

Net Zero By 2050 and the EU's Long Term Strategy

Presentation to IMEAS conference
4 December 2018

Erica Hope, European Climate Foundation



European
Climate
Foundation



- Context for the EU's Long Term Strategy
- The CTI 2050 Roadmap Tool project (ECF initiative)
 - The model
 - Key insights of the report "Net Zero By 2050: From Whether To How"
- The European Commission's official proposals
 - Modelling approach taken
 - Key messages
 - Next steps for the process

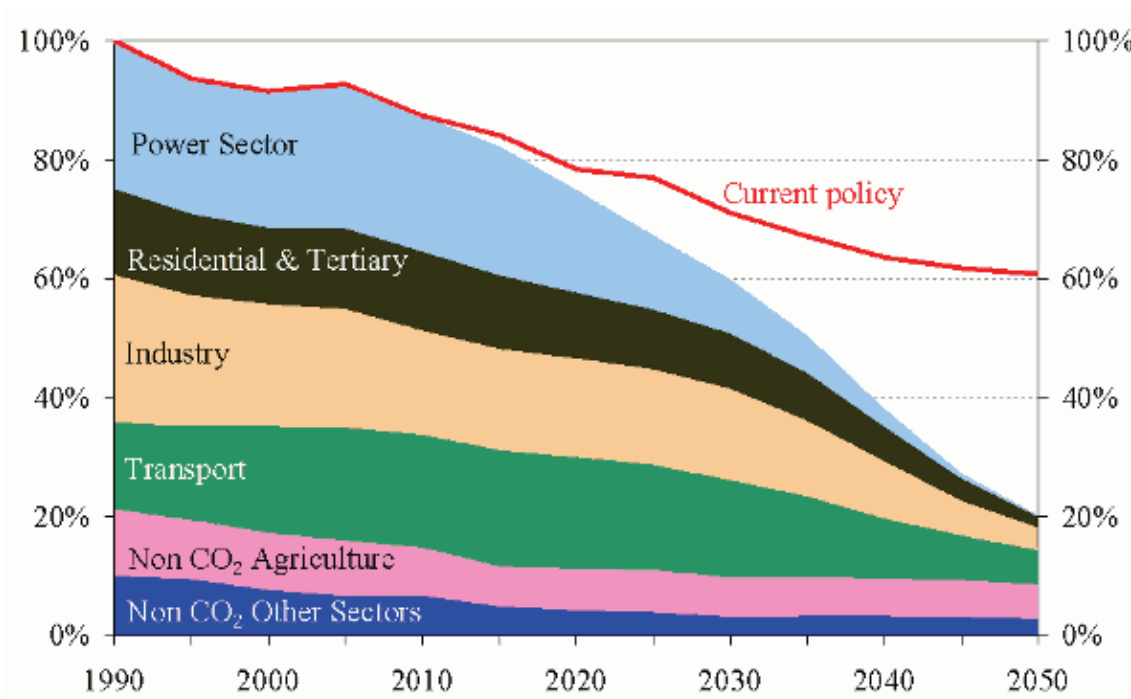


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2011: European Commission Roadmap for a Low Carbon Economy



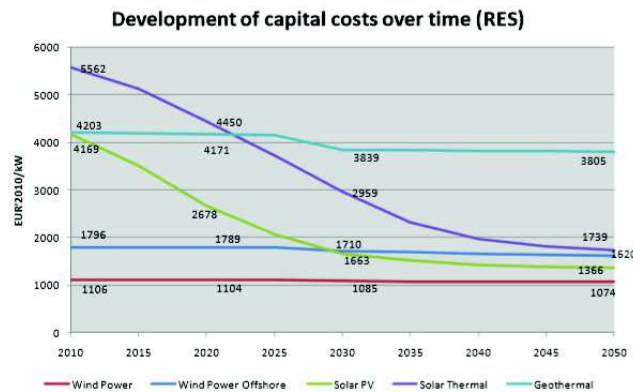
- In 2011 the Commission published its Roadmap, aiming at 80% GHG emission reductions by 2050



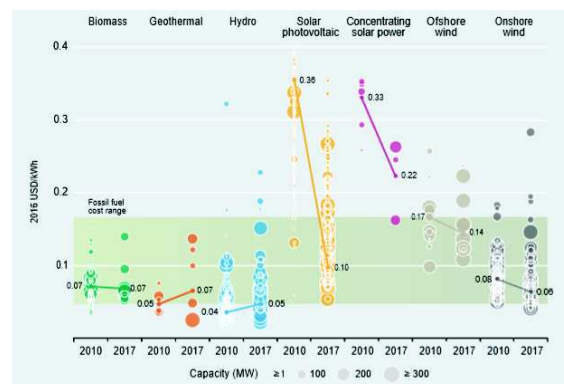
Since then, the context has changed: technology costs have fallen rapidly



- 2011 EU Roadmap projected gradual cost reductions for wind and solar...



- ... but in reality they have fallen far more steeply (IRENA)

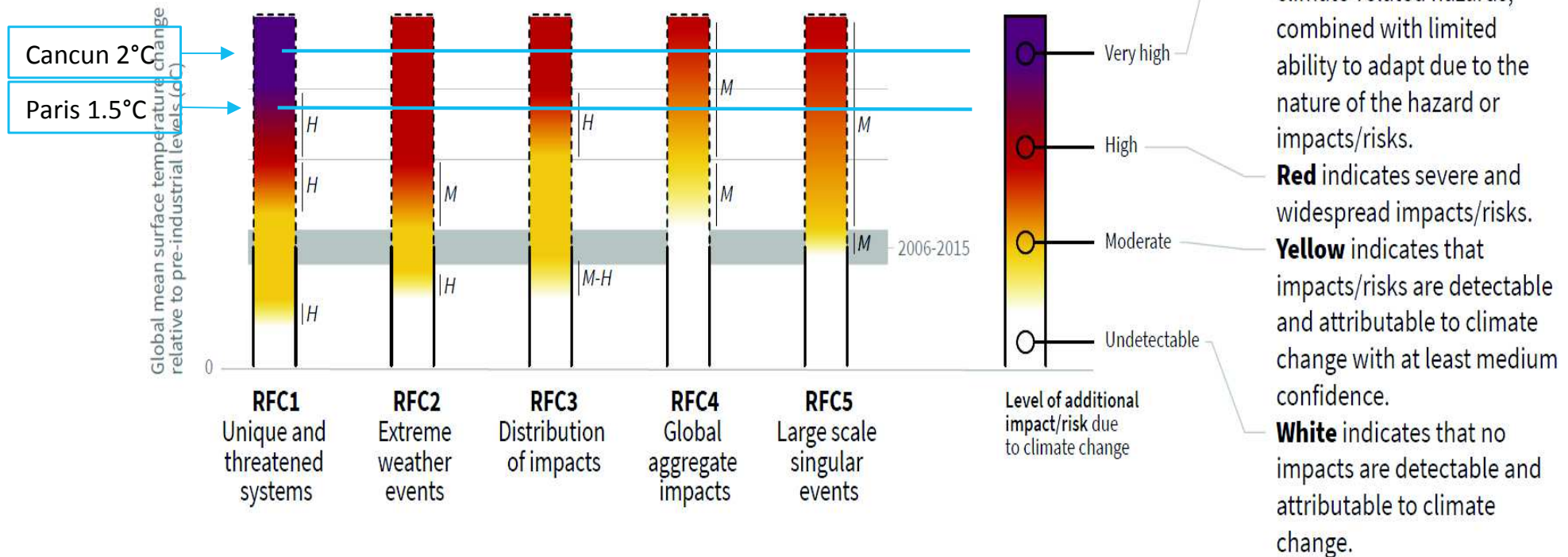


... and climate science shows the EU needs to move faster than previously thought



different levels of global warming for people, economies and ecosystems across sectors and regions.

