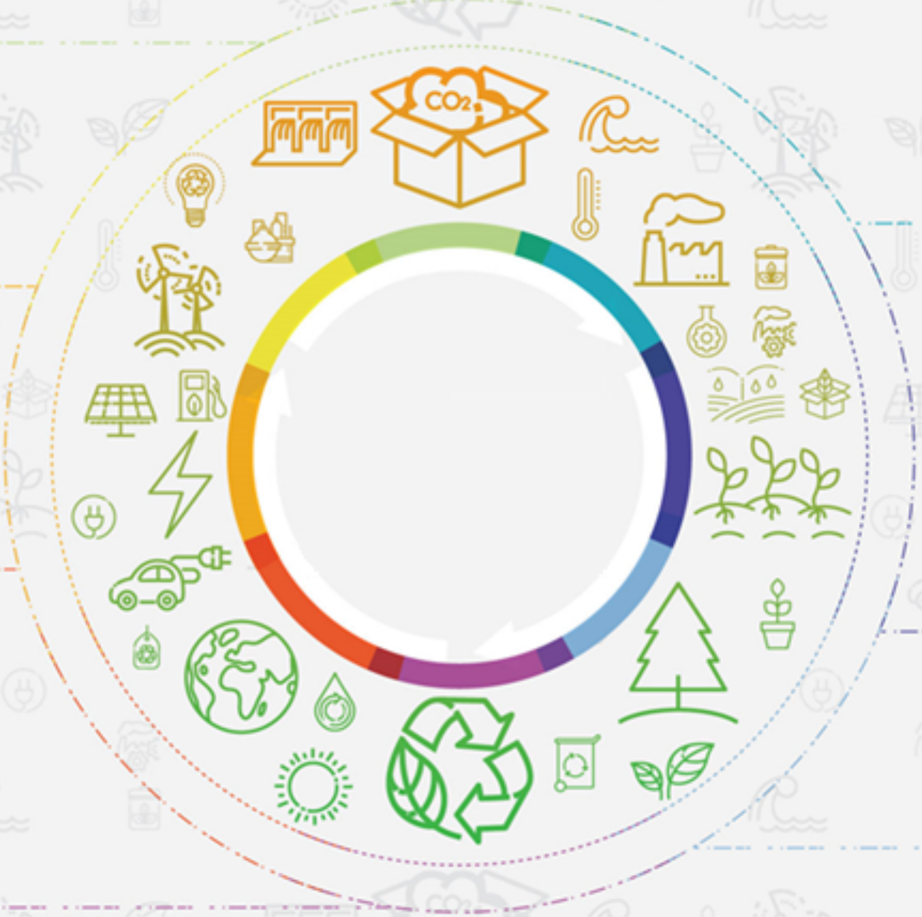
A Clean Planet for all

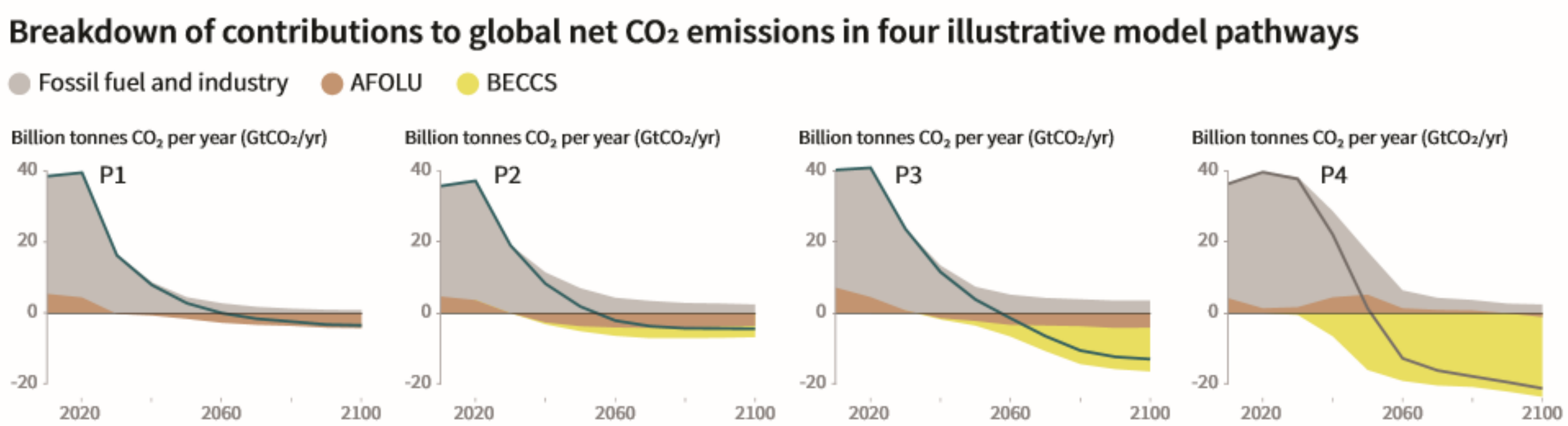
A European strategic long term vision for a prosperous, modern, competitive and climate neutral economy



10th EU ETS Compliance Conference
Brussels 26 November 2019

Cécile Hanoune, DG CLIMA, European Commission

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



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.

