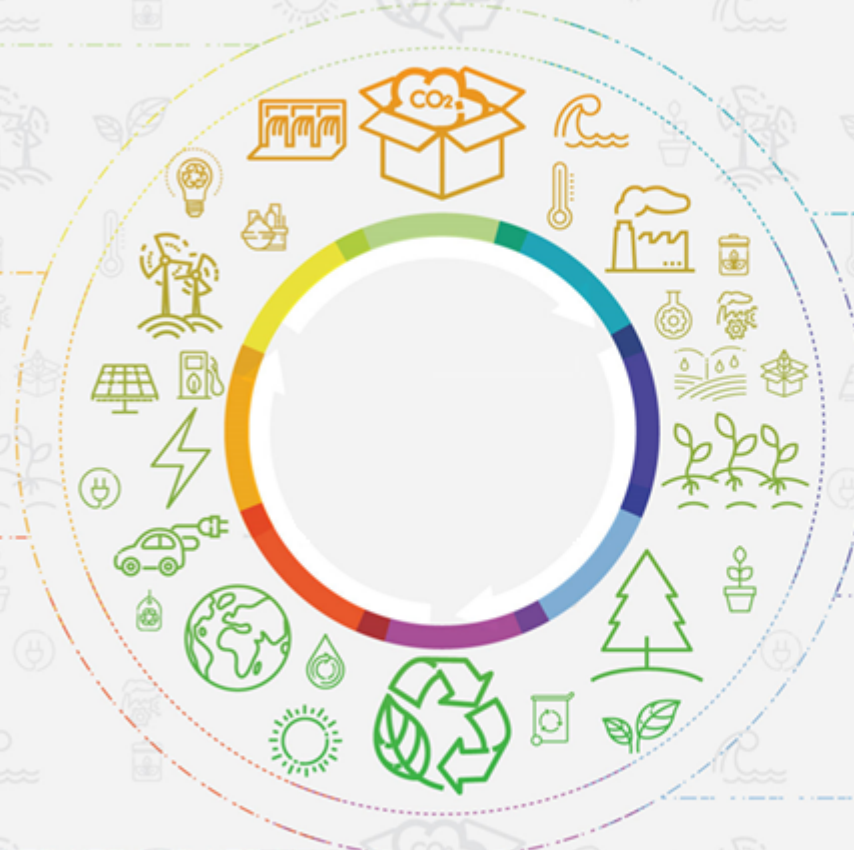




A Clean Planet for all

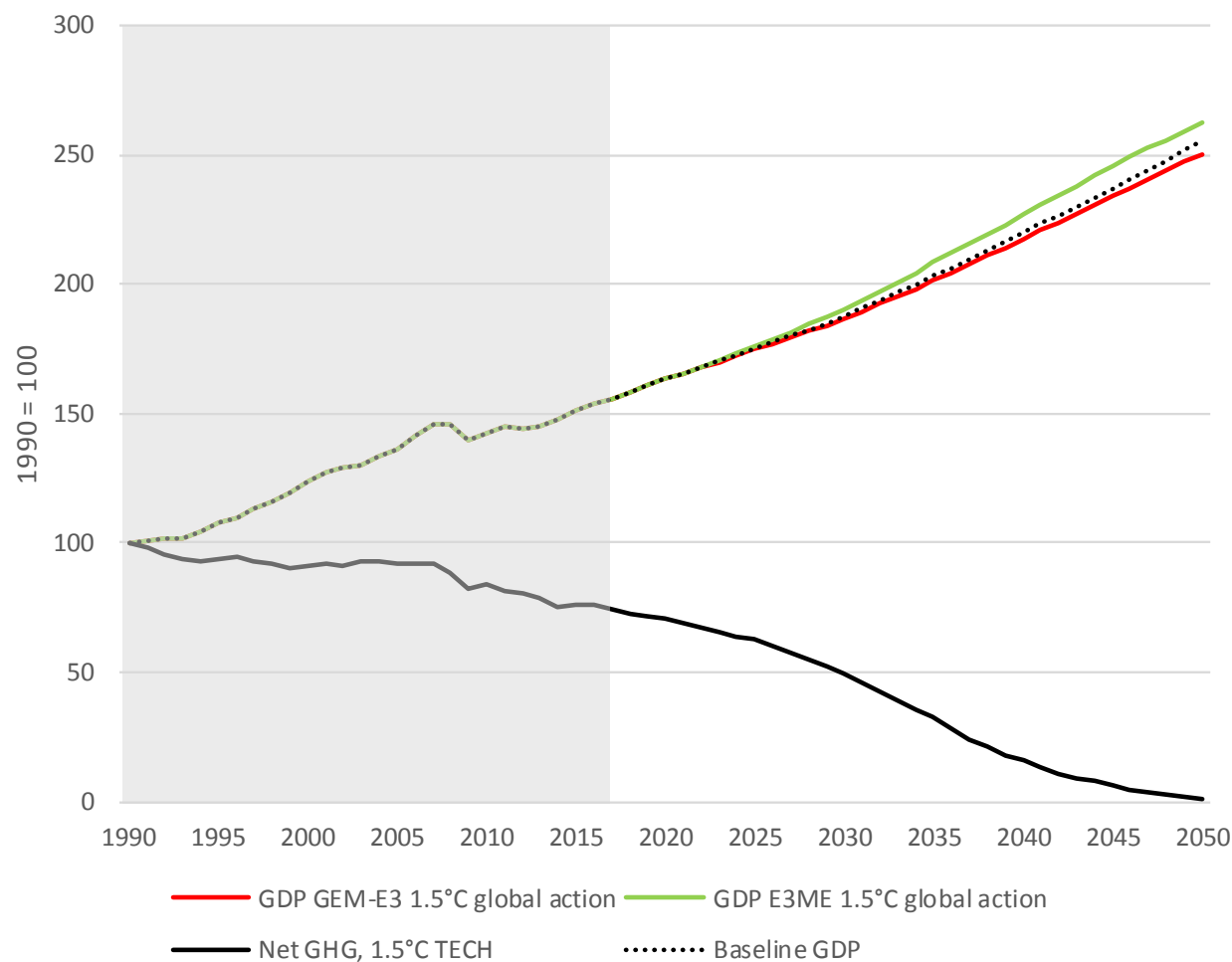
**A European strategic
long term vision for a
prosperous, modern,
competitive and
climate neutral
economy**