Impacts and risks associated with the Reasons for Concern (RFCs)



Political decisions affirm the need for a new Long Term Strategy



2015 Paris Agreement: all Parties should strive to formulate and communicate long-term low greenhouse gas emission development strategies by 2020



March 2018: The **European Council** invites the Commission to present by the first quarter of 2019 a proposal for a strategy for long-term EU greenhouse gas reductions in accordance with the Paris Agreement, taking into account the national plans

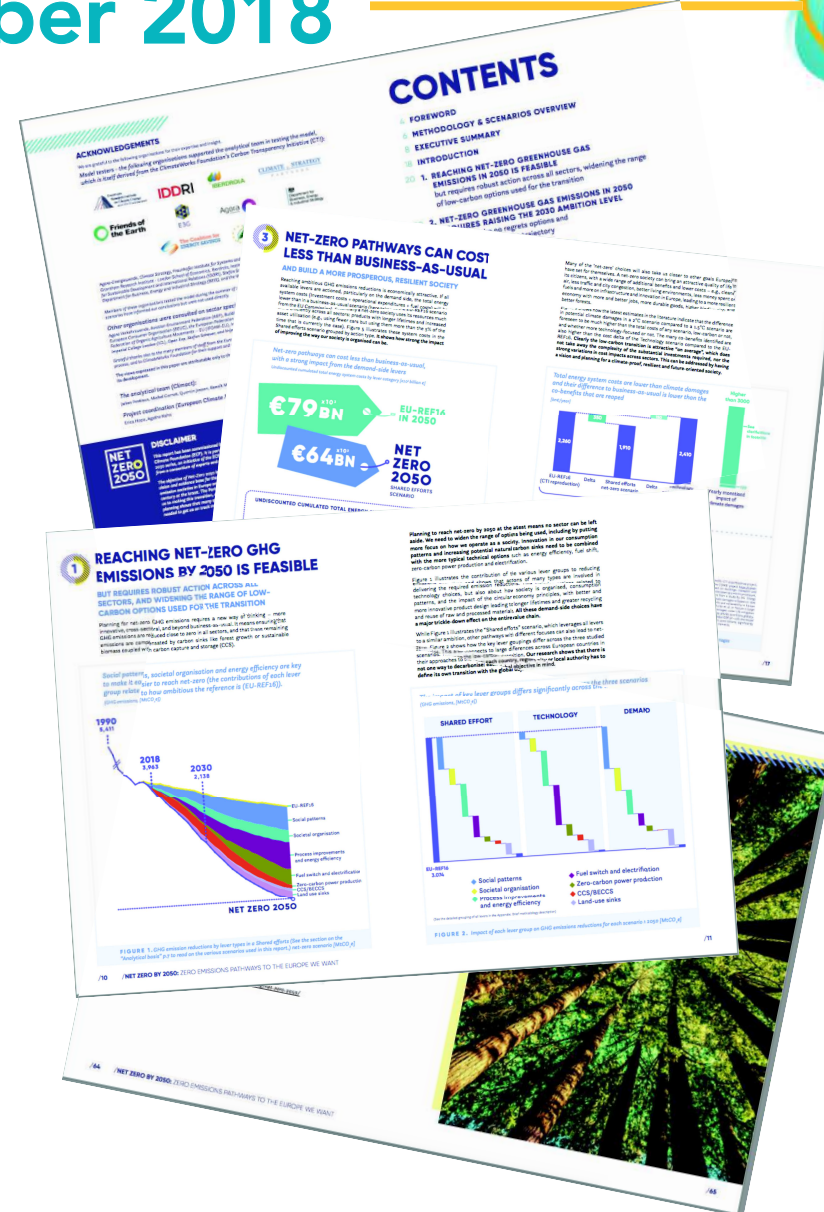


2018: Governance regulation: EU longterm strategy to include a scenario on achieving net zero GHG emissions within the Union by 2050 and negative emissions thereafter; countries to develop 2050 strategies by 2020

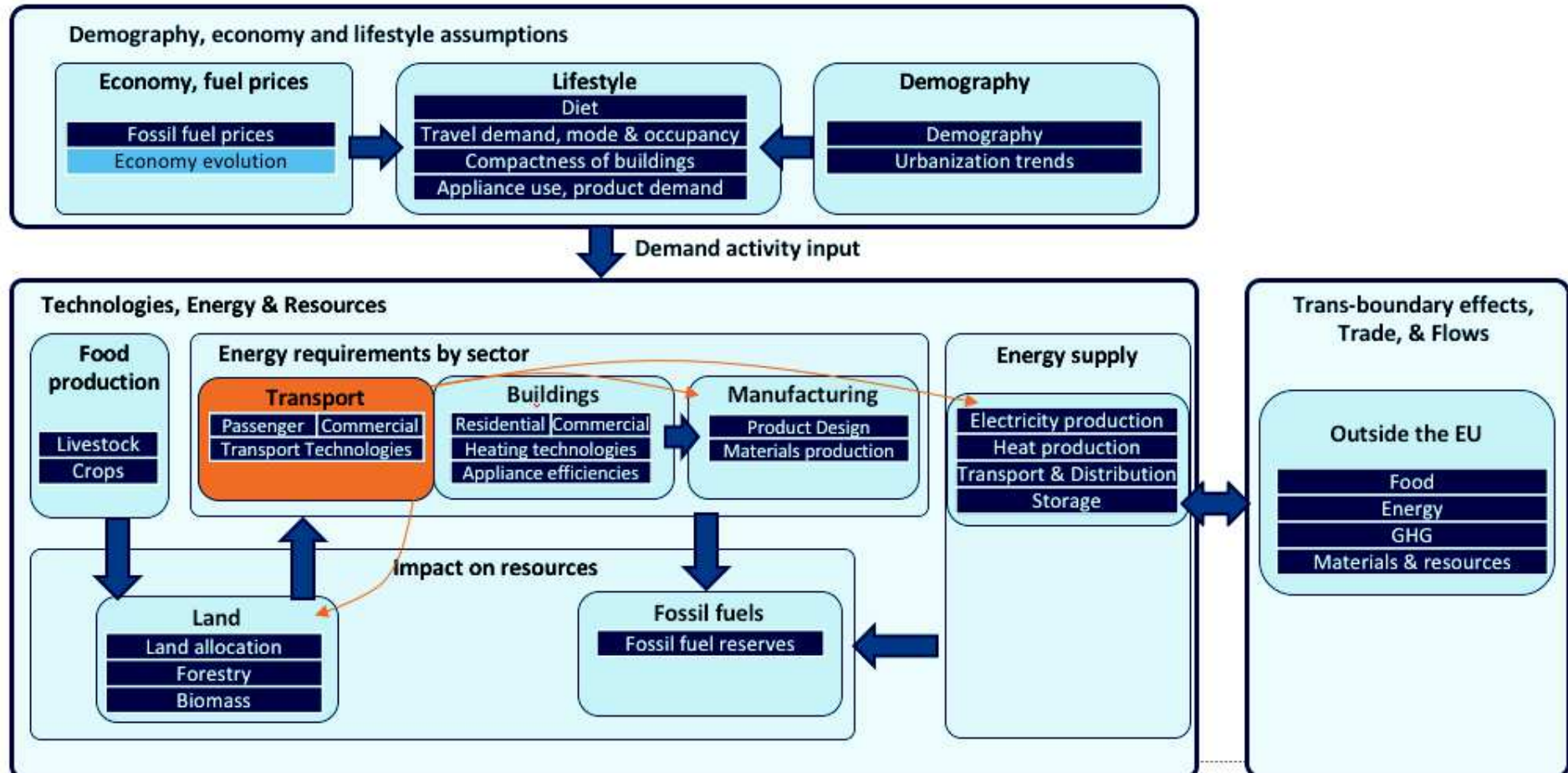


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Publication in September 2018



