AMO.CZ

MAY 2024

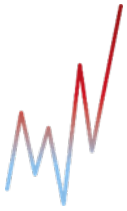
POLICY BRIEF | 04

2040 Climate Target for Czechia

Current policy, ambition gap and sectoral analysis

Kristina Zindulková (ed.)

CLIMATE PAPER No. 28



Acknowledgements

Publication of this report is part of the project on the EU climate ambition by 2040, partnered with the Ecologic Institute and supported by the European Climate Initiative (EUKI) and the Federal Ministry of Economy and Climate Action (BMWK) of Germany. Opinions expressed in this report represent the views of the authors and the responsibility for the content of this publication lies solely with the authors.

Authors

Editor and main author: Kristina Zindulková
Contributors: Oldřich Sklenář (on Industry, Transport), Michaela Kožmínová (on Agriculture), Martin Abel (on Waste), Barbora Chmelová (on LULUCF), Barbora Kvasničková (on Technological removals), Tomáš Jungwirth Březovský

Executive summary

On the EU 2040 target:

1. In February 2024, the European Commission launched a crucial and difficult conversation by publishing a recommendation to aim at a 90% emissions reduction by 2040. This was based on the impact assessment scenarios and the advice of the European Scientific Advisory Board on Climate Change, and lays the foundation for possibly the most important milestone on the way to EU climate neutrality by mid-century. The conversation is inherently sensitive as it requires states and industries to consider decarbonisation of all sectors and all processes beyond the low-hanging fruits of shutting down the most polluting power plants, and opens questions on many structural changes it would require, as well as the impacts on business, labour markets, households or even the Union's geopolitical standing. The 2040 target recommendation stimulates a number of questions about policy requirements, sectoral contributions, additional investment demands or socioeconomic implications.
2. The 2040-related conversation in Czechia shows that **it is not helpful to frame the EU's proposed climate target by 2040 of 90% greenhouse gas net reduction compared to 1990 levels as "business-as-usual plus",** which would be one possible interpretation of the Commission's communication. On the contrary, an EU yearly emissions reduction rate of 3,5% relative to 1990 would be needed to achieve the 90% target, while the EU annual average reduction between 1990 and 2020 was at a rate of about 1,1%. There should be an open and honest debate about all the required behavioural, socio-economic, regulatory and technological changes that need to be implemented to achieve this goal. This report is intended to contribute to this question.
3. Government reception of the Commission's communication on the 2040 climate target has been mixed in Czechia. **The Czech government framework position questions the choice of the 90% reduction goal among the other discussed options for levels of ambition,** and asks for a more detailed impact assessment. Doubts remain around the assumptions about both natural and technological carbon sinks potential and the role of hydrogen.

On the Czech climate policy and contribution to the 2040 target:

4. **The time of publication of this report corresponds to the period of updating the main climate and energy policies**: the State Energy Policy originally from 2015, the Climate Protection Policy approved in 2017, and the National Energy and Climate Plan from 2020, are all to be updated in 2024. These documents define the Czech climate targets and strategies, and are tightly linked to the EU climate policy (ie. EU ETS 1 and 2 common targets, the Czech contribution to the ESR target, RES and energy efficiency, LULUCF etc., see the table below).
5. The updating of all documents is expected to bring major changes, including increased climate ambition, the 2033 coal phase-out target, new 2030 emissions and RES share targets (NECP), and the 2040 emissions target (in the CPP). Increasingly, it is becoming apparent that Czechia (with GDP currently standing at 94% of the EU27 average in PPP) will not legitimately be able to set a climate target well below the majority of EU Member States as was the case in the past.
6. **Czech climate policy is guided by SEEPIA modelling.** The "WAM3" scenario drafted for the update of the Czech National Energy and Climate Plan and other strategic documents envisages **a gross reduction in GHG**

emissions of 82% by 2040 compared to 1990 levels (without LULUCF). However, the scenarios with existing (WEM) and with additional measures (WAM)[1] proposed by the model do not differ significantly, which might again disclose the fundamental and systemic changes necessary for thorough decarbonisation, framing the process as business-as-usual plus. A "Net-Zero 2050" scenario drafted by AMO utilising the Pathways Explorer tool sets a prospective gross emissions reduction of 86% for the same time frame. See the table below for scenario comparison.

7. As for the 2040 target, the indicative 64% emissions reduction target set in the outdated CPP is far from the EU Member State current average of 86% for the year 2040, counted as an average of the existing indicative and binding targets. It is yet further away from the recommended EU 2040 reduction target of 90%. The 82% reduction stemming from the NECP WAM3 scenario reaches much closer.