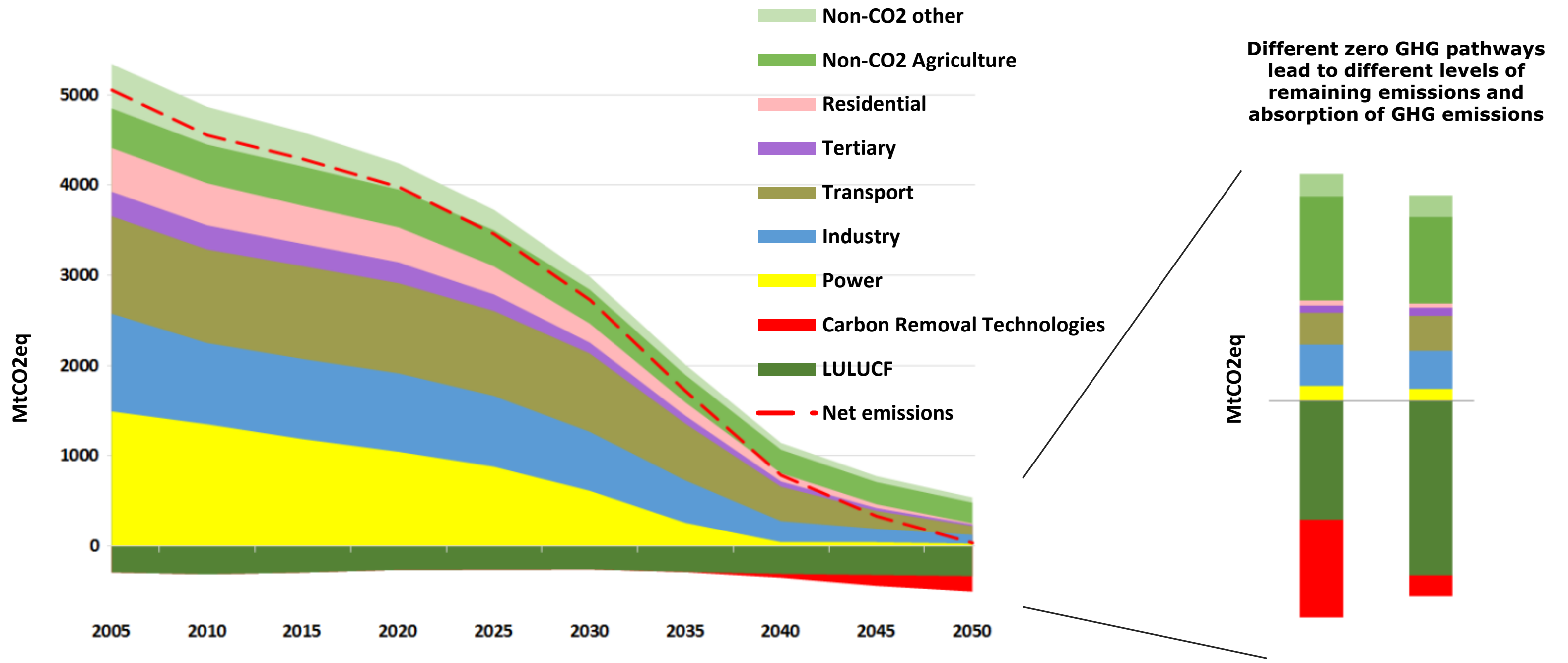
P3: A middle-of-the-road scenario in which societal as well as technological development follows historical patterns. Emissions reductions are mainly achieved by changing the way in which energy and products are produced, and to a lesser degree by reductions in demand.

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.