Structure of the CTI 2050 Roadmap Tool



4 ambition levels are used as boundaries to create scenarios



Oct 2017 – May 2018: consultation, building of CTI EU 2050 model and webtool

<https://stakeholder.netzero2050.eu>



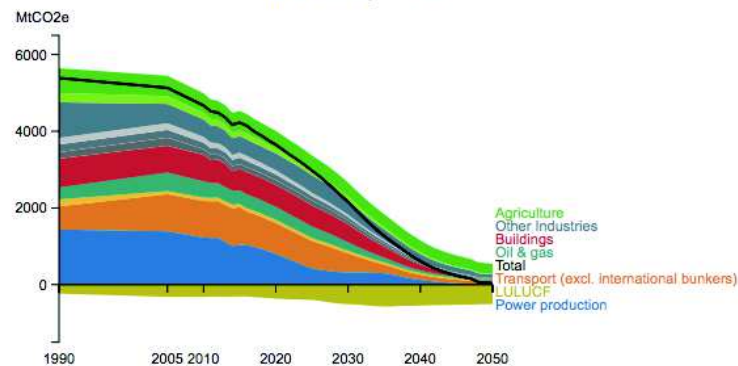
Net Zero 2050

CLIMACT

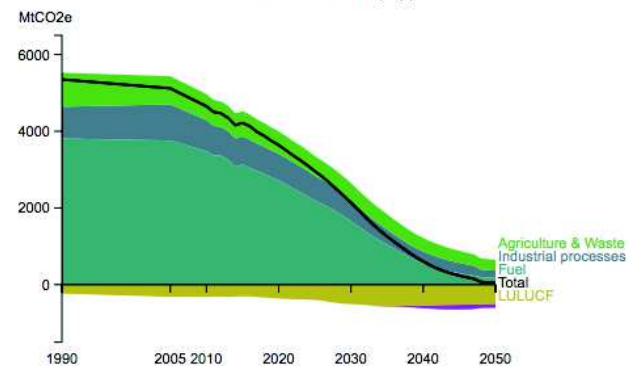
Pathway: Shared Effort

Implication: GHG Emissions

GHG emissions by sector



GHG emissions by type



KPI	2030	2050
Net GHG emissions vs 1990:	-60%	-100%
Emissions vs 1990 (excl LULUCF & Bunkers):	-52%	-90%
Energy demand vs 2010:	-24%	-59%
Electricity demand vs 2010:	-9%	+16%
Cumulated GHG emissions (GtCO2e):	+75	+89
EE 2030:	-39%	0%
Renewable energy sources:	+32%	+94%
RES-E:	+62%	+93%
RES-H&C:	+21%	+72%
RES-T:	+31%	+80%
Solid Bioenergy imported:	0%	0%
Liquid bioenergy imported:	+3%	0%
Emissions outside EU for food & Meat (MtCO2e):	-662	-542

TRANSPORT (DETAILED CHOICES)

0 1 2 2.1

Passenger and freight

Energy efficiency (detailed choices)	0	1	2	2.4
Biofuels (detailed choices)	0	0.2		
E-fuels	0	1	2	2.4
Shipping electrification	0	1	2	2.4
Short-haul flights electrification	0	1	2	2.4

Passenger transport

Land transport demand	0	1	2	2.4
Aviation transport demand	0	1	2	2.4
Modal share (detailed choices)	0	1	2	2.4
Passenger vehicles utilization and occupancy (detailed choices)	0	1	2	2.4
Technology evolution (detailed choices)	0	1	1.9	

Freight transport

Freight transport demand	0	1	2	2.4
Modal share (detailed choices)	0	1	2	2.4
Freight vehicles utilization and load factor (detailed choices)	0	1	2	2.4
Technology evolution (detailed choices)	0	1	2	2.4

BUILDINGS (DETAILED CHOICES)

0 1 2 2.5

INDUSTRY (DETAILED CHOICES)

0 1 2 2.3

EU Activity (consumer goods)	0	1	2	2.4
Product lifetime/Functional economy (detailed choices)	0	1	2	2.4
Share of product manufactured in EU (detailed choices)		B		
Product material switch (detailed choices)	0	1	2	2.4
Material intensity (detailed choices)	0	1	2	2.4
Recycled materials ratio (detailed choices)	0	1	2	2.4
Share of materials manufactured in EU (detailed choices)		B		
Processes (incl. EE, switch to gas & elec) (detailed choices)	0	1	2	2.4
Switch to hydrogen (detailed choices)	0	1	2	2.4
Switch to biomass (incl. CCU) (detailed choices)	0	1	2	2.4
Carbon Capture & Storage (detailed choices)	0	1	2	2.4

POWER PRODUCTION (DETAILED CHOICES)

0 1 2 2.3

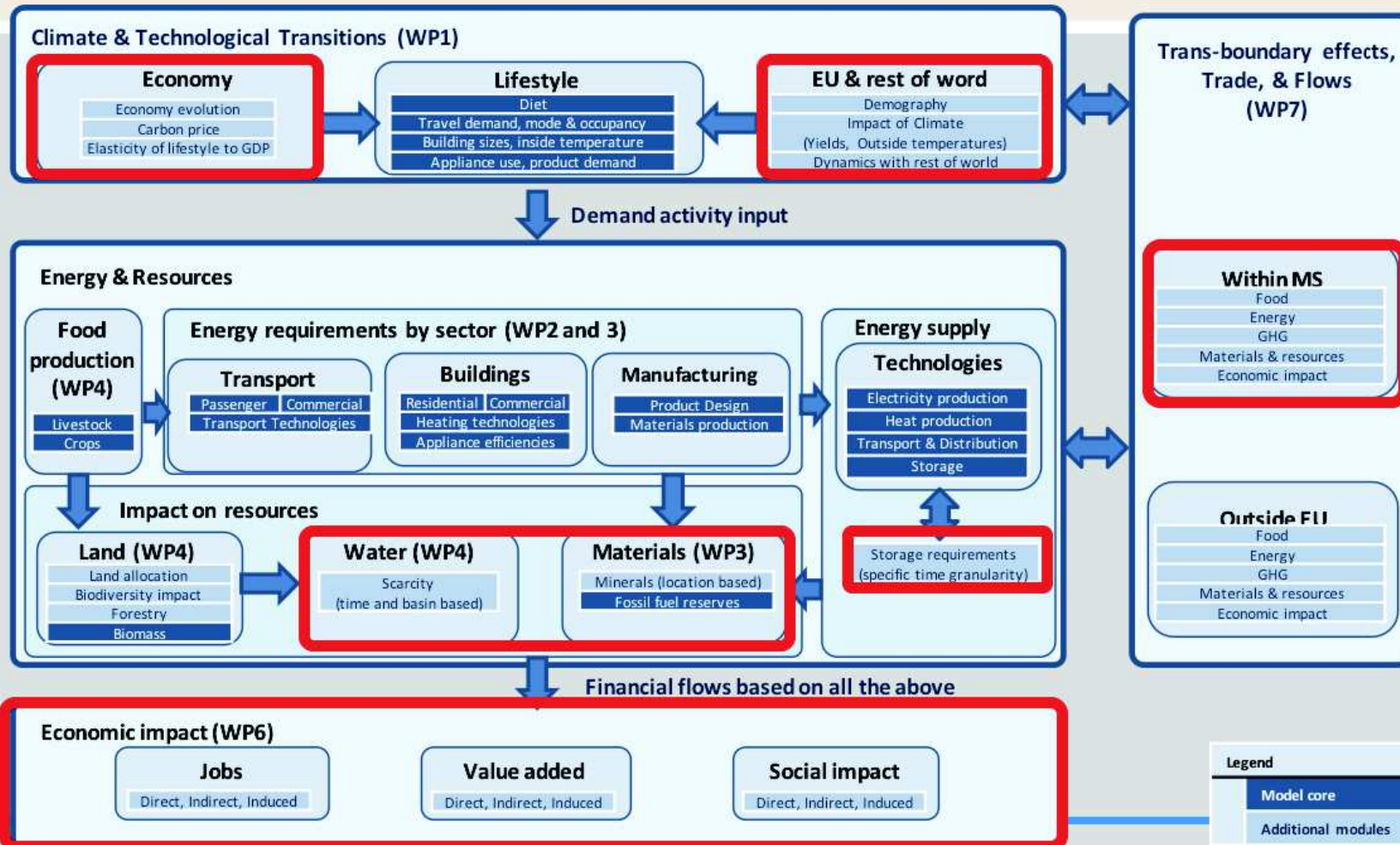
EU coal phase out	0	1	2	2.4
EU nuclear context		B		
vRES framework	0	1	2	2.4
Zero-carbon flexibility options	0	1	2	2.4
Biomass contribution	0	1	2	
Natural gas to H2	0	1	2	2.4
Carbon Capture & Storage	0	1	2	2.4