Table A: Comparison of GHG emissions reduction by 2040 in Czech decarbonisation scenarios

Original goal of the CPP	-64% (to 70 Mt CO2eq)
McKinsey & Co scenario	-77% (excl. LULUCF)
SEEPIA WEM scenario	-76% (excl. LULUCF)
SEEPIA WAM3 scenario	-82% (excl. LULUCF)
AMO Net-Zero 2050	-86% (excl. LULUCF)

Source: authors

On the sectoral contributions:

8. In the SEEPIA scenario, **the biggest contribution to the 2040 emissions reduction target is expected in electricity production and industry covered by EU ETS 1** (90% reduction compared to 2021 in WAM3), which also achieved the fastest reduction between 2005 and 2021 (-30%). In the AMO Net-Zero scenario, heat and power production and industry reach 83% and 82% reductions by 2040 from 2021, respectively. By the 2030s, the emissions fall is driven by the gradual coal phase-out and given the RES prices, the cost-optimisation SEEPIA model drives coal down very fast. Nevertheless**, it is still a major challenge for Czech politics to enable the conditions for such a transformation** and overcome the non-economic barriers of RES share acceleration.
9. From 1990, emissions in buildings decreased by 62% to 2021 and are modeled to decrease by another 86% between 2021 and 2040 in the AMO Net-Zero. To the contrary, **emissions in transport rose by 62% from 1990 to 2021**, so the 62% reduction by 2040 envisaged in the AMO Net-Zero scenario poses the considerable challenge of curbing this trend. In the WAM3 SEEPIA scenario, the ESR emissions without agriculture and waste are expected to decrease by 56% by 2040 relative to 2021. The prospective extension of the EU ETS to these sectors is meant to create appropriate price signals in these sectors, while the successful decarbonisation of these sectors depends also on the Czech authorities' approach towards alleviating regressive distributional effects of such mitigation policies and **protecting vulnerable households in relation to a deteriorating socio-political context**, avoiding social backlash.

[1] WAM scenario refers to a more ambitious scenario "with additional measures". The WAM3 scenario is one of the SEEPIA variants of WAM chosen as a basis for the NECP.

10. The contribution of **thus far overlooked sectors including agriculture and waste** will matter in the 2040 emissions pathway. Between 2005 and 2021, emissions in agriculture stagnated while emissions from the waste sector increased by a third. The SEEPIA model, however, does not include these emissions in the modelling, instead it assumes reductions based on other scenarios.
11. The LULUCF sector remains an issue, currently contributing significantly to Czechia's overall emissions balance, **emitting a similar amount as agriculture instead of behaving as an emissions sink**. This is due to the bark beetle outbreak in Czech forests. The scenarios assume the trend will turn and LULUCF will again turn into a net sink.

Table B: Czech GHG emissions in 2021 and 2040 according to SEEPIA WEM and WAM3 scenarios, split into ETS1 and ESR

Sectors in Czechia	Shares 2021[2]	2005-2021 change	2021-2040: SEEPIA WEM	2021-2040: SEEPIA WAM3
ETS1	49%	-30%	-74%	-90%
ESR (without Agri and Waste)	40%	-14%	-50%	-56%
Agriculture	7%	0%	-15%	-15%
Waste	5%	+33%	-77%	-77%
LULUCF	7%	+117%	-148%	-148%
Total emissions (excl. LULUCF)	100%	-21%	-60% (or 76% /1990)	-70% (or -82% /1990)

Source: authors, based on SEEPIA, Eurostat and Facts about climate

Table C: Czech GHG emissions in 2021 and 2040 according to AMO Net-Zero 2050, split into sectors

Sectors in Czechia	Shares 2021	1990-2021 change	2021-2040: AMO Net-Zero
Energy (heat and power production)	33%	-28%	-83%
Industry	28%	-58%	-82%
Transport	16%	+62%	-62%
Buildings	10%	-62%	-86%
Agriculture	8%	-52%	-57%
Waste	5%	+72%	-65%
LULUCF	7%	+197%	-199%
Total emissions (excl. LULUCF)	100%	-41%	-86% (or -77% /2021)

Source: authors, based on AMO Net-Zero 2050, Eurostat and Facts about climate

[2] The total is counted as emissions without LULUCF, in line with the text.

Abbreviations

BECCS	Bioenergy with carbon capture and storage
CCS	Carbon capture and storage
CCU	Carbon capture and utilisation
CCUS	Carbon capture, utilisation and storage
CFR	Common Reference Framework
CHMI	Czech Hydrometeorological Institute
CO2eq	Carbon dioxide equivalent
CPP	Climate Protection Policy of the Czech Republic
DACCS	Direct air carbon capture and storage
EC	European Commission
EEA	European Environment Agency
ESR	Effort Sharing Regulation
ETS	EU Emissions Trading System
EUA	European Union Allowance
GHG	Greenhouse gases
IPCC	Intergovernmental Panel on Climate Change
LTS	Long-Term Strategy
LULUCF	Land Use, Land-Use Change and Forestry
NDC	Nationally Determined Contribution
NECP	National energy and climate plan
RES	Renewable energy sources
SEEPIA	Center for Socio-Economic Research on Environmental Policy Impact Assessment
SEP	State Energy Policy of the Czech Republic
WAM	With additional measures
WEM	With existing measures

