PARIS REINFORCE

Switzerland Stakeholder Workshop

Insights from existing EU modelling studies

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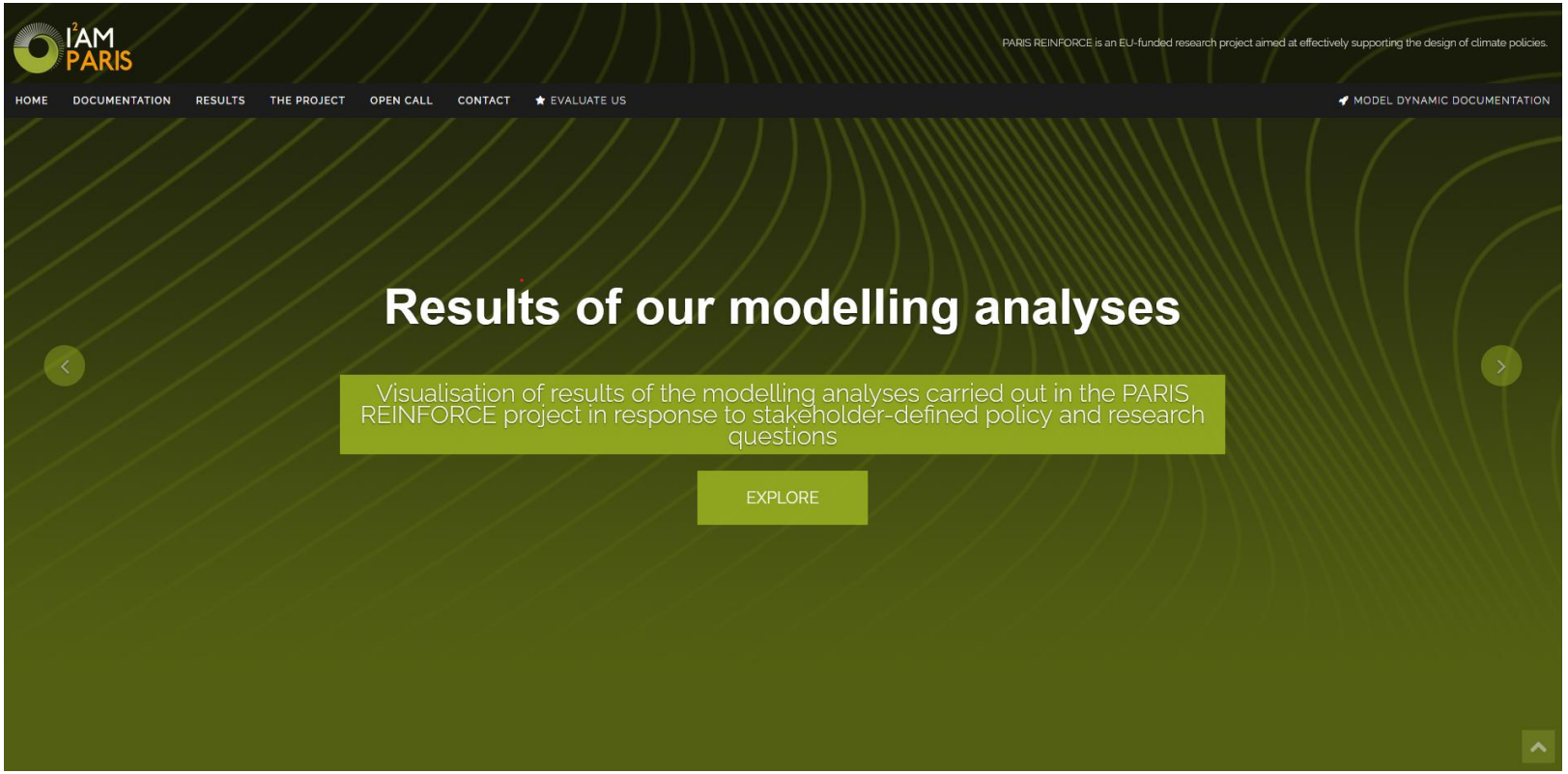
www.paris-reinforce.eu

Content

- Overview of the I²AM PARIS Platform
  - www.i2am-paris.eu
- EU modelling exercises:
  - Where is the EU headed?
    - A modelling exercise done with the Paris Reinforce models' ensemble
  - Deeper decarbonization in EU
    - A GHG reduction of -80% in 2050
    - First insights on post-COVID and EU Green Deal scenarios

The PARIS REINFORCE project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No 820846.

- www.i2am-paris.eu



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Where is the EU headed?

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- ***Scenario logic: Where are We headed scenarios*** *(Sognnaes et al.)*

  - The scenario is designed to **reflect current levels of mitigation efforts in the EU**, considering current policies

  - **Beyond 2030:**
    - we use the carbon prices that, on their own (absent other current policies), achieve the same levels of emissions as current policies in 2030. We call these carbon prices: ***equivalent carbon prices (ECPs)***
    - We extend the ECPs in the EU, **growing at the rate of GDP per capita from 2030 onwards**, to represent a "constant" economic burden from carbon pricing, as proxied by the ratio of carbon price to per capita income over time.