Key messages



- Reaching net-zero GHG emissions by 2050 is feasible but requires robust action across all sectors, and widening the range of low-carbon options used for the transition
- Net-zero GHG emissions in 2050 requires raising the 2030 ambition level to set Europe on the right trajectory
- Net-zero pathways can cost less than business-as-usual and build a more attractive, resilient society

The EU Calc model adds Member States granularity and additional modules





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28 November 2018

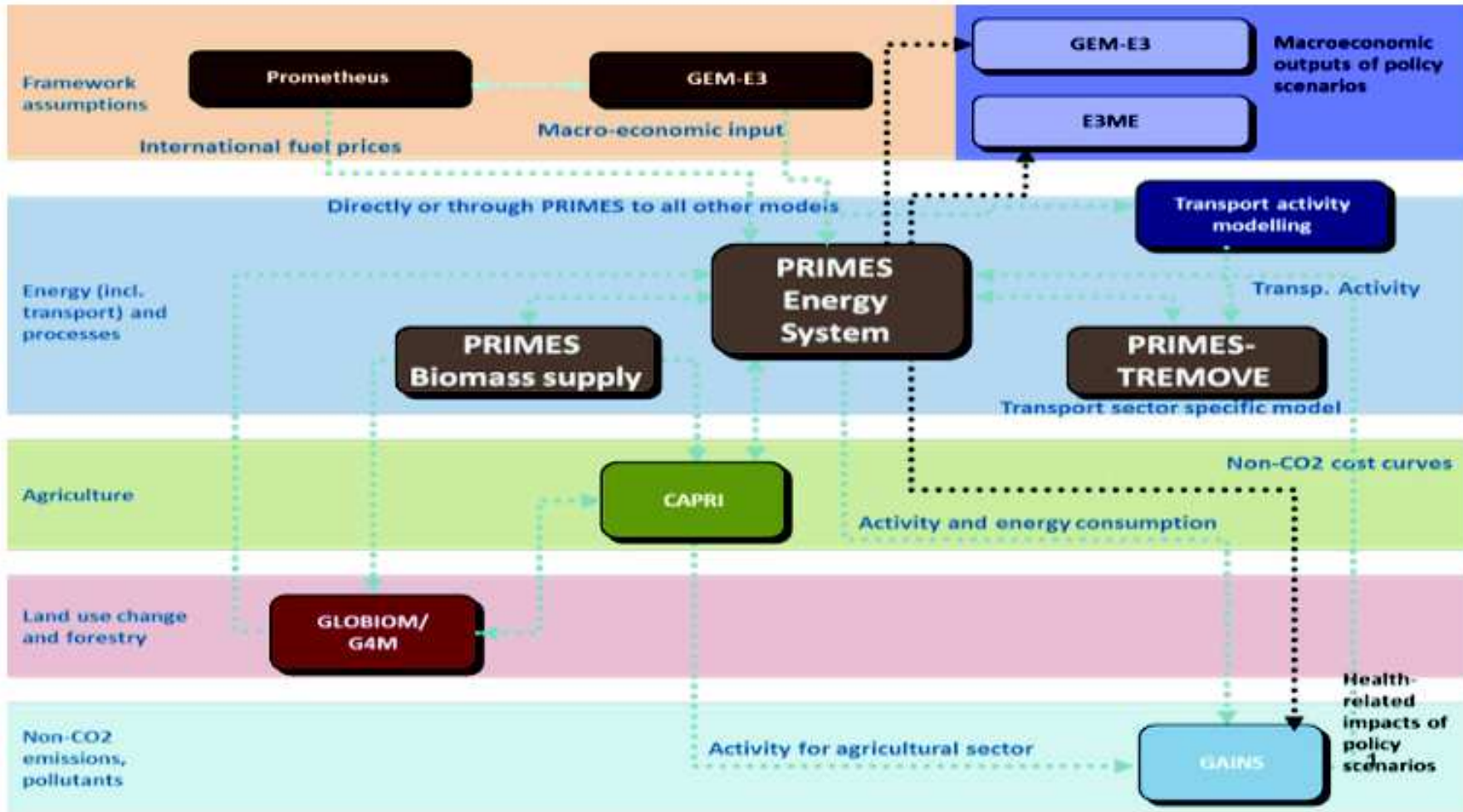


Source: EC Audiovisual Service



Source: Twitter

Model suite used



Source: E3MLab/ICCS⁶⁸⁴.

Taken from European Commission proposal, 28 November 2018

Baseline: updated REF2016



- Baseline keeps the macro-economic projections, fossil fuels price developments and pre-2015 Member States policies as implemented in REF2016, and incorporates
 - an update of technology assumptions as conducted under the ASSET project
 - several major recently agreed pieces of legislation + recent Commission proposals
 - Achievement of the 2030 climate and energy targets (*at least 40% GHG vs 1990, at least 32% share RES in final energy consumption, at least 32.5% reduction in energy consumption*)
- `Results in 45% GHG reductions vs 1990 by 2030 – *many argue this is insufficient*
- Includes projections out to 2070

8 scenarios developed, in 3 categories



- CATEGORY 1: -80% by 2050 excluding LULUCF, with reductions driven by
 - Electrification
 - Hydrogen
 - Production and use of e-fuels (power to X)
 - Energy Efficiency in buildings, industry and transport
 - Circular economy in industry and (to a lesser extent) transport
- CATEGORY 2: "COMBO" scenario combining Category 1 pathways on a moderate basis (reaches ~85% + 5% sink)
- CATEGORY 3: 1.5% degree scenarios, reaching net zero by 2050 (including sinks), achieved by
 - Greater use of negative emissions technologies (BECCS)
 - Sustainable lifestyles: consumer choice in transport, circular economy in industry

Common features of Category 1 scenarios



Table 26: Major common characteristics of Scenario Category 1

Level of Ambition
<ul style="list-style-type: none">• Around -80% GHG emission reductions in 2050 (excluding LULUCF)
Main Common Assumptions
<ul style="list-style-type: none">• Market Coordination for infrastructure deployment.• Significant learning by doing for low carbon technologies.
No Regret Options
<ul style="list-style-type: none">• Intensification of Energy Efficiency post-2030 across the energy system.• Average renovation rate of buildings post 2030 is minimum double than the historical rates.• Smoothened electricity consumption patterns, driven by increased self-consumption, demand response and digitalisation (making smart appliances/building control functions wide-spread).• Development of electricity storage for better integration of RES• Moderate circular economy measures, with increased resource efficiency and improved waste management compared to today
Renewable Energy
<ul style="list-style-type: none">• High penetration of RES in Power Generation, but also in heating & cooling.• Increase in the advanced biofuel (and bio-methane) mandate in Transport, reaching at least 25% in total transport fuels (excluding electricity and hydrogen) by 2050.• Biomass imports limited post-2030, close to 2015 levels (approx. 12 Mtoe)
Power Sector
<ul style="list-style-type: none">• Power is nearly decarbonized by 2050.• Nuclear still plays a role in the power sector.• CCS deployment faces limitations until 2050. These are relaxed post-2050.
Transport Sector
<ul style="list-style-type: none">• Higher intensity of policies post-2030 relative to the Baseline.• Measures increasing the efficiency of the transport system (i.e. digital technologies, connected, cooperative and automated mobility, smart pricing, encouraging multi-modality and shifts to lower emission transport modes).• Ambitious CO2 standards for LDVs and HDVs in all scenarios.• Connected, cooperative and automated mobility.
ETS
<ul style="list-style-type: none">• Common carbon price for all scenarios in Scenario Group 1.