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Detailed assessment supported by scenario analysis

Long Term Strategy Options

	Electrification (ELEC)	Hydrogen (H2)	Power-to-X (P2X)	Energy Efficiency (EE)	Circular Economy (CIRC)	Combination (COMBO)	1.5°C Technical (1.5TECH)	1.5°C Sustainable Lifestyles (1.5LIFE)
Main Drivers	Electrification in all sectors	Hydrogen in industry, transport and buildings	E-fuels in industry, transport and buildings	Pursuing deep energy efficiency in all sectors	Increased resource and material efficiency	Cost-efficient combination of options from 2°C scenarios	Based on COMBO with more BECCS, CCS	Based on COMBO and CIRC with lifestyle changes
GHG target in 2050	-80% GHG (excluding sinks) ["well below 2°C" ambition]					-90% GHG (incl. sinks)	-100% GHG (incl. sinks) ["1.5°C" ambition]	
Major Common Assumptions	• Higher energy efficiency post 2030 • Deployment of sustainable, advanced biofuels • Moderate circular economy measures • Digitilisation • Market coordination for infrastructure deployment • BECCS present only post-2050 in 2°C scenarios • Significant learning by doing for low carbon technologies • Significant improvements in the efficiency of the transport system.							
Power sector	Power is nearly decarbonised by 2050. Strong penetration of RES facilitated by system optimization (demand-side response, storage, interconnections, role of prosumers). Nuclear still plays a role in the power sector and CCS deployment faces limitations.							
Industry	Electrification of processes	Use of H2 in targeted applications	Use of e-gas in targeted applications	Reducing energy demand via Energy Efficiency	Higher recycling rates, material substitution, circular measures	Combination of most Cost-efficient options from "well below 2°C" scenarios with targeted application (excluding CIRC)	COMBO but stronger	CIRC+COMBO but stronger
Buildings	Increased deployment of heat pumps	Deployment of H2 for heating	Deployment of e-gas for heating	Increased renovation rates and depth	Sustainable buildings			CIRC+COMBO but stronger
Transport sector	Faster electrification for all transport modes	H2 deployment for HDVs and some for LDVs	E-fuels deployment for all modes	Increased modal shift	Mobility as a service			• CIRC+COMBO but stronger • Alternatives to air travel
Other Drivers		H2 in gas distribution grid	E-gas in gas distribution grid				Limited enhancement natural sink	• Dietary changes • Enhancement natural sink

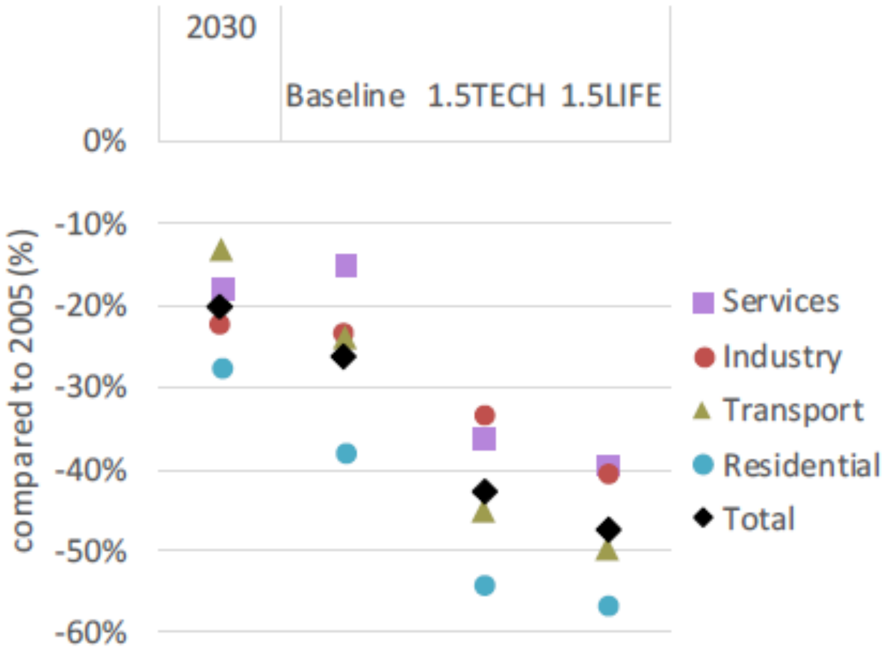
7 Building Blocks

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)