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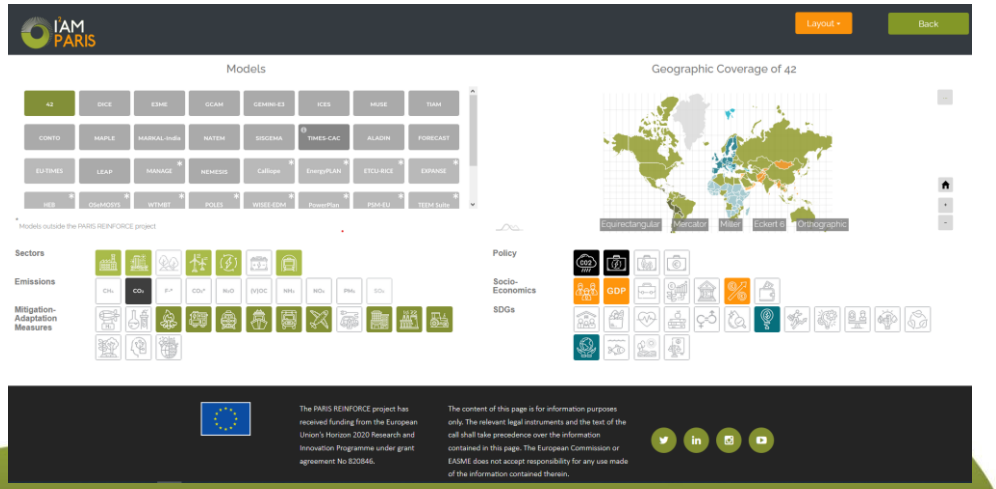
❖ *Modelling tools used*

	Global	EU/EU-National
General equilibrium	GEMINI-E3 ICES (WPS 1.0)	
Partial equilibrium	GCAM (v5.3) TIAM (Grantham)	
Energy system	MUSE 42	EU-TIMES
Macroeconometric	E3ME (v6.1)	NEMESIS
Sectoral		ALADIN FORECAST

Models' documentation on the I²AM Paris Platform (https://paris-reinforce.epu.ntua.gr/main)



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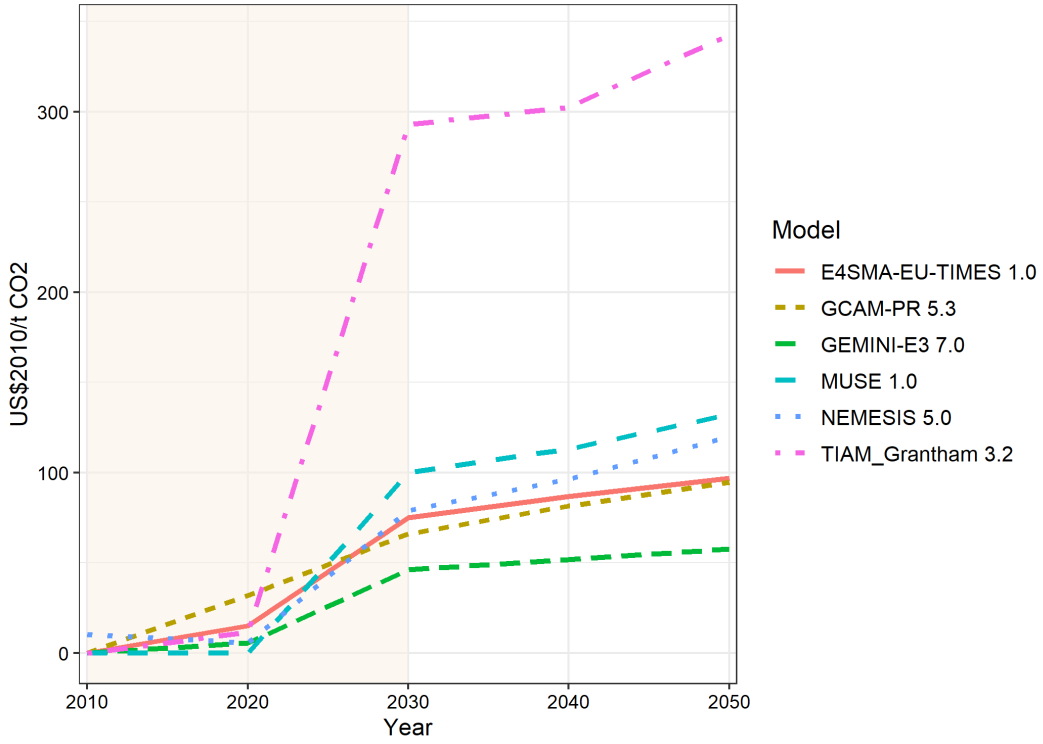
❖ *(Equivalent) Carbon prices*