Source: https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf

Differences in Category 1 scenarios



Table 28: Main differences in assumptions of Scenario Category 1

Sector	ELEC	H2	P2X	EE	CIRC
Buildings	Promoting use of electricity for heating.	Promoting use of carbon neutral gases.	Promoting use of carbon neutral gases.	High rate and depth of renovations. Further improved energy efficiency in appliances.	Reduced renovation costs due to material efficiency and substitution.
Industry	Electrification for part of high temperature heat.	Direct use of hydrogen in high temperature furnaces.		Further improved energy efficiency in industrial heat applications and equipment. Waste heat recovery.	Changing industrial value chain, more circular, more recycling, reduced primary industrial output on average 10%. Waste heat recovery.
Transport	Optimistic learning assumptions for batteries. Standards for cars reach 16 gCO ₂ /km (WLTP cycle) in 2050 and become zero from 2060 onwards.	Optimistic learning assumptions for fuel cells. Large scale availability of H ₂ refuelling stations. Standards for cars reach 18 gCO ₂ /km in 2050	Standards for cars reach 30 gCO ₂ /km in 2050	Further improved energy efficiency of vehicles. Higher model shift towards rail, waterborne transport and collective transport modes in the urban environment. Standards for cars reach 23 gCO ₂ /km in 2050	Integrating the sharing economy and connected, cooperative and automated mobility. More efficient logistics. Standards for cars reach 30 gCO ₂ /km in 2050
Other		Share of hydrogen in distributed gas of up to 50% in 2050 and 70% in 2070. Hydrogen production provides indirect electricity storage.	Share of e-gas in gas distribution grid up to 60%. E-gas production provides indirect electricity storage.		

Source: https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf

Top lines of the Communication



“The aim of this long-term strategy is to confirm Europe’s commitment to lead in global climate action and to present a vision that can lead to achieving net-zero greenhouse gas emissions by 2050 through a socially-fair transition in a cost-efficient manner.”

- We can and should reach net zero by 2050.
- It is affordable and there are plenty of co-benefits.
- Existing technologies can get us a long way, and to get all the way to zero we can focus more on technologies or on behaviour change.
- It is a vision to set direction of travel: does not propose new policies or revision of 2030 targets.

=> It is a conversation starter: not legally binding, and not yet a true strategy

What happens next?



- Deadline for submitting LTS to UNFCCC is end of 2020
- Political endorsement is needed: Heads of State should issue conclusions on the top lines and the European Parliament will also give a view
 - *Council endorsement could occur at any of several meetings in coming months – Sibiu summit in May?*
 - *Sectoral Councils should also be invited to consider the contents*
 - *European Parliament will prepare a resolution by March*
- Then Commission will prepare a short document to submit to UNFCCC
- In terms of underpinning policies and making the strategy “live”: European Commission work programme for 2019-2024 mandate is an important landing point
 - *Priorities will be determined during 2019*

For more details:



- Overall page:
https://ec.europa.eu/clima/policies/strategies/2050_en
- Communication (narrative document, 25 pages)
https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_en.pdf
- In-depth technical analysis (393 pages)
https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf

The background is a solid teal color with several overlapping, wavy, semi-transparent shapes in various shades of teal and light green, creating a layered, organic effect. A thin, bright yellow line curves across the lower portion of the image.

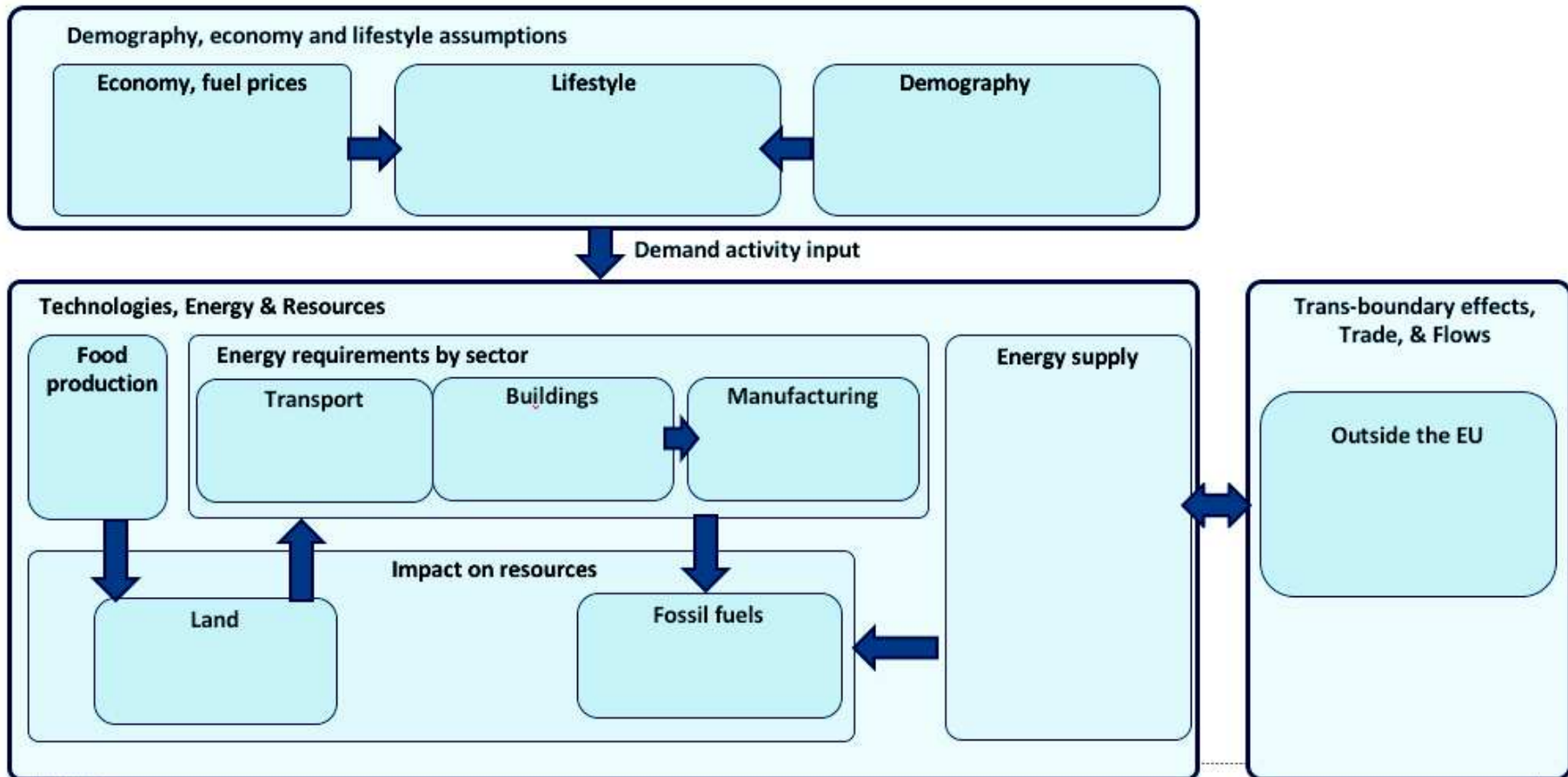
Thank you!

erica.hope@Europeanclimate.org

Back-up slides

The background is a solid teal color with several overlapping, wavy, semi-transparent shapes in various shades of teal and green. A single, solid yellow line curves across the lower portion of the slide.