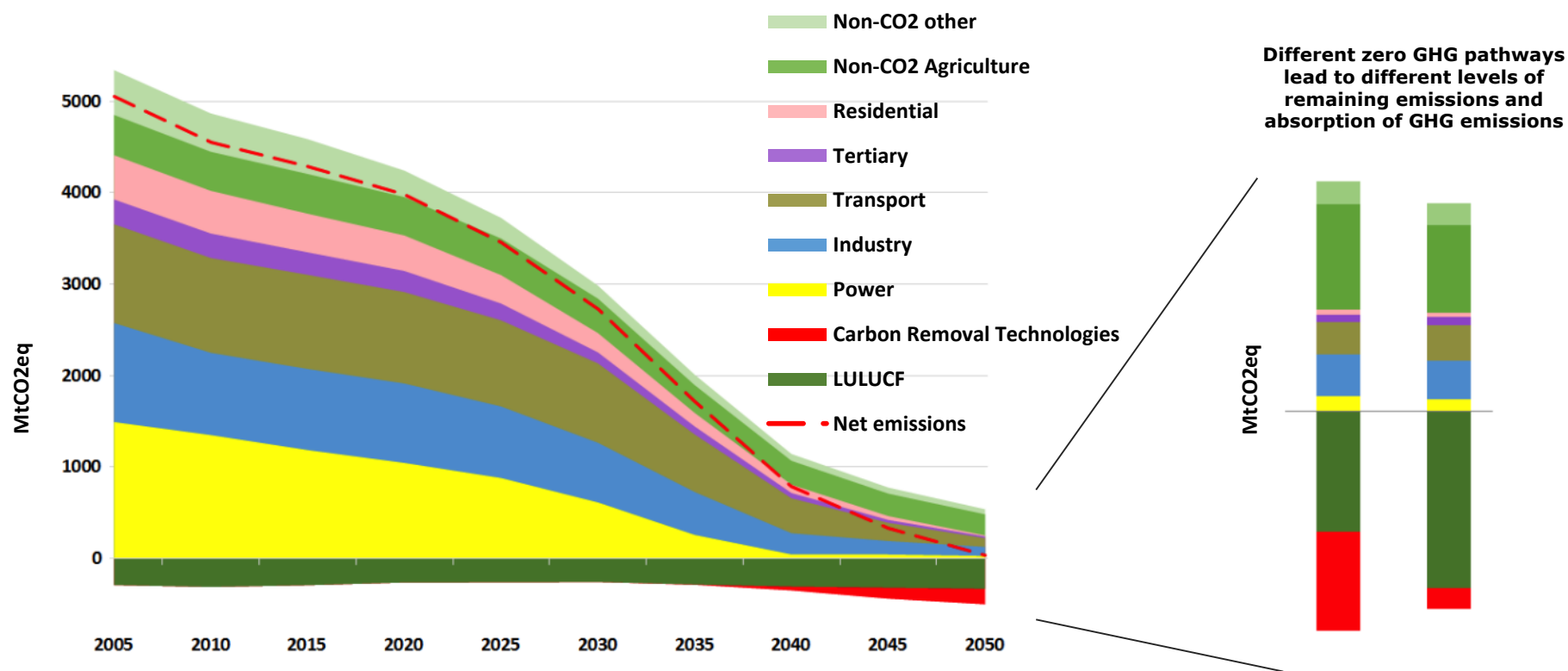
Our Vision for a Clean Planet by 2050

- The Paris Agreement objective is to keep temperature increase to well below 2°C and to pursue efforts to limit it to 1.5°C
- But the IPCC report confirms that limiting climate change to 1.5°C has to be pursued to avoid these worst impacts
- For the EU to lead the world in climate action, it means achieving net-zero greenhouse gas emissions by 2050
- The EU with this vision can inform others how we can deliver collectively a clean planet.
- The Long Term Strategy shows transforming our economy is possible and beneficial.

Our Vision for a Clean Planet by 2050



Emissions pathway to net zero GHG



Macro-economic impacts: aggregate level

Diverse set of models converge on broad economic impacts:

- Net GHG neutrality can be achieved with limited impact on aggregate output by 2050;
- Impact on output could be slightly positive (+2.2%) at best and slightly negative at worst (-1.3%);
- This is to put in context of an economy growing by close to 70% between 2015 and 2050 under the baseline.

GDP vs. Baseline, 2050	Fragmented action		Global action	
Temperature target	2°C	1.5°C	2°C	1.5°C
EU action	-80%	Net GHG neutrality	-80%	Net GHG neutrality
Global action	NDC	NDC	-46%	-72%
JRC-GEM-E3	-0.13%	-0.63%	-0.28%	-1.30%
E3ME	1.26%	1.48%	1.57%	2.19%
QUEST	0.31%	0.68%	--	--

Source: JRC-GEM-E3, E3ME and DG ECFIN.

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)

1. Energy efficiency

- Energy consumption can be reduced by as much as half in 2050 compared to 2005
- Buildings are key: most of the housing stock of 2050 already exists today. High renovations rates and fuel switching are needed.
- Requires adequate financial instruments and skilled workforce, integrated policy approach and consumer engagement.

2. Deployments of renewables

- The share of electricity in final energy demand will at least double.
- RES-E allows the production of carbon-free energy carriers (hydrogen, e-fuels) to decarbonize heating, transport and industry.
- RES-E are increasingly competitive, mainly wind and solar.
- Deployment facilitated by rising storage capacity and technological options.

7 Building Blocks (2)

3. Clean, safe & connected mobility

- Electric cars, carbon-free power, connectivity and autonomous driving offer prospects to decarbonise personal transport.
- Innovative mobility for urban areas and smart cities, underpinned by changing behaviour, leading to improvement of quality of life.
- Alternative fuels (advanced biofuels, e-fuels, hydrogen) will be critical for heavy duty or long distance transport modes.

4. Competitive industry and circular economy

- Competitive resource-efficient industry and circular economy, increased recovery and recycling of raw materials (including critical materials), new materials and business concepts.
- Completed by fuel and feedstock substitution: electrification, hydrogen, biomass, renewable synthetic gas. CCS where still needed
- In the next 10 to 15 years, technologies that are already known will need to demonstrate that they can work at scale.