Source: Nikas et al. (in revision)

Carbon prices in EU models in 2030

(US_{2010}/tCO_2)	NEMESIS	EU-TIMES	Vielle (2019)
EU-ETS	80.8	79.7	54.8
ESR	77.0	70.6	249.2
	(0 - 416)	*(0 - 616)*	*(0-661)*

ESR: weighted mean, in brakets (min – max)

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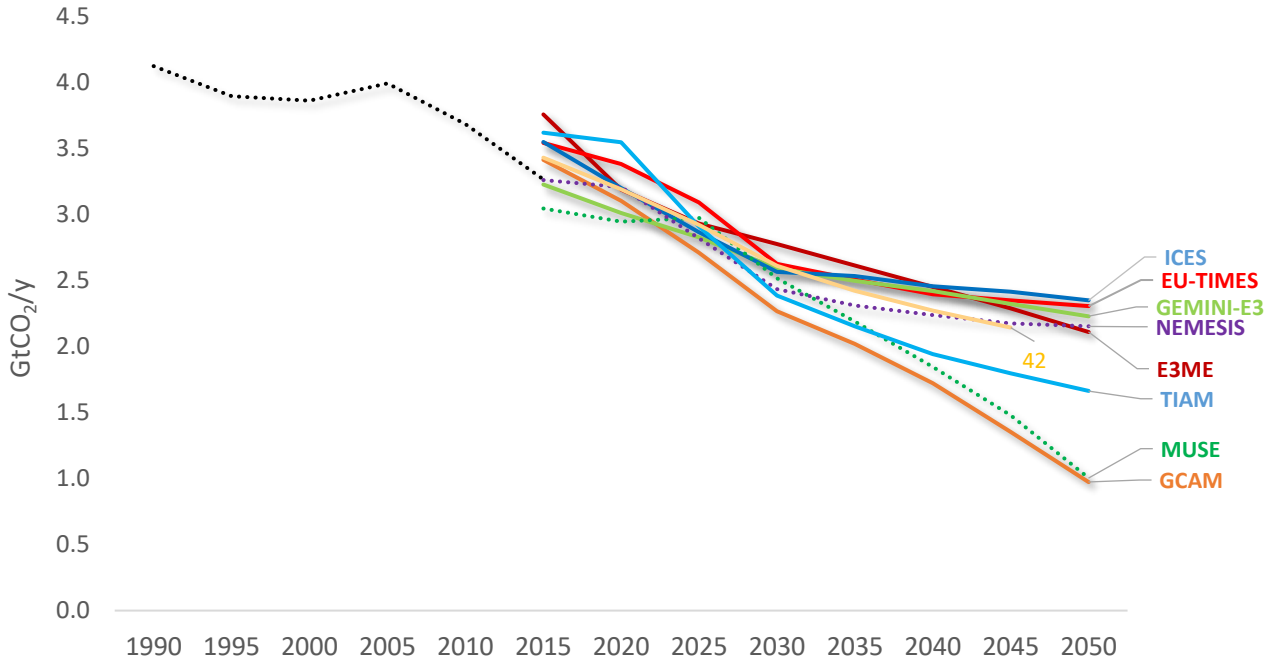
❖ CO_2 emissions from Energy in EU until 2050



CO_2 emissions from energy in the EU across models total values until 2050—black dotted line: historical data from European Environmental Agency (2020)

Source: Nikas et al. (in revision)