Structure of the CTI 2050 Roadmap tool



Levers are grouped in 7 categories to discuss scenarios implications

Category	Description
Social patterns	Demand-side levers driven by social context and lifestyles
Societal organization	Demand-side levers driven by infrastructures and business models
Process improvements and energy efficiency	Technologies to improve processes and energy efficiency
Fuel switch and electrification	Switching to low-carbon fuels
Zero-carbon power production	Power supply specific levers
CCS/BECCS	Carbon Capture & storage potentially combined with bioenergy
Land-use sinks	Increasing natural sinks through land use

— Summer 2018: testing, scenario development



elementenergy



IBERDROLA



Department for
Business, Energy
& Industrial Strategy

IDDRI



E3G

CLIMATE & STRATEGY
PARTNERS



**Friends of
the Earth**



Institute for
European
Environmental
Policy



Agora
Energiewende



**The Coalition for
ENERGY SAVINGS**

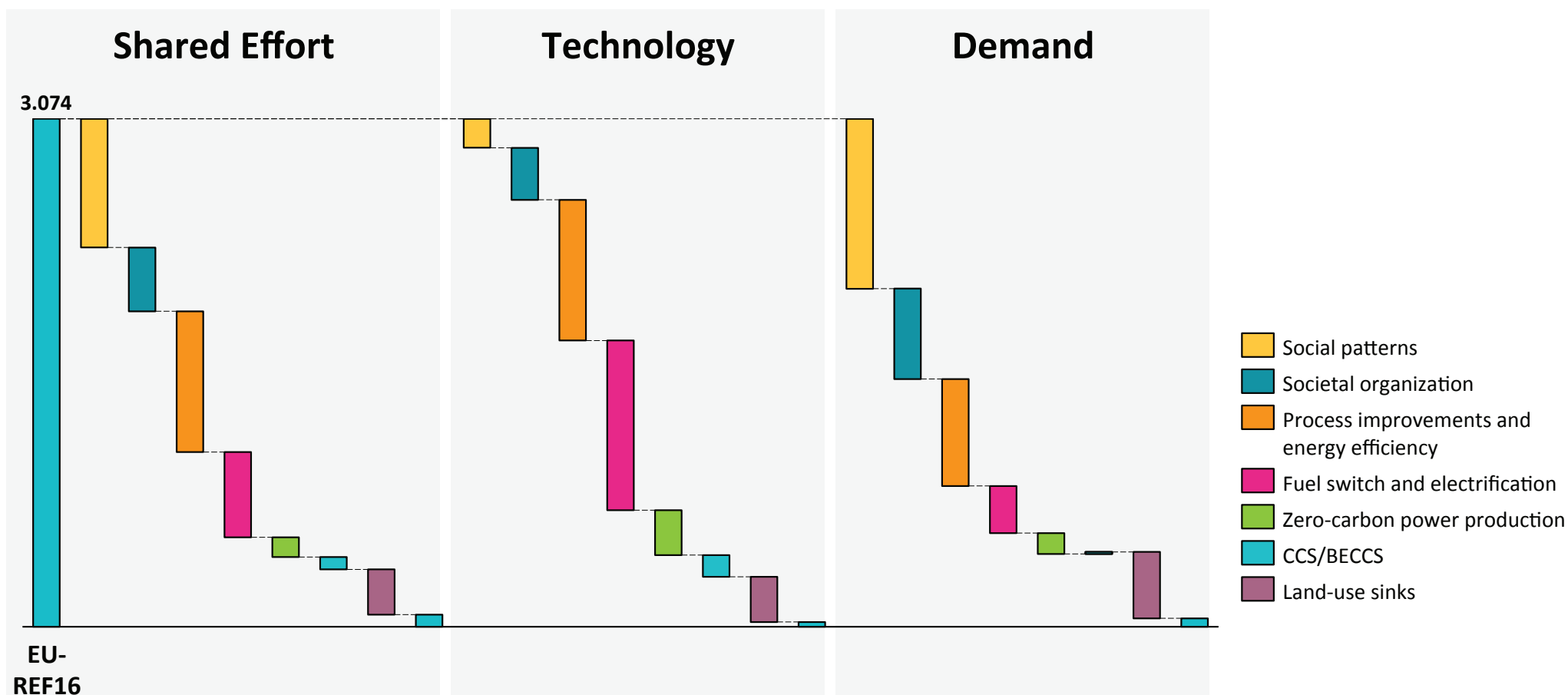


**Grantham
Research Institute
on Climate Change
and the Environment**

The impact of key lever groups differs significantly across the three scenarios

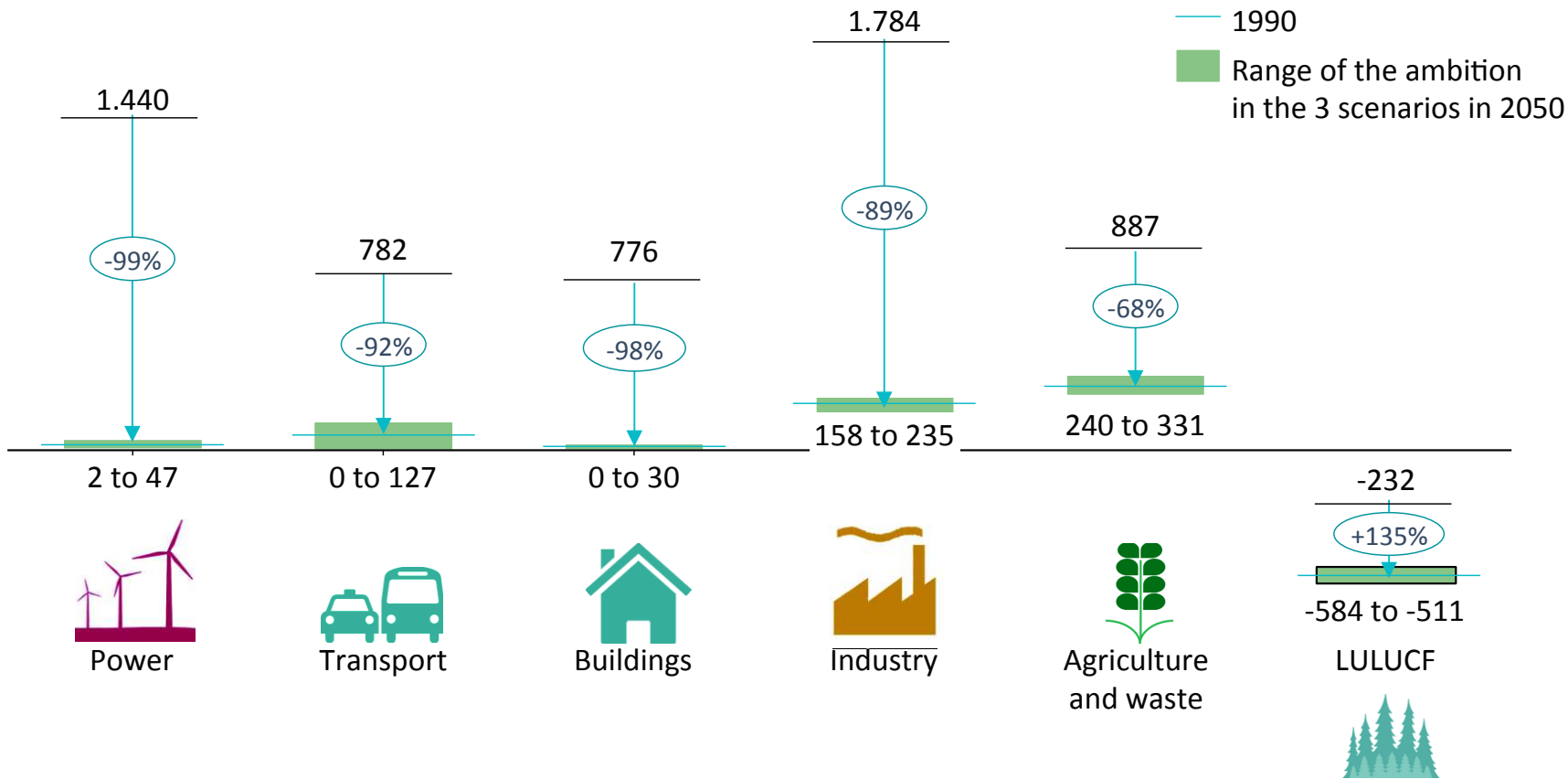
GHG emissions by lever category in the 3 net-zero scenarios

[MtCO₂e]