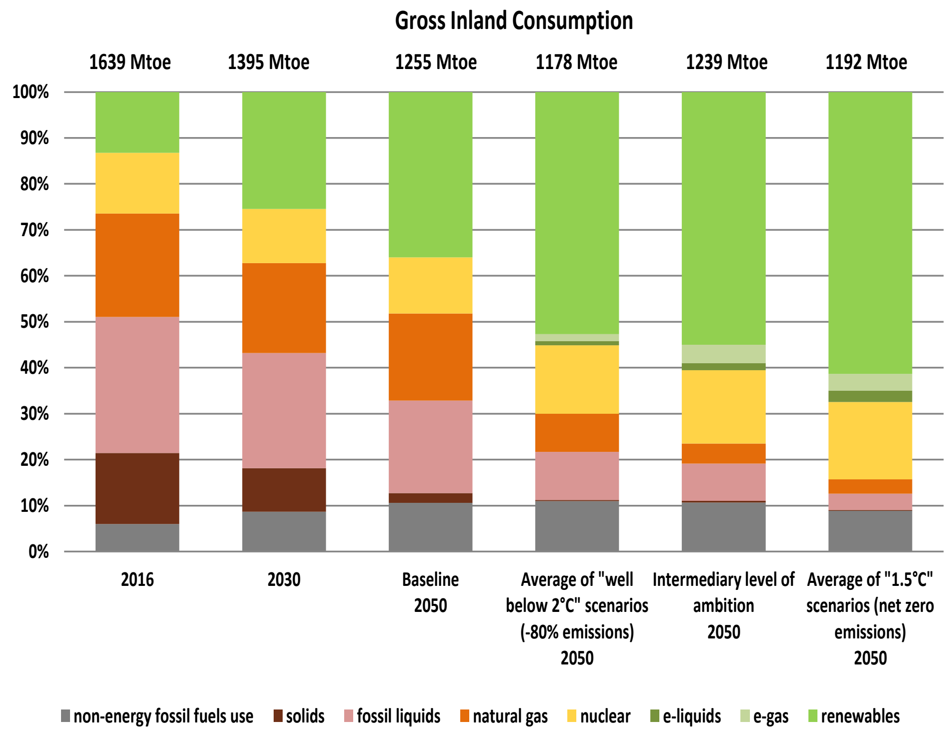


Note: "Services" includes here the agriculture sector.

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.



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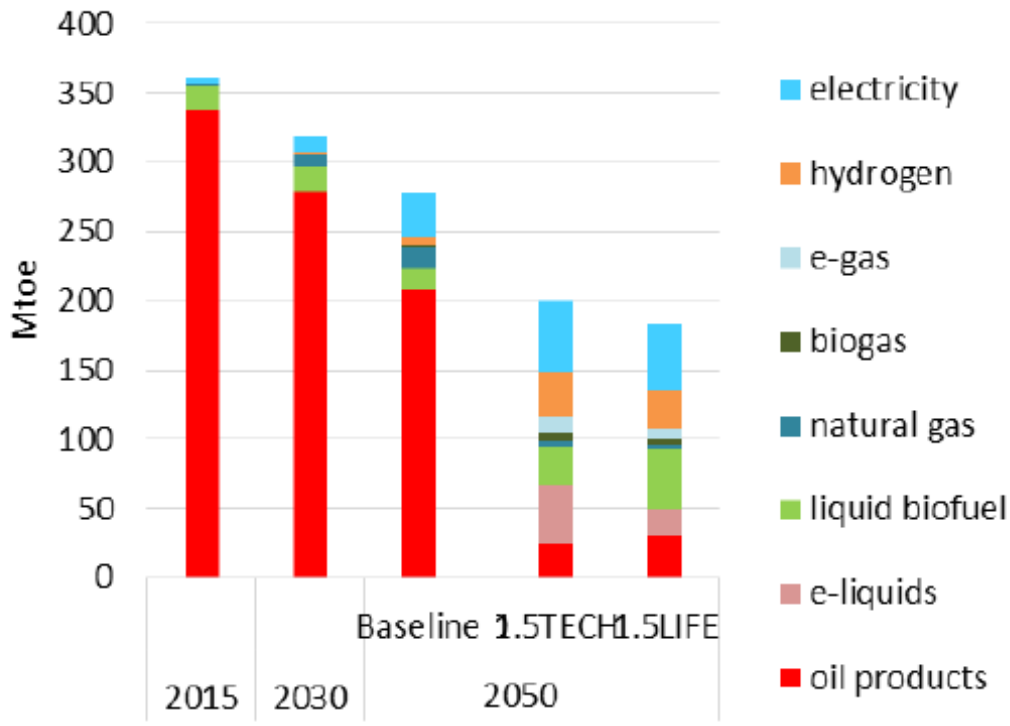
Building Block 3 - Clean, safe & connected mobility