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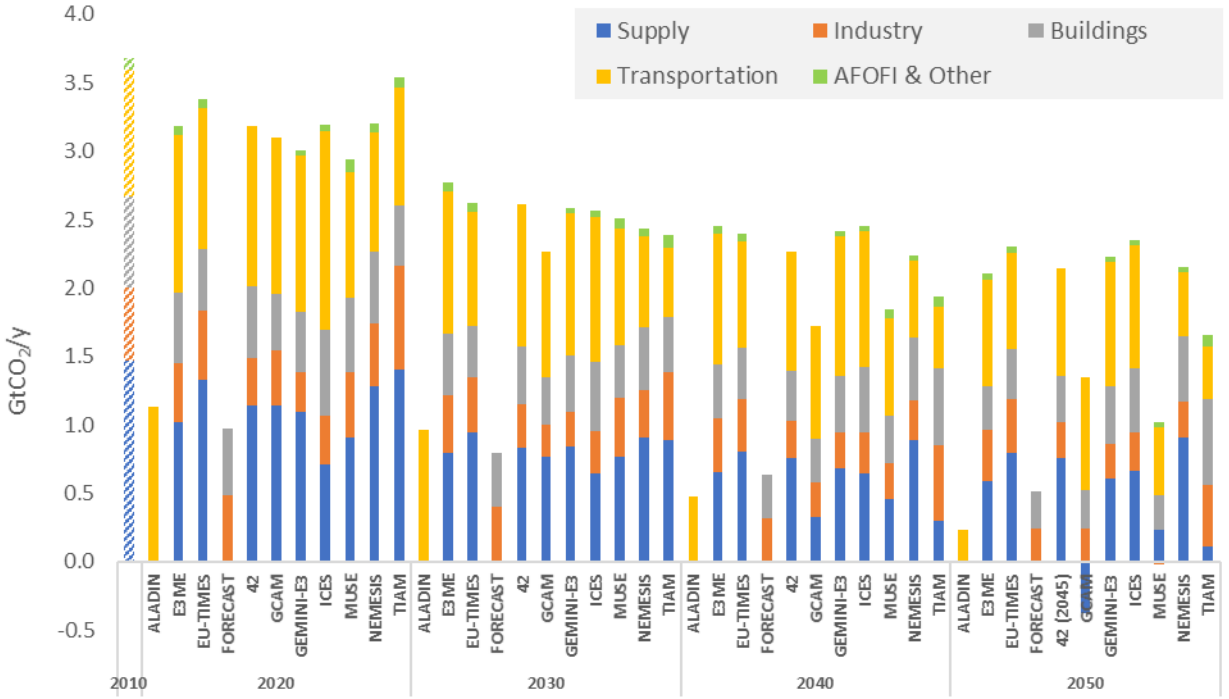
❖ CO_2 emissions from Energy in EU by sector



CO_2 emissions from energy in the EU across models total by sector — hachted bars: historical data from European Environmental Agency (2020)

Source: Nikas et al. (in revision)

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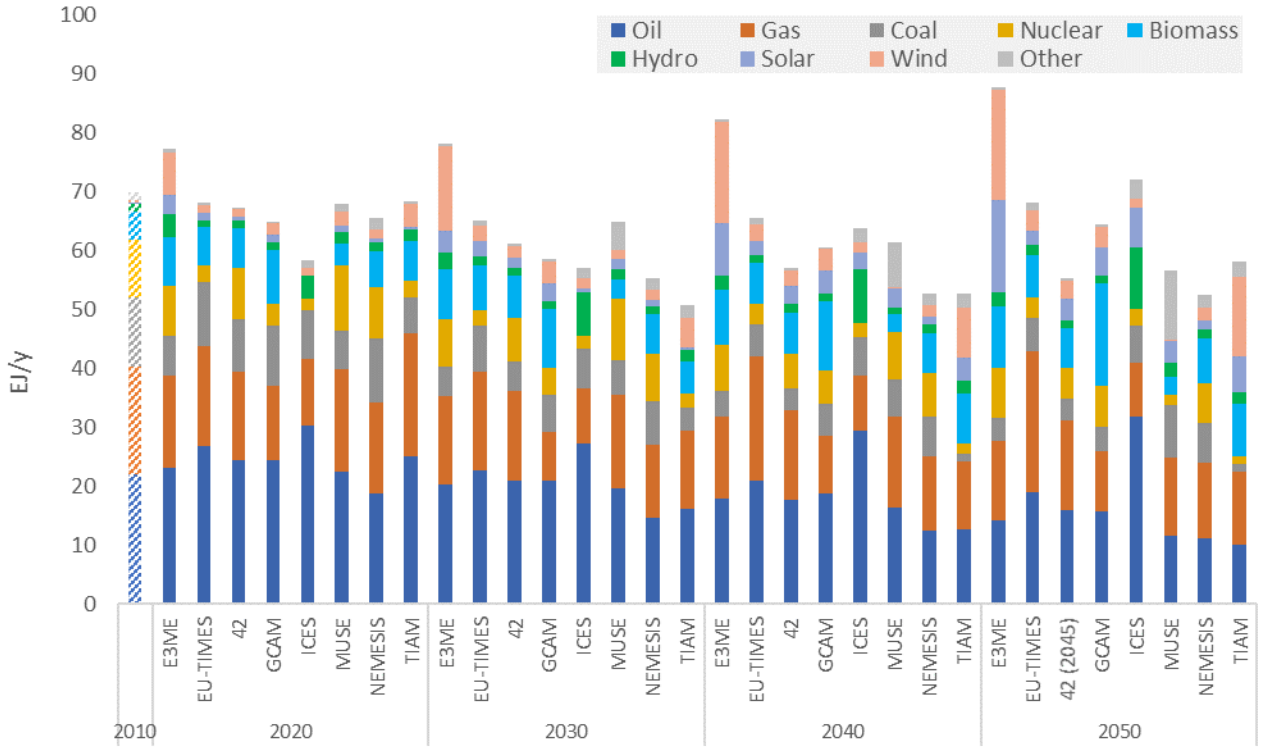
❖ *Primary energy in EU by fuel*



Source: Nikas et al. (in revision)

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Deeper decarbonization

-80% in 2050

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Deeper Decarbonisation – EU NDC (-80%)