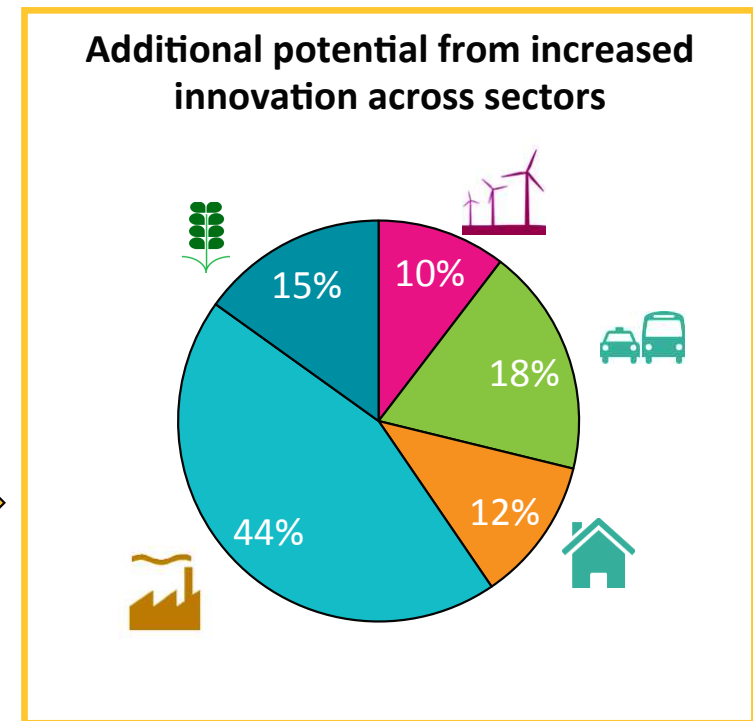
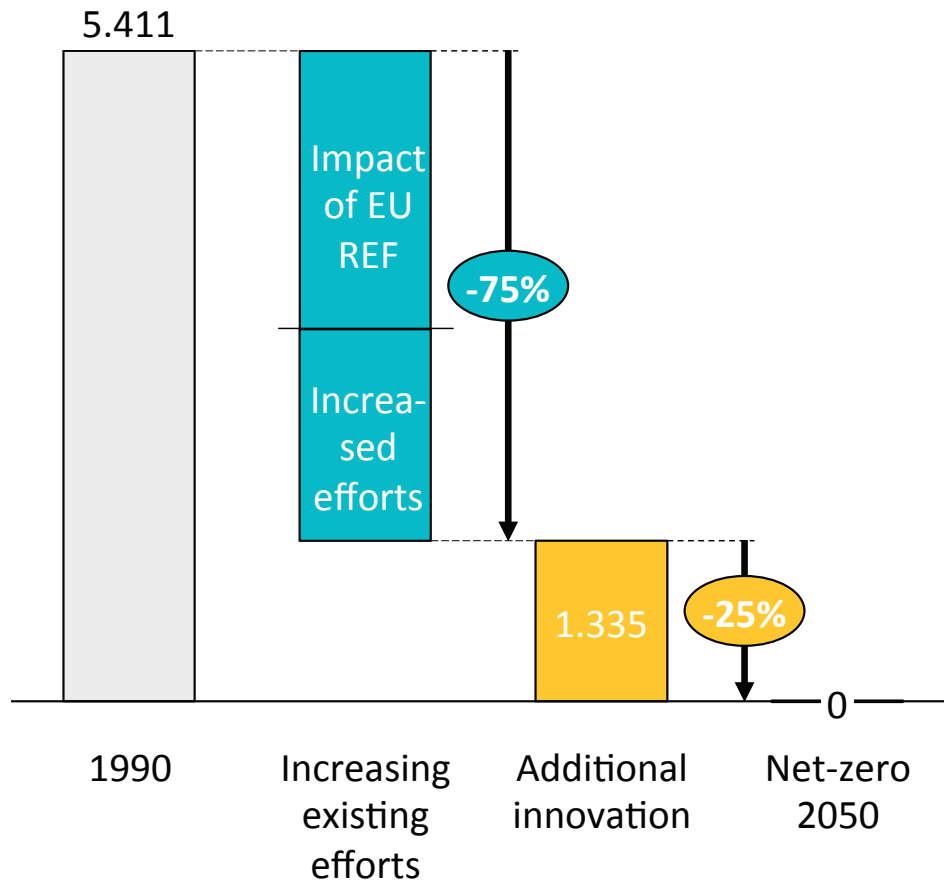
High ambition is required in all sectors, whatever the chosen pathway

GHG emission reductions by sector between 1990 and 2050 in the 3 net-zero scenarios (Shared efforts, Technology, Demand) [MtCO₂e/year]



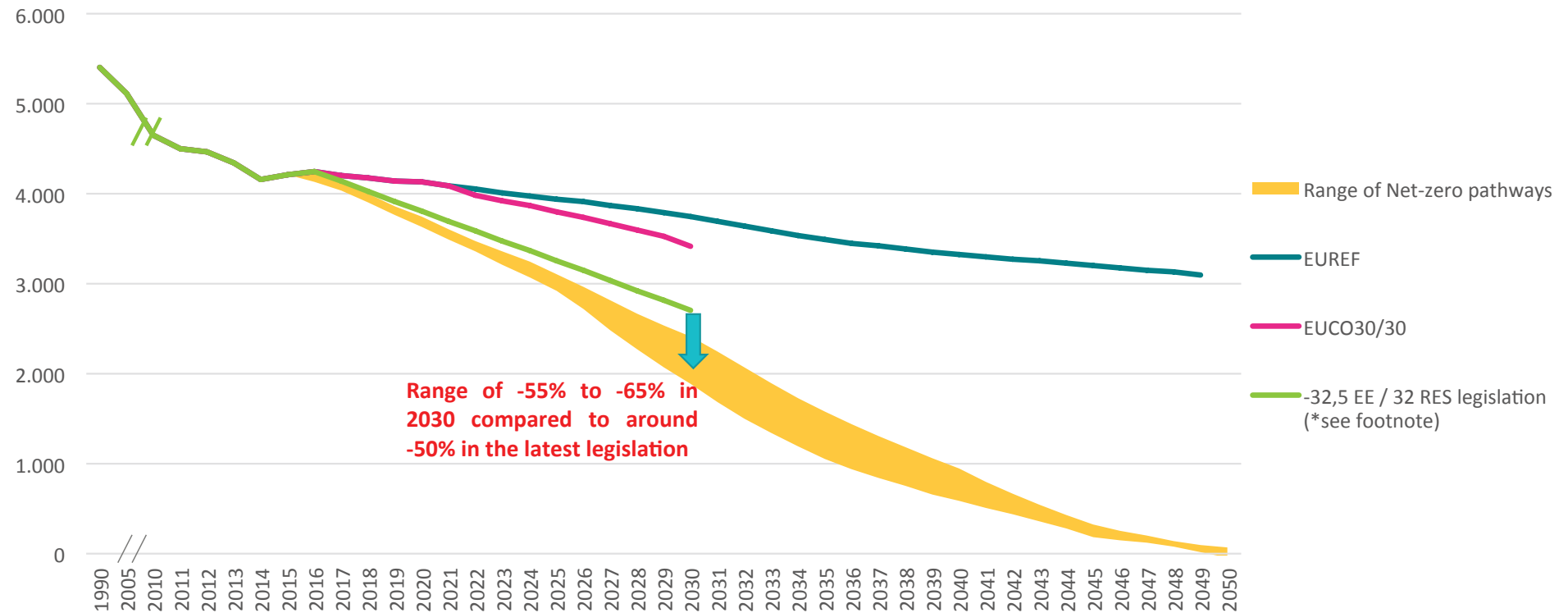
Net zero requires increasing existing efforts and solutions, as well as upscaling the commercialization and deployment of new technologies and the innovation in business models

[MtCO₂e]








The 2030 ambition needs to be increased level to be in line with net-zero scenarios.