7 Building Blocks (3)

5. Infrastructure and interconnections

- Interconnected smart infrastructure for sectoral integration.
- Completion of the Trans-European Energy and Transport Networks.
- Smart electricity and data/information grids, hydrogen pipelines.
- Smart charging or refuelling stations for transport. Increased synergy between transport and energy systems.

6. Bio-economy and natural carbon sinks

- Agriculture to provide food, feed and fibre, but also reduce emissions.
- Biomass is multipurpose: heat, biogas, biofuels, alternative to carbon intensive materials and generate negative emissions when coupled with carbon capture and storage.
- Natural carbon sink can be enhanced through afforestation and restoration of degraded forest lands and other ecosystems.

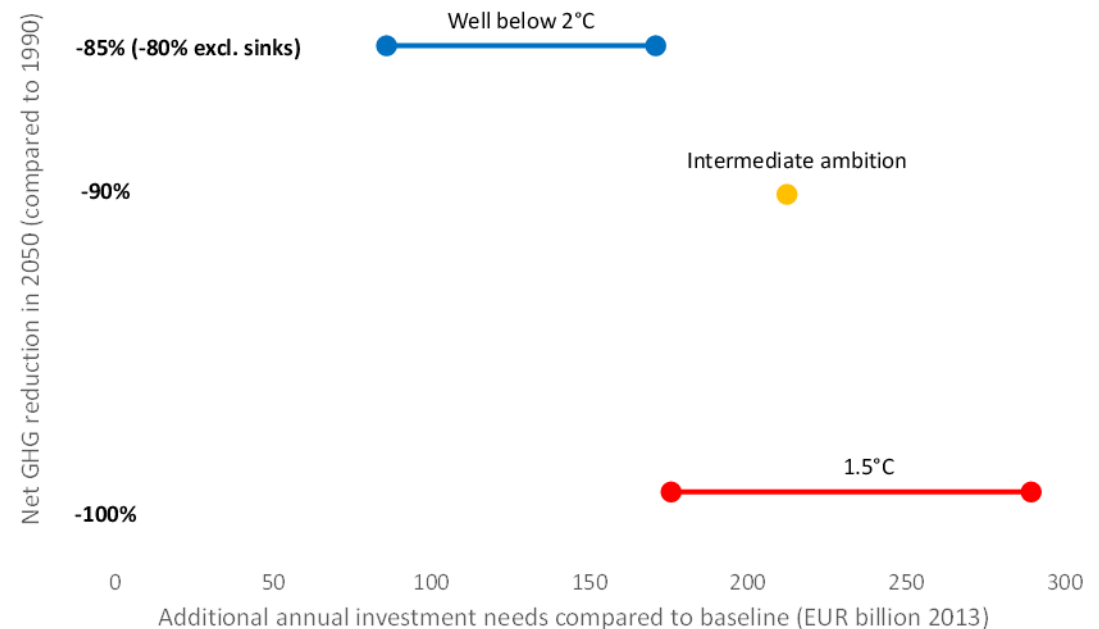
7 Building Blocks (4)

7. Carbon capture and storage

- Rapid deployment of renewable energy and new options to decarbonize industry reduced the need for CCS.
- 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.
- Coordinated action needed on demonstration and commercial facilities to overcome the obstacles.

Increased Investment in 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
- Positive for growth and jobs, with GDP higher by up to 2% in 2050
- Co-benefits: energy imports down, public health, etc.



