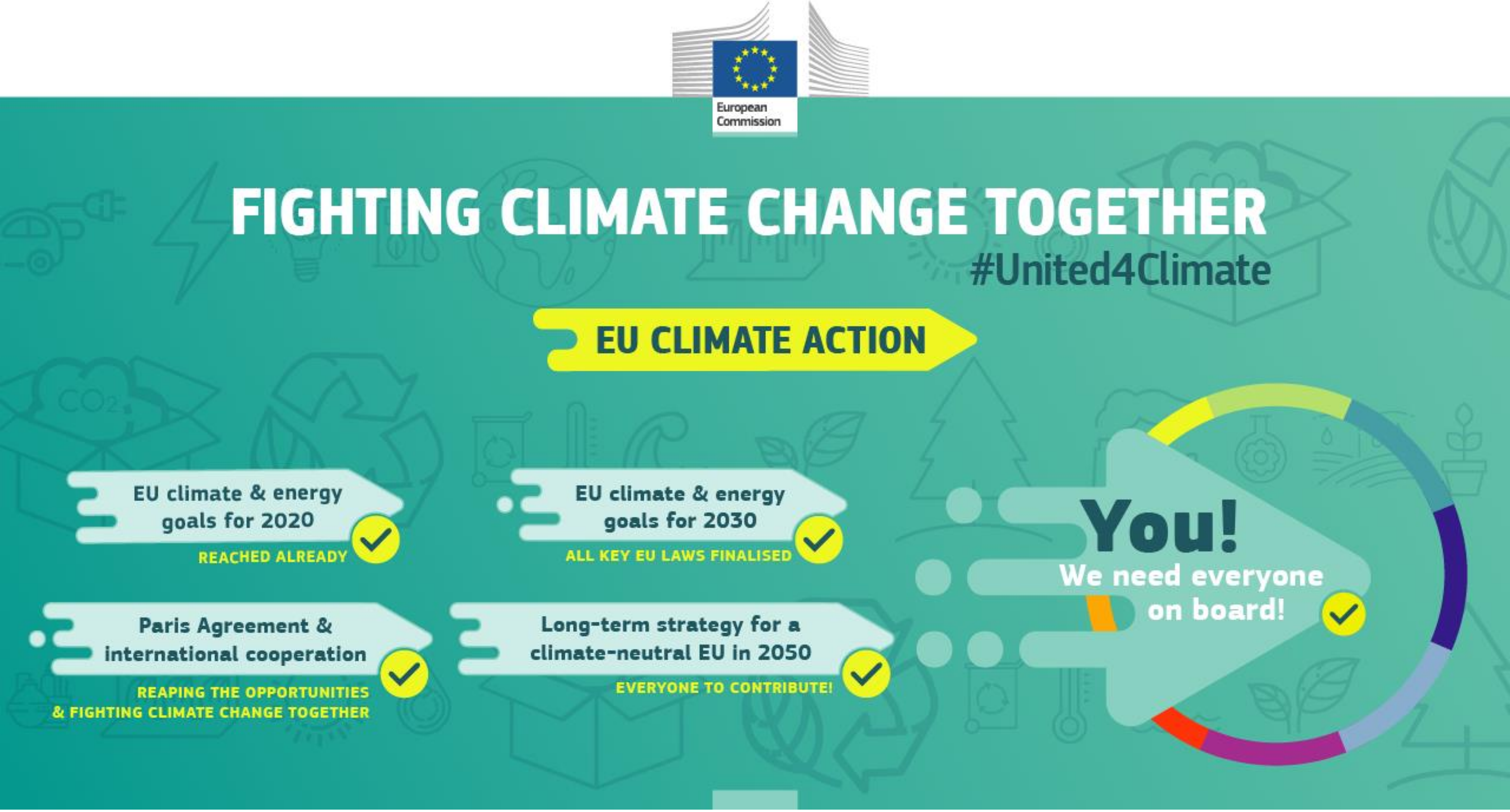
Global dimension

- Open markets, a globalised world and multilateralism are a precondition to benefit from this transition domestically and globally.
- The EU's long-term strategy cannot be pursued in isolation. Role of energy and climate diplomacy and other political dialogues, security and development cooperation
- EU to prepare for geopolitical and geo-economic shifts with new and changed dependencies

Emissions trading schemes under development worldwide

Absolute size, $MtCO_2e$ 2015
Source: ICAP Status Report 2015

- Trade policy to promote uptake of new technologies while defending the right to fair access to markets and critical raw materials.
- EU must take all necessary measures to safeguard and boost its own prospects for economic and social development.
- As the world's largest single market, EU standards on products affect global markets



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https://ec.europa.eu/clima/news/commission-calls-climate-neutral-Europe-2050.en