EU GHG Emissions [MtCO₂e]

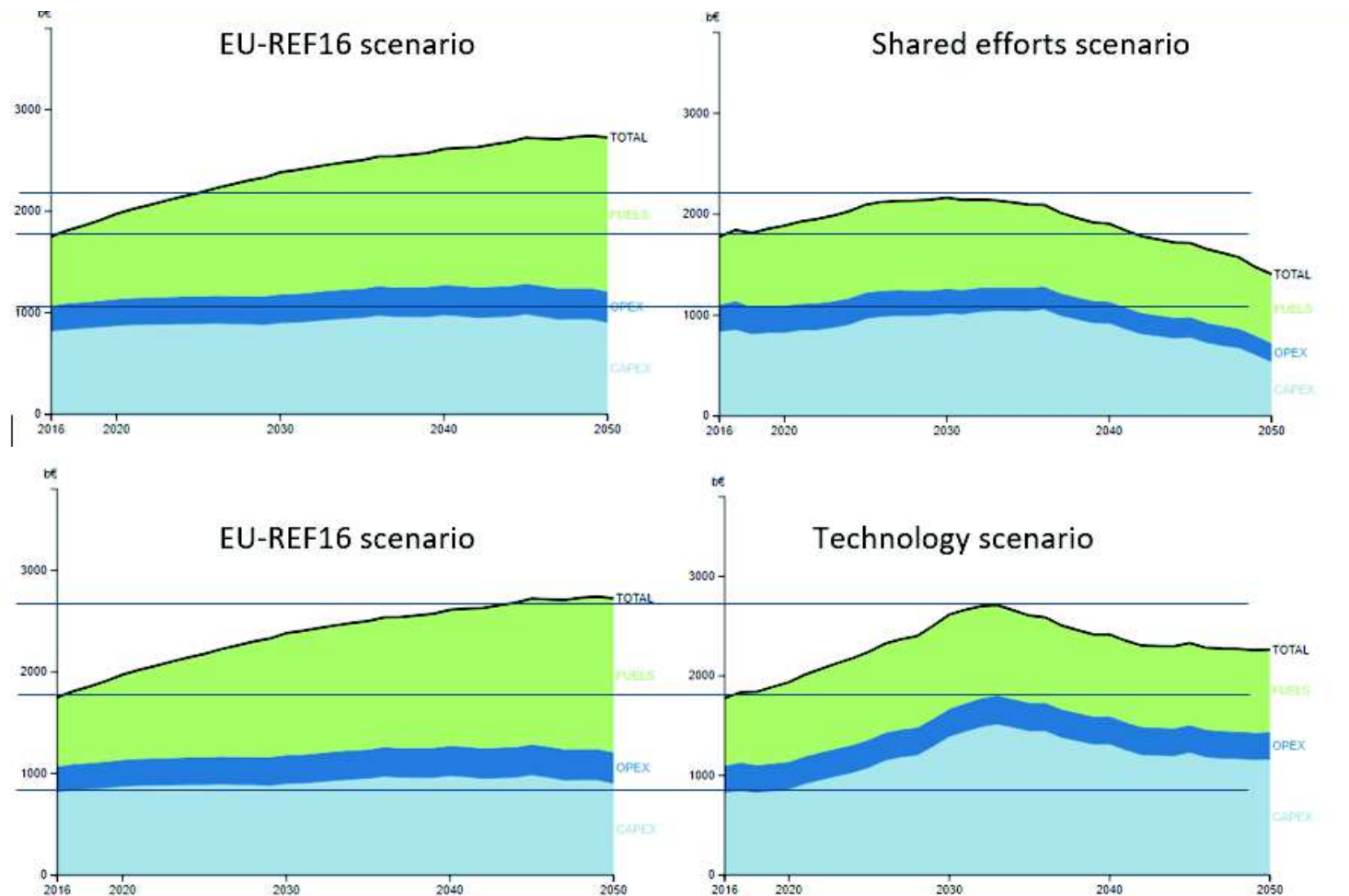


* This scenario is based on the latest « Non paper on complementary economic modelling undertaken by DG ENER regarding different energy policy scenarios » and is using the 33% RES / 33% EE figure for 2030, with a linear interpolation from 2016, so it slightly overestimating the latest legislation

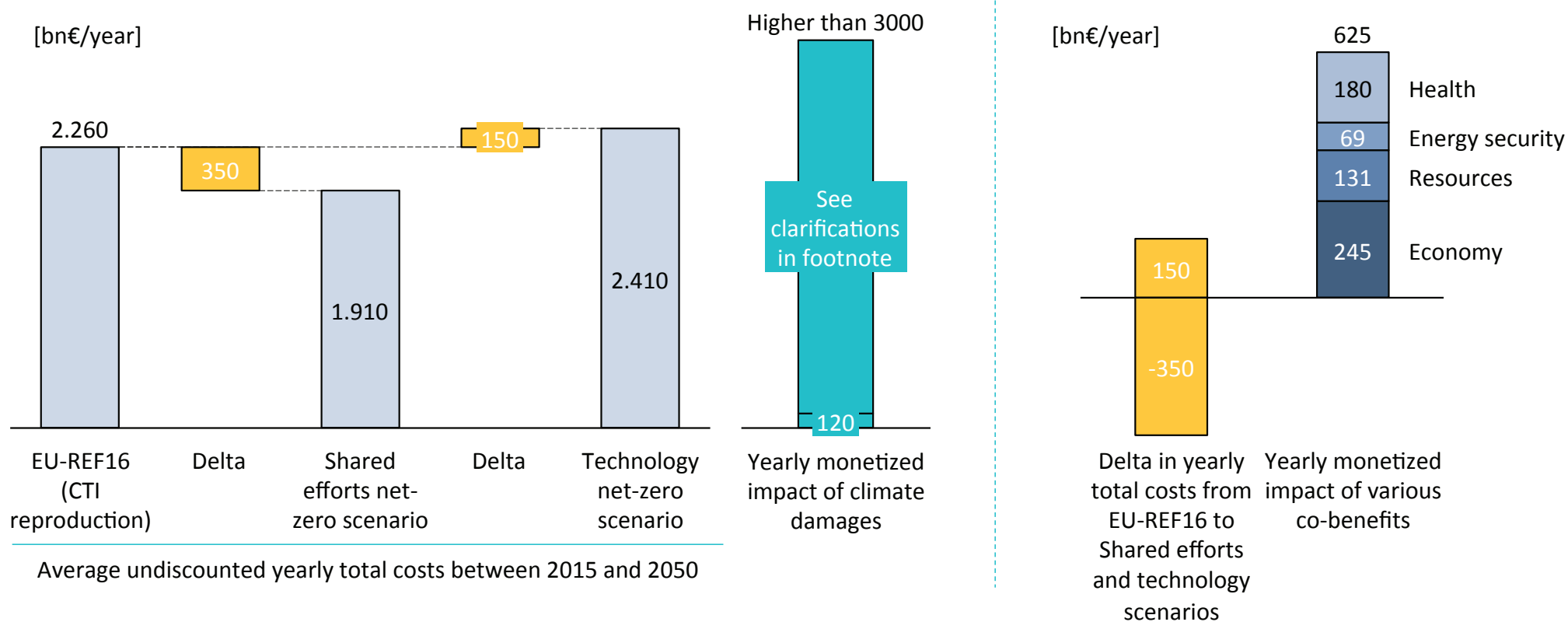
There are « no-regret » actions to implement by 2030

	Sector	Example of “no-regret” action
	Transport	<ul style="list-style-type: none">- Stabilizing transport demand- The car share decreases to 70% from around 80% today
	Buildings	<ul style="list-style-type: none">- Reaching 3% annual renovation rate (deep retrofit)- Sector transition: From 2030, new buildings must be « energy positive »
	Industry	<ul style="list-style-type: none">- Significantly reducing the demand for material and products (functional economy, circular economy, innovation)
	Power	<ul style="list-style-type: none">- Nearly complete phase-out of coal- Wind and solar should reach at least 50% of power production
	AFOLU	<ul style="list-style-type: none">- land-use must fully integrate climate change- Design incentives for afforestation- Meat consumption must be reduced by at least 25%

Net-zero GHG emissions pathways can be cost-negative in the medium to long term, particularly if social and business model innovation can be channelled to increase asset utilisation



Total energy system costs are lower than climate damages and their difference to business-as-usual is lower than the co-benefits that are reaped



Source: Yearly costs are from the EU-CTI 2050 Roadmap project, co-benefits are derived from the COMBI project <https://combi-project.eu/> and they are focused on buildings, transport and industry efficiency so they should be taken as a minimum amount, figures specifically for health are from a study by DG Energy (2018), and the impact from climate damages is based on EEA report on "Climate change, impacts and vulnerability in Europe 2016" and finally the article by Burke et al. in Nature « Large potential reduction in economic damages under UN mitigation targets" comes to potential damages of US\$ 20 trillions globally. Taking today's share of Europe in global GDP of ~17% this would lead to a figure around EUR 3000 to 4000 billions, significantly above the costs and investment requirements.