TABLE OF CONTENTS

Introduction

On 6 February 2024, the European Commission published a communication related to the 2040 EU climate goal with the **recommendation to aim at a 90% GHG emission reduction by 2040 compared to 1990**.[3] This marks a pivotal moment in the ongoing commitment of the European Union to reach climate neutrality by 2050, delineating a next step in climate policy beyond the established 55% reduction target by 2030. While achieving climate neutrality by mid-century might seem like an ambitious, yet distant goal, the 2040 perspective gives it a more concrete shape, stimulating a number of questions about its policy requirements, sectoral contributions, additional investment demands or socioeconomic implications.

The capitals will play a key role. Are the Member States ready for implementing ambitious 2040 climate targets? Are their respective climate ambitions in line with the overarching goal? How and where do national climate mitigation efforts need to accelerate in order to meet the common target?

In this report, we are investigating these questions in relation to Czechia, where decarbonisation represents a pressing challenge. The Czech economy is marked by a long history of industrial development, with its energy system historically based on coal and nuclear sources. Despite the restructuring following 1989, **Czech emissions per capita as well as the emission intensity of the economy remain chronically high** both in global and in European comparison. In 2021, Czechia ranked fourth regarding per capita GHG emissions and fourth regarding GHG emissions per value added within the EU.[4] In spite of its relatively small population of around 10 million people, Czechia has historically emitted globally significant amounts of GHG, exceeding much more populous countries like Egypt, Argentina or Turkey, and almost on a par with Spain.[5] However, Czechia's emissions have been decreasing, albeit at a slower pace than the EU average, and the Czech government has acknowledged the EU 2050 climate neutrality target.

With the following analysis, we try to contribute to the 2040 debate by mapping the current state of climate policies, the projections into 2040, as well as the sectoral contributions towards the potential 2040 targets. Whether the governance framework, political will, public support and financial means will be in place for Czechia to contribute with a fair share to the pan-EU 2040 mitigation effort, remains to be seen.

The time of publication of this report corresponds with a period of climate policy review and the development of energy scenarios in Czechia as well as the formulation of the Czech position towards the newly published 2040 EU target recommendations, **therefore climate policy is a dynamic and unsettled topic**. It is expected that the update procedure will be finished in an order of months, and although we have worked with the most current available documents, there might still be changes until the very end of the process.

[3] EC. "Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Securing our future: Europe's 2040 climate target and path to climate neutrality by 2050 building a sustainable, just and prosperous society COM/2024/63", 2024.'
https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52024DC0063.

[4] Eurostat. "Net greenhouse gas emissions", 2024.
https://ec.europa.eu/eurostat/databrowser/view/sdg_13_10__custom_10171150/.

[5] Ritchie, Hannah, and Max Roser. "Who has contributed most to global CO2 emissions?" Our World in Data, 2024. https://ourworldindata.org/contributed-most-global-co2.

1 Current state of climate policies in Czechia

Czech climate policy is closely tied to EU climate legislation and global climate commitments. Most energy and industry-related emissions are traded within the Emissions Trading System (EU ETS), and a new EU ETS 2 is about to be implemented for emissions from fuel combustion in road transport and buildings, fully starting in 2027/28. The remaining emissions are covered by the Effort Sharing Regulation (ESR) and the LULUCF regulation. In these, the EU sets binding national targets for all Member States. The targets have become much more ambitious following the past EU legislative cycle, which has delivered on the Fit for 55 package, in part thanks to the efforts of the 2022 Czech Presidency of the EU Council.

The Czech climate policy (focusing on GHG mitigation) is contained in three main policy documents: State Energy Policy originally from 2015 and updated in 2024, Climate Protection Policy (CPP) approved in 2017 and updated in 2024, and the National Energy and Climate Plan (NECP) from 2020, updated also in 2024.