Fuels consumed in the transport sector in 2050

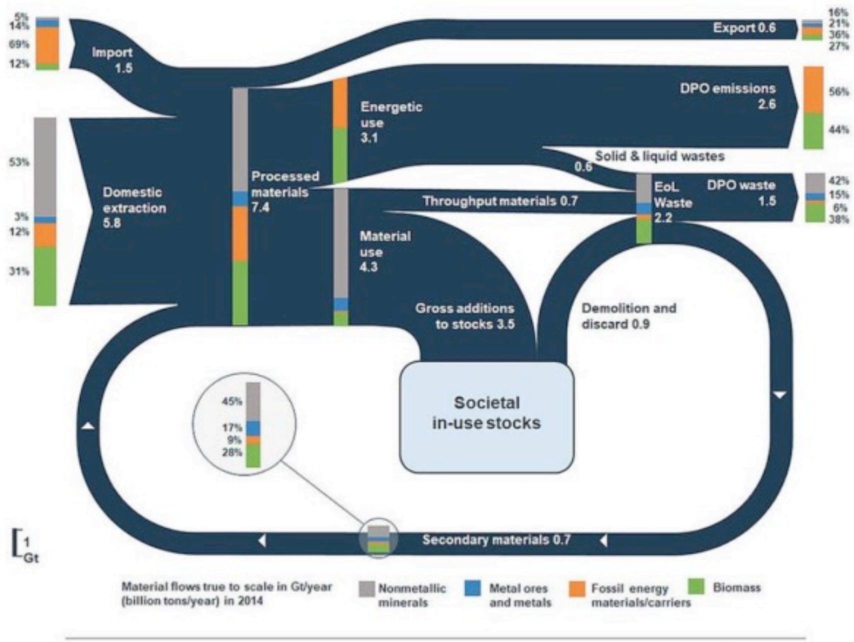


Source: PRIMES.

- Cheaper and efficient 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.

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 CO2 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.

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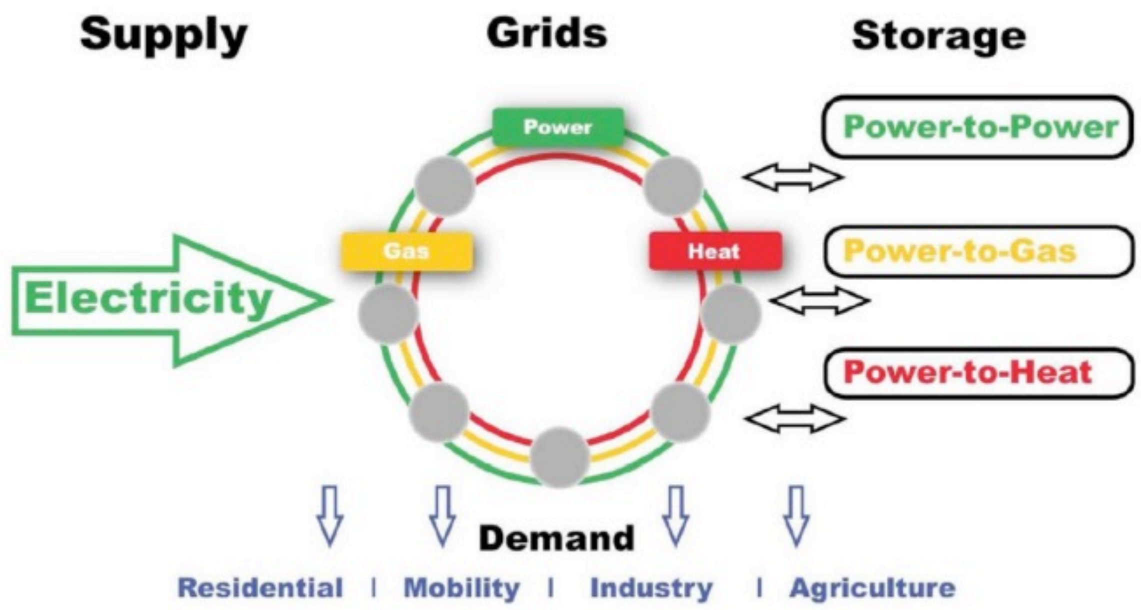
Building Block 5 - Network infrastructure

- 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.