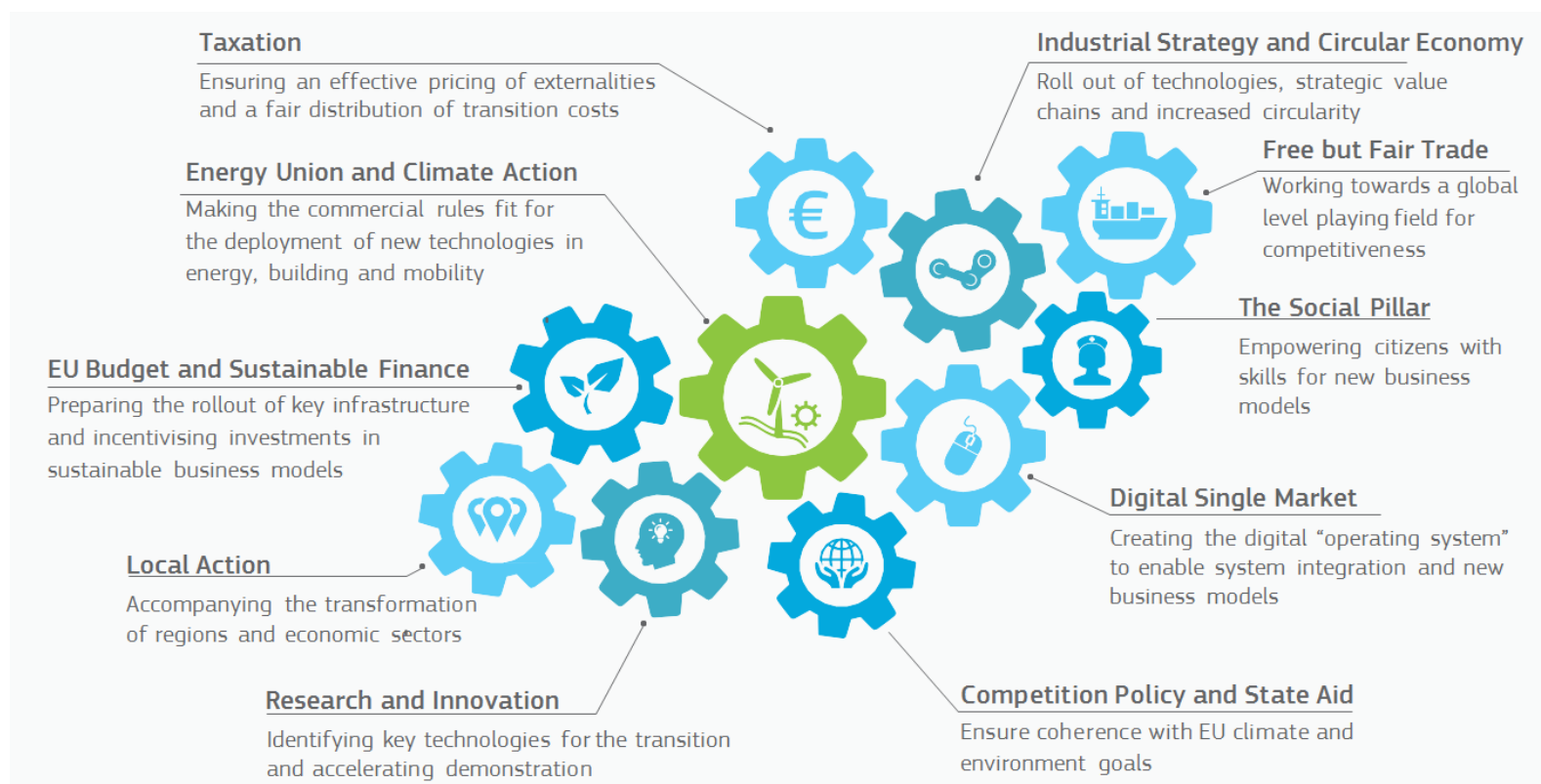
Investments needs by sector (1.5°C)

- Investment builds up significantly to 2030 already in most sectors and peaks around 2040
- All LTS scenarios share a common path to 2030, based on recently adopted and proposed legislation
- Investment needs will be particularly large in the residential sector (energy efficiency) and the power sector (generation and grid)
- Investment needs will be large in transport, though a significant share is the replacement of vehicles

Average annual investment, 2021-2030 and average of 1.5°C scenarios 2031-2050 (billion EUR 2013)

	2021-2030	2031-2050
<u>Supply</u>	<u>115.0</u>	<u>223.5</u>
Power grid	59.2	96.6
Power plants	53.9	107.1
Boilers	1.7	0.7
New carriers	0.1	19.2
<u>Demand excl. transport</u>	<u>281.0</u>	<u>324.0</u>
Industry	18.1	25.2
Residential	198.9	226.8
Tertiary	64.3	71.9
<u>Transport</u>	<u>685.0</u>	<u>875.5</u>
TOTAL	1081.0	1423.0
TOTAL excl. transport	396.0	547.5