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❖ One additional « where are we headed » ran for EU

		"Where are we heading" scenarios	
		Current Policies	**NDCs**
Climate change mitigation actions	**up to 2030**	EU policies as close as possible of legal texts	Reduction of EU GHG emissions by 40% in 2030 in comparison with 1990, following EU-ETS and ESR burden sharing
	After 2030	Project EU climate action using different metrics and/or scenario design	Prolongation of 2020-2030 EU climate change mitigation efforts (-20pp of GHG emissions per decade in comparison with 1990)

(Mt CO_2 eq./y.)	1990	2005	2020	2030	2040	2050
EU-ETS*	--	2 340.30	1 848.80	1 334.00	782.9	242.6
ESR	--	3 021.70	2 729.50	2 110.60	1 506.30	901.9
Total	5 722.90	5 362.00	4 578.30	3 444.60	2 289.20	1 144.60
Reduction Total (w.r.t. 1990)	0%	-6%	-20%	-40%	-60%	-80%
Reduction EU-ETS (w.r.t. 2005)		0%	-21%	-43%	-67%	-90%
Reduction ESR (w.r.t. 2005)		0%	-10%	-30%	-50%	-70%

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Deeper Decarbonisation – EU NDC (-80%)

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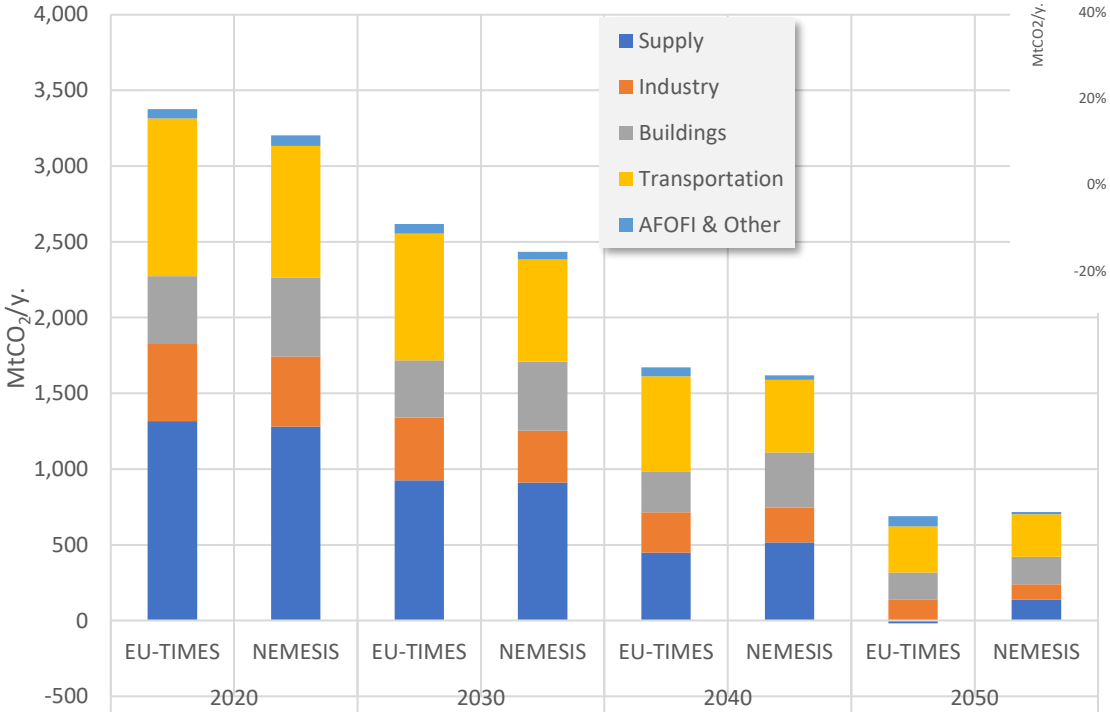
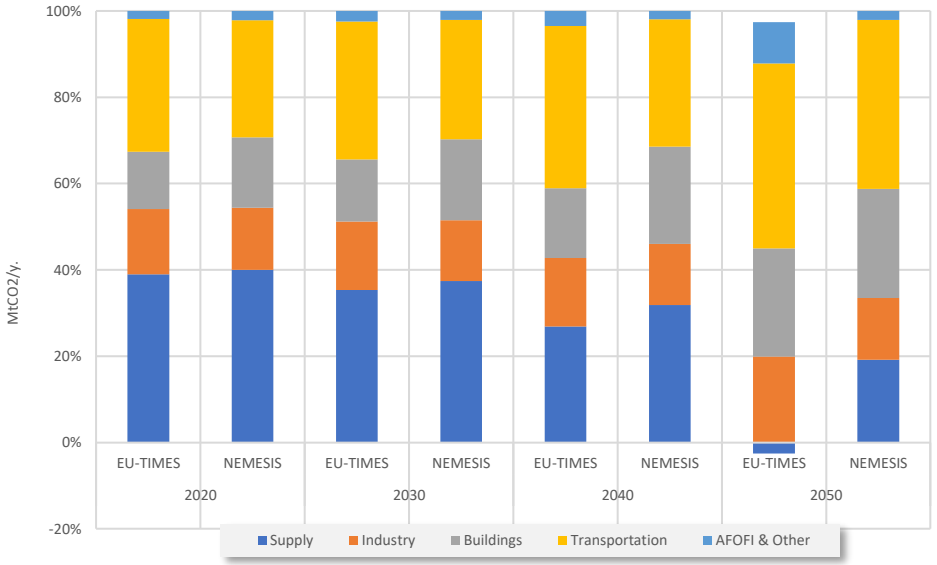
❖ CO_2 emissions from Energy in EU by sector