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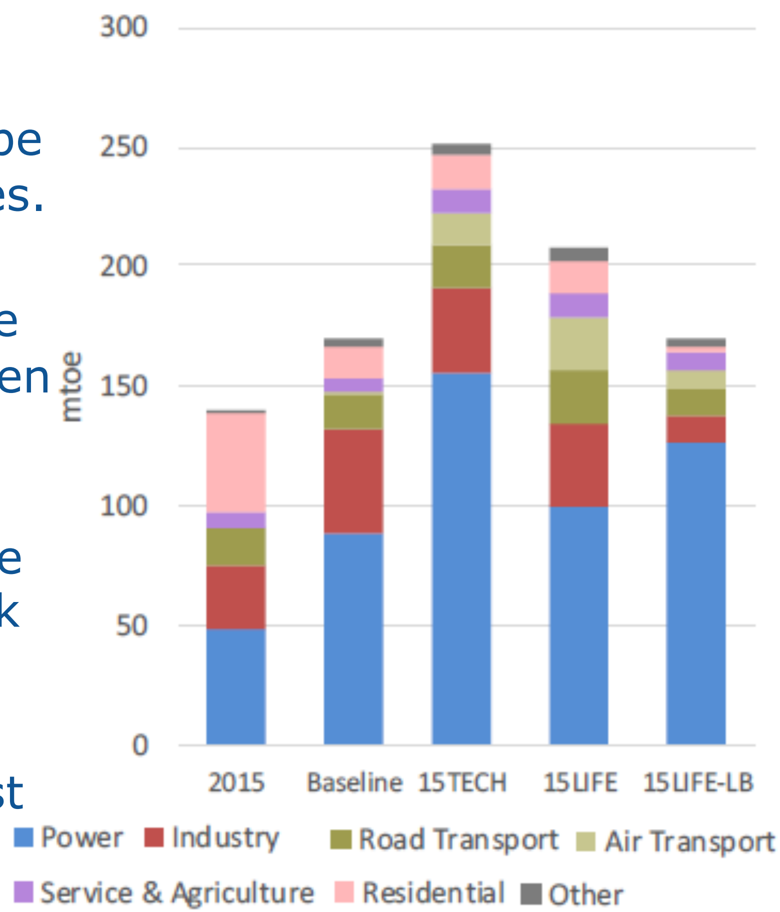
Building Block 6 - Bio-economy

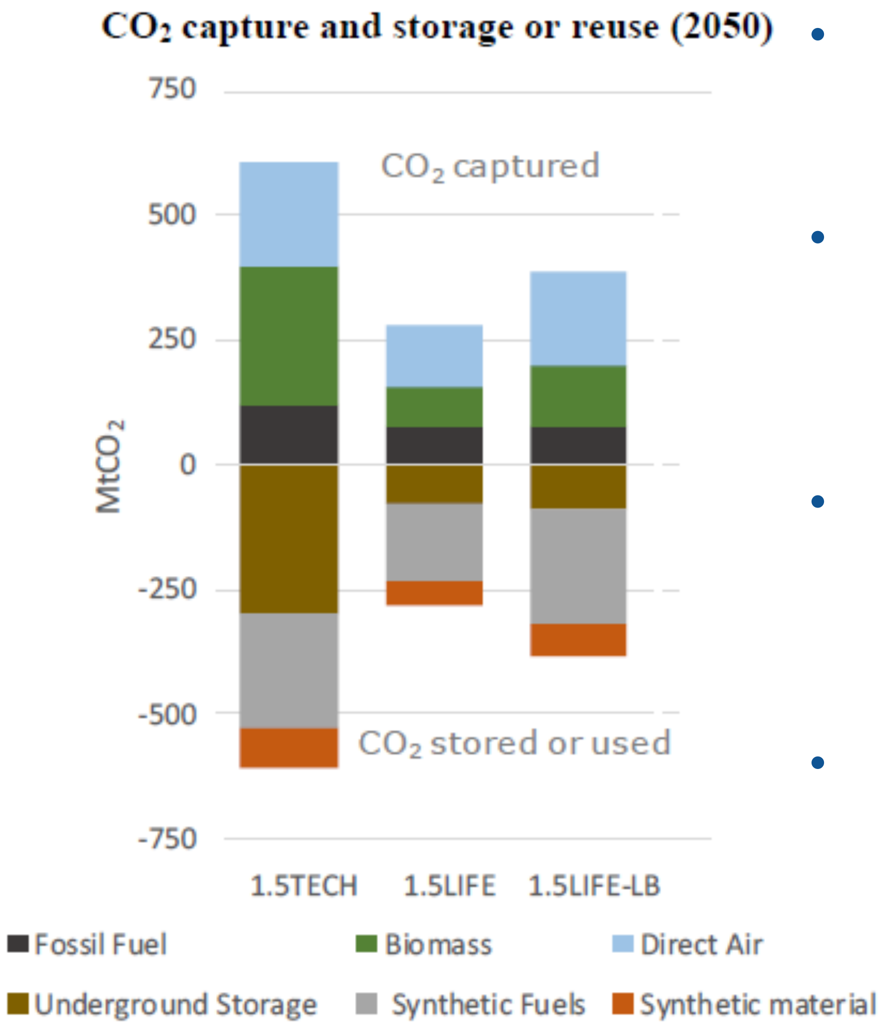
- Agriculture to provide sufficient food, feed and fibre. Agricultural non-CO2 emissions can be reduced (but not to zero) and soil carbon can be increased through improved farming techniques.
- Biomass is multipurpose: supply direct heat, biogas, biofuels, alternative to carbon intensive materials and 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.