Enabling framework crucial to deliver transformation



Current 2030 targets and implications from a carbon budget perspective

- EU Council decision of 2014:
 - ✓ “At least 40% reduction” target by 2030 (compared to 1990);
 - ✓ -43% in ETS and -30% in non-ETS (vs. 2005), based on cost efficiency;
 - ✓ 27% RES share and 27% energy efficiency gains.
- EU climate policy/commitments are not based on carbon budgets.
- But the 2030 targets still define a trajectory:
 - ✓ Annual allocations under the ESR (linear trajectories);
 - ✓ National targets under the ESR are based on GDP per capita (fairness);
 - ✓ Adjustment for high-income MS and enhanced flexibilities (banking, borrowing, trading, LULUCF, ETS) encourage cost-effectiveness;
 - ✓ ETS linear reduction factor increased from 1.74% to 2.2% in 2021-2030;
 - ✓ Adopted RES and EE target: 32% share and 32.5% EE gain.
- Full implementation of 2030 package would generate 45% reduction in GHG emissions.

Sectoral trajectories

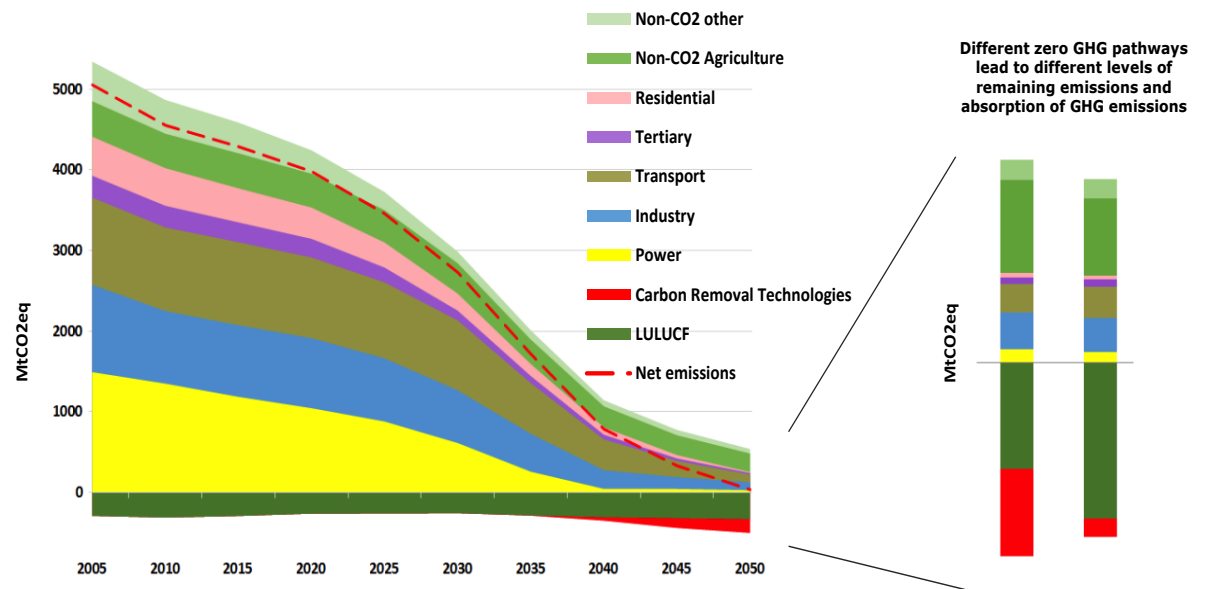
No carbon budgets are defined explicitly beyond ETS/non-ETS.

End-points (2050) differ by sector.

Pace/timing of reductions differ.

Key determinants 2030:

- ✓ MAC curves and technological progress (learning by doing);
- ✓ Full modelling of EU-ETS;
- ✓ Energy efficiency values;
- ✓ RES values;
- ✓ RES target (32%);
- ✓ EE target (32.5%).





President-elect von der Leyen Political Guidelines: a European Green Deal

- Make the EU the first climate neutral continent and enshrine the 2050 objective in a Climate Law.
- Extension of the ETS system.
- Put forward a comprehensive plan to increase ambition for 2030 to 50% and up to 55% in a responsible way, following social, economic and environmental impact assessments.
- A carbon border tax to avoid carbon leakage.
- Just Transition fund.
- Strategy for green financing and Sustainable Europe Investment Plan.
- European Climate Pact.

Thank you