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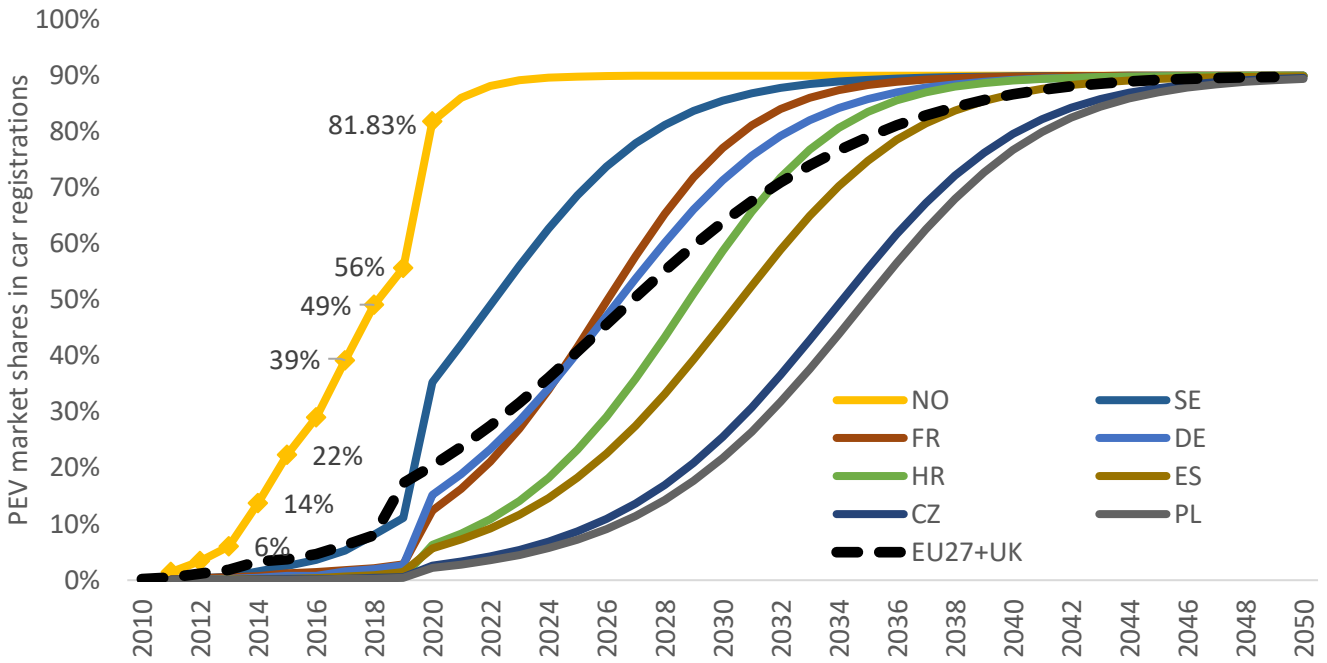
Deeper Decarbonisation – EU NDC (-80%)

❖ Market shares of PEV in car registrations by a selection of EU28+NO countries



Source: ALADIN model

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Deeper decarbonization

Post COVID 19 pandemic & EU Green Deal

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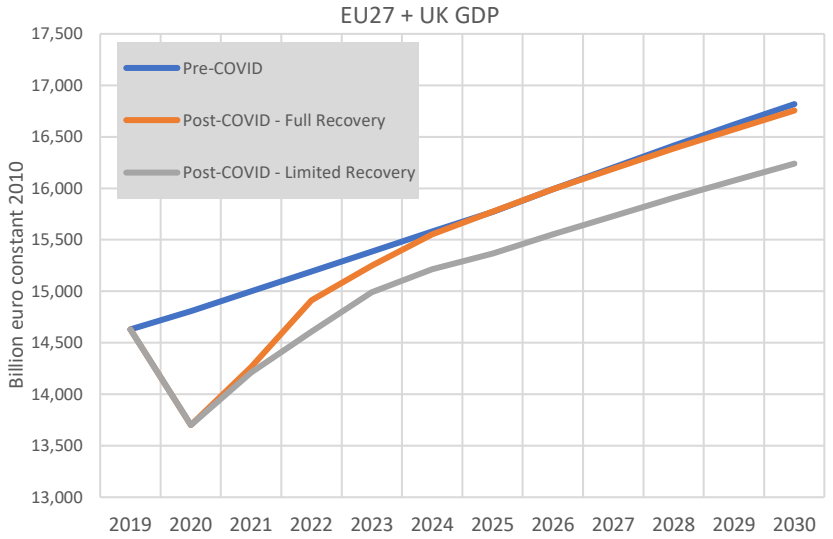
- Scenarios based on three layers:
  - An economic layer:



		EU GDP (bn€$_{2010}$/y.)			Average GDP growth rate (%/y.)		
		2020	2025	2030	2020-2025	2026-2030	2020-2030
Pre-Covid	WWH	14 806.9	15 771.5	16 817.6	1.3%	1.3%	1.3%
Post-Covid	Full Recovery	13 702.2	15 774.4	16 755.3	1.3%	1.2%	1.2%
		-7.5%	*0.0%*	*-0.4%*			
	Limited Recovery	13 702.2	15 365.7	16 240.2	0.8%	1.1%	1.0%
		-7.5%	*-2.6%*	*-3.4%*			

Source: NEMESIS model; in italic percentage deviation with respect to the Pre-Covid WWH scenario.

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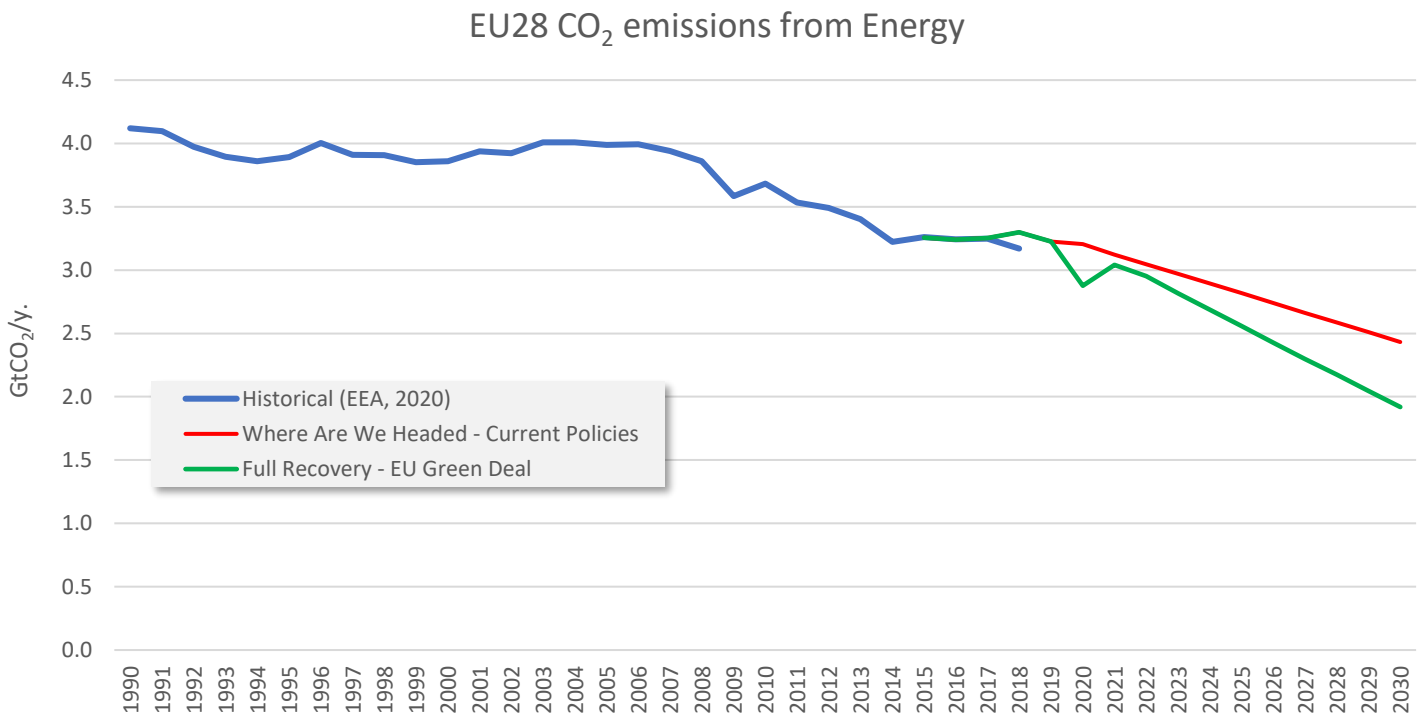
- Scenarios based on three layers:
  - A EU climate policy layer:



Source: NEMESIS model

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COVID19 pandemic and the EU Green Deal