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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

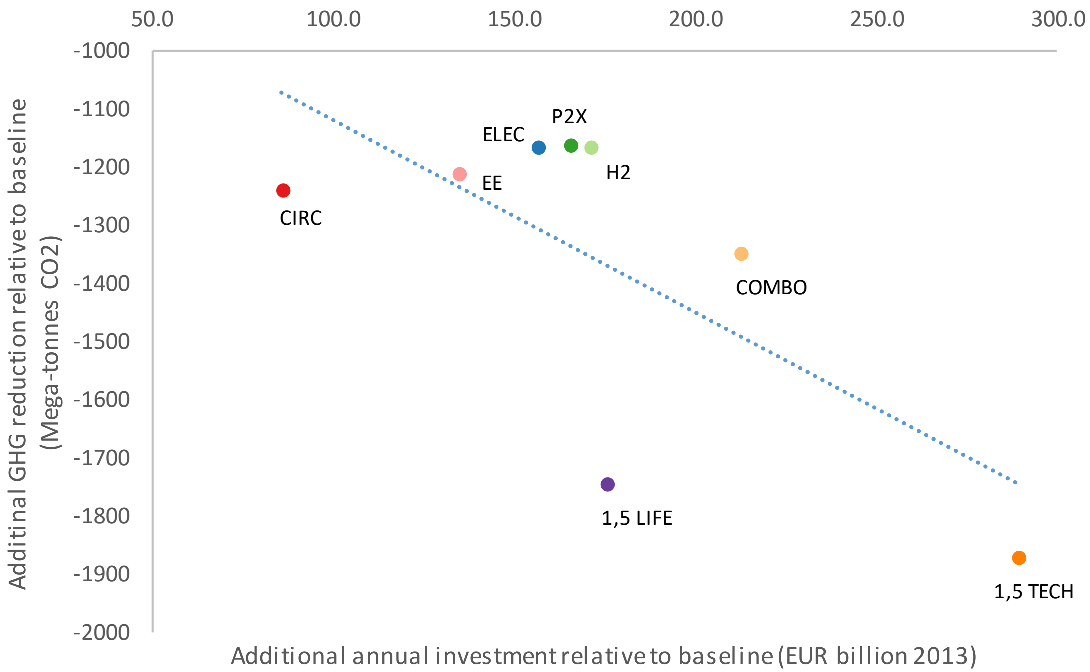
Research and Innovation
Identifying key technologies for the transition and accelerating demonstration

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

Stimulating clean investment into the EU economy

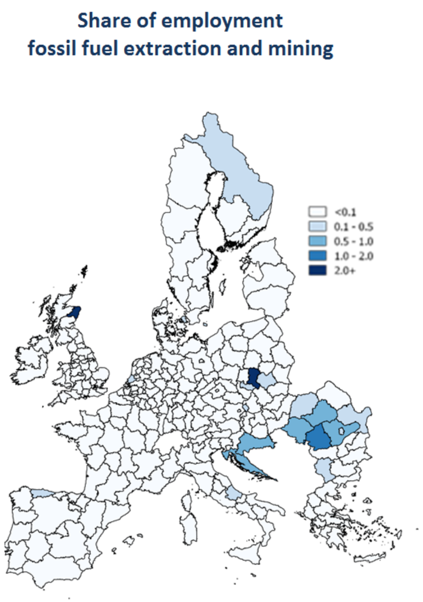
- Modernising and decarbonising the EU's economy will stimulate significant additional investment

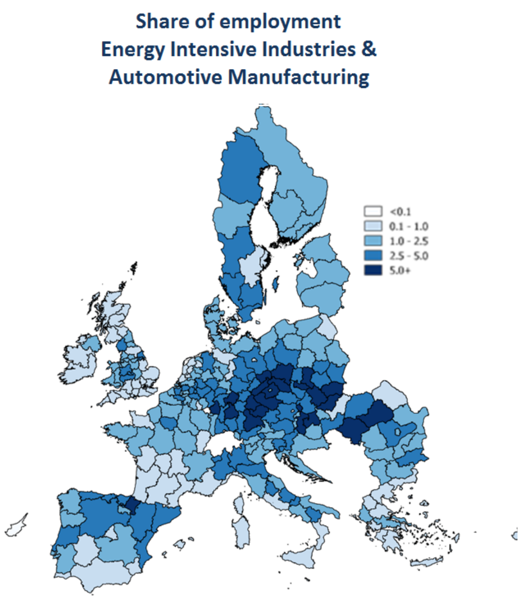
- From 2% of EU GDP invested in the energy system today to 2.8% (up to € 575 bn per annum) to achieve a net-zero greenhouse gas emissions economy



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





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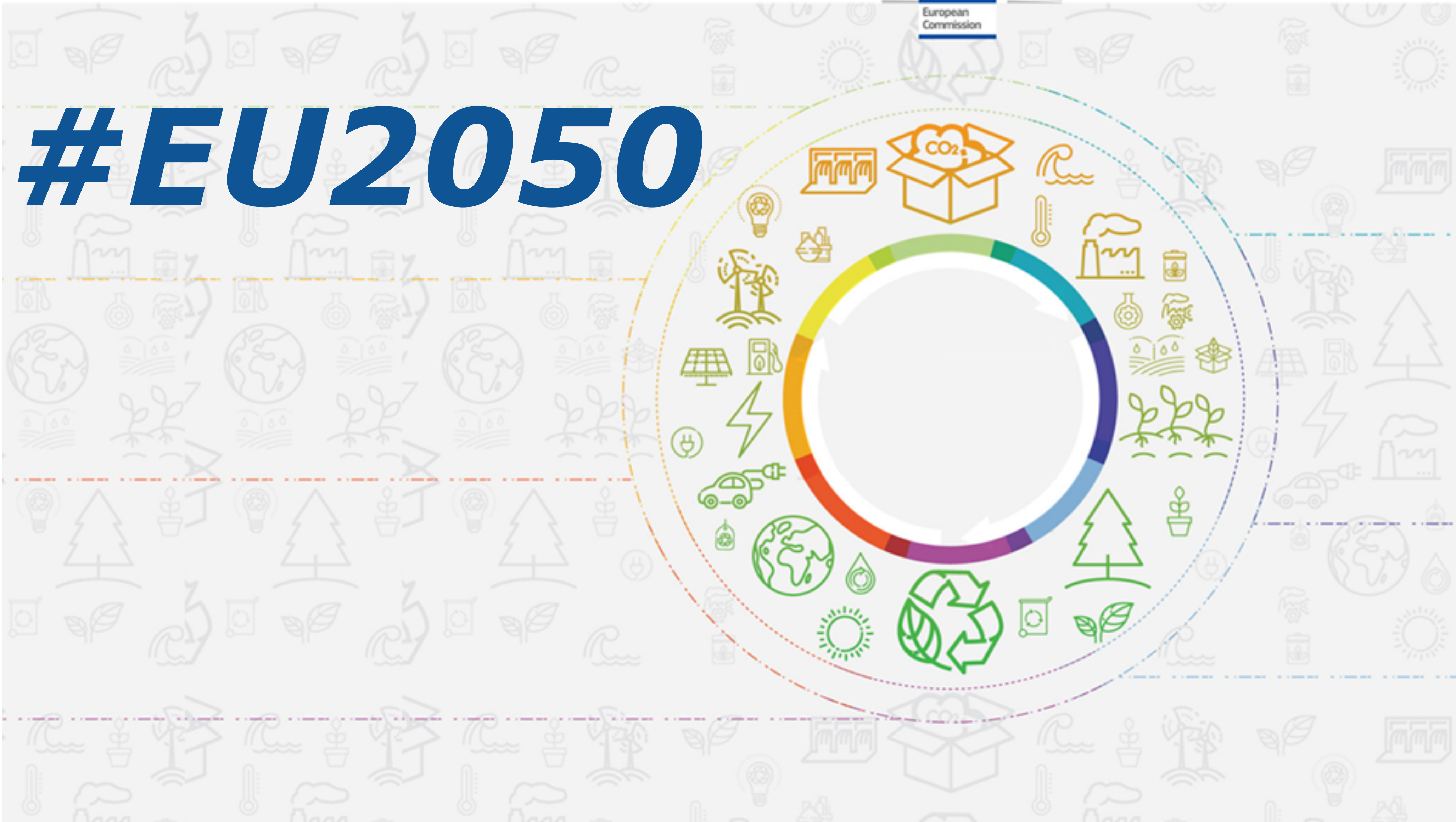
Role of citizens and local authorities

- 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.

Next steps

- National Climate and Energy Plans under finalisation.
- All EU institutions considered the EU vision:
  - EP resolution
  - EESC and CoR opinions
  - Policy debates in all relevant Council formations under the AT, RO and FI Presidencies
  - European Council guidance
- EU to adopt and submit an ambitious strategy by early 2020 to the UNFCCC as requested under the Paris Agreement.
- Show leadership and work with other parties to do the same.



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

Climate Action