- Scenarios based on three layers:
  - A EU behavioural change layer:

Transformation	*Modelling interpretation*
Behaviour changes due to environmental concerns.	• **Remote working**: change is modelled by projecting **2% higher energy demand in the residential sector** and the counter effect of **6% less private car commutes in the transportation sector**. The percentage of workforce considered is 25% and the share of commutes to work is considered as the 40% of total passenger journeys for 3 days per week. The increase in energy demand of the residential sector is calculated as one third of the decrease in the transport sector. The same increase is accounted to electric consumption and to space heating demand [1]. The effect on the tertiary sector is not modelled in this work due to lack of estimates in literature to date. • Environmental concern and increase of prices in **aviation sector**: change is modelled by projecting **34% lower demand in the aviation sector in 2030**.
Behaviour changes due to COVID-19 pandemic	• **Remote working**: change is modelled by projecting **3.3% higher energy demand in the residential sector** and the counter effect of **10% less private car commutes in the transportation sector**. The percentage of workforce considered is 40% and the share of commutes to work is considered as the 40% of total passenger journeys for 5 days per week. The increase in energy demand of the residential sector is calculated as one third of the decrease in the transport sector. The same increase is accounted to electric consumption and to space heating demand [1]. The effect on the tertiary sector is not modelled in this work due to lack of estimates in literature to date. • Teleconferences: change is modelled by projecting **additional 10% lower energy demand in the aviation sector in 2030** compared to the reduction due to environmental concern.

[1] Estimates of behaviour changes from [1] are derived from NZE scenario
[2] Estimates of behaviour changes from [1] are derived from NZE scenario

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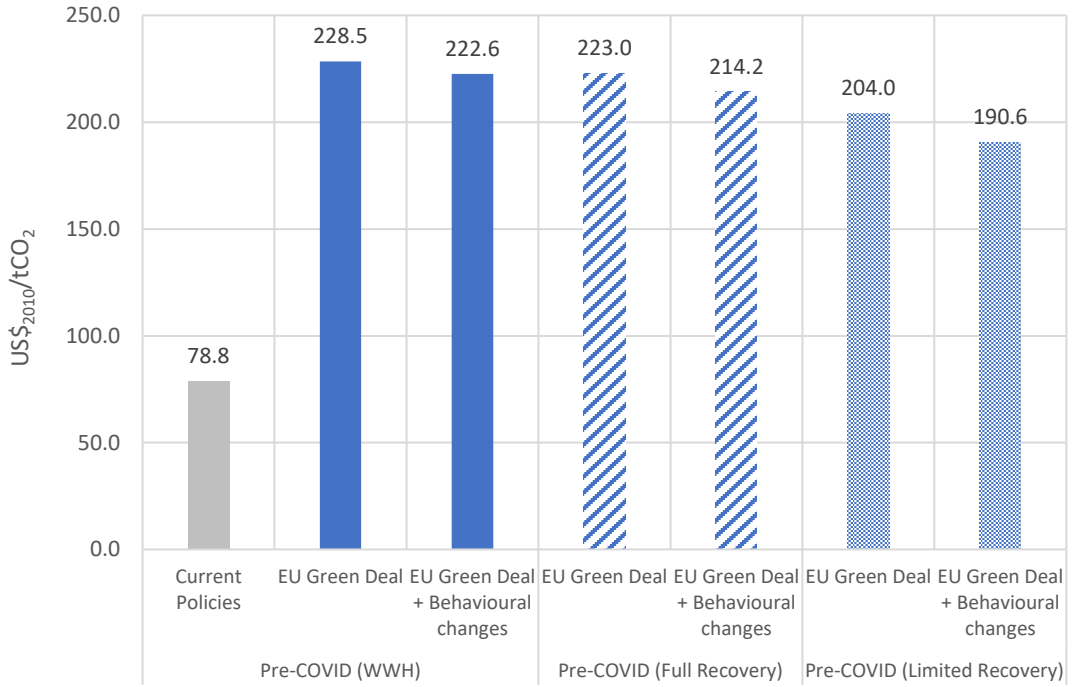
COVID19 pandemic and the EU Green Deal

- The carbon prices



Source: NEMESIS model

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How to implement the -55% in 2030 in EU?

- Enlarging the EU-ETS sector?
  - *Extention to the Transport and/or the Buildings sectors*
- *Implement a common taxation in EU on the ESR sectors*
  - *Problem of unanimity*
  - *What about the use of the taxation revenues*
- *What about the national burden sharing of ESR sector?*
- *How should EU designed its Carbon Border Adjustment*
  - *Pricing: Link with EU-ETS or a specific carbon tax*
  - *Which sectors: EU-ETS or Energy Intensive and Trade Exposed sectors (cement, steel, etc…)*
  - *Which regions: all, excluding developing countries or based on environmental considerations*
  - *Etc..*

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Thank You

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