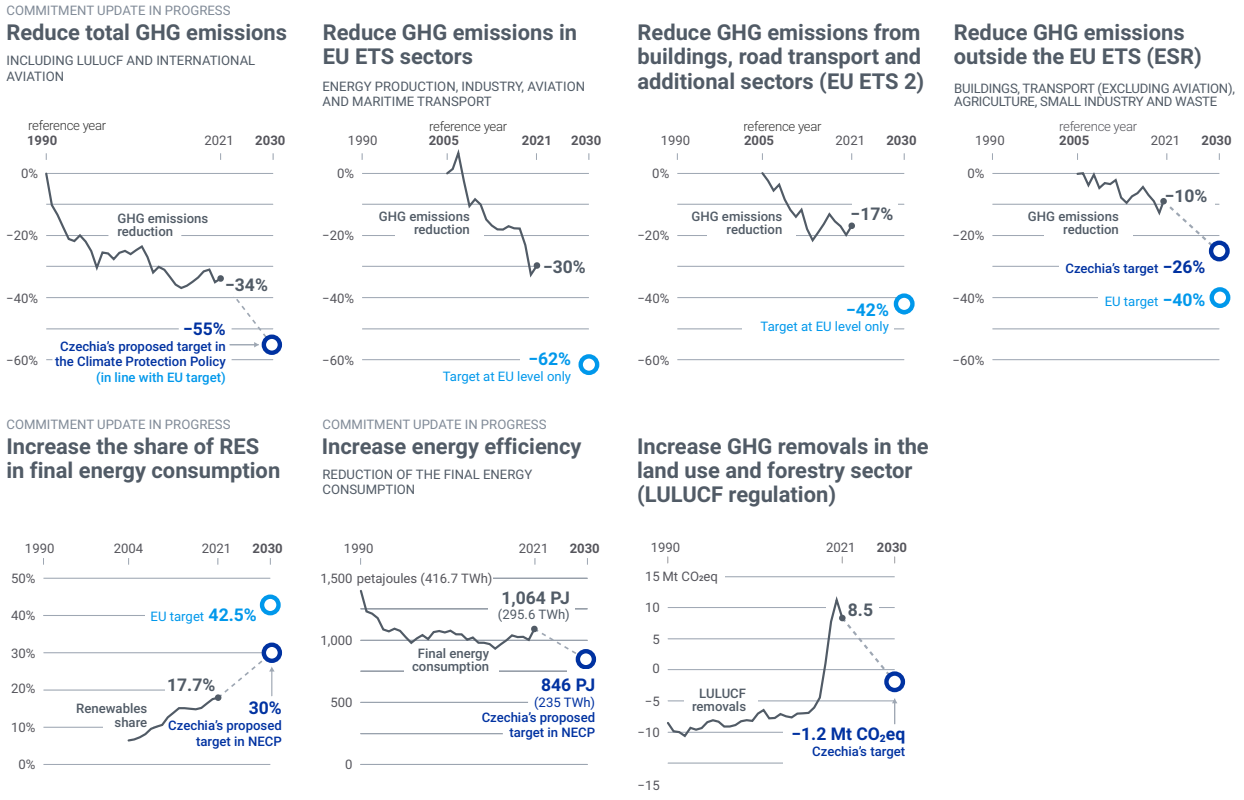
Table 1: Overview of selected EU and Czech 2030 targets before and after the adoption of the Fit for 55 package

2030 target		Targets before FF55	Updated targets	Reference year
Total emissions	EU	40%	55%	1990
	CZ (in CPP)	47%[6]	55%[7]	1990
ETS	EU	43%	62%	2005
	CZ	-	-	
ETS 2	EU	-	42%	2005
	CZ	-	-	
ESR	EU	29%	40%	2005
	CZ	14%	26%	2005
RES share on final energy consumption	EU	32%	42,5%	
	CZ (NECP)	22%	30/33%[8]	

Source: authors

[6] As in the Climate Protection Policy from 2017.
[7] As proposed in the Climate Protection Policy during the updating process.
[8] 30% RES share in the 2023 NECP draft, 33% required by the EC in NECP assessment.

Figure 1: Overview of Czechia's climate commitments for 2030 (as of February 2024)



Read more at **faktaoklimatu.cz**/klimaticke-zavazky-cr

Data source: EC, EEA, Czechia's NECP, Czechia's Climate Protection Policy, original calculations

Source: Facts on Climate 2024[9]

The **State Energy Policy** (SEP) from 2015 concentrates on the energy sector, defining goals of security, competitiveness and sustainability, with sustainability including energy efficiency, use of fossil fuels and renewables, land use, emissions and other indicators. The goals are adjusted and specified in the **Climate Protection Policy** (CPP) from 2017, an equivalent to the national long-term strategy (nLTS) under EU law with the horizon of 2050, which sets the GHG emission goals, presents emission scenarios and outlines concrete mitigation measures. The **National energy and climate plan** (NECP) from 2020 and the drafted update from 2023 react to the EU legislation (EU Regulation 2018/1999), following the obligations of defining national RES share, energy efficiency and other targets.

It is important to note that these strategies were created in different years and rather independently of each other, containing different goals and approaches, which corresponds to the degree of departmentalism chronically present among Czech central institutions. At the same time, both SEP and CPP are outdated and do not correspond to the extended EU climate policies. As of Q2, 2024, all three documents are undergoing an update, this time based on aligned underlying data and presumptions.

The updating of all documents is expected to bring major changes, increasing the climate ambition and eventually bringing a better coherence. Based on the preliminary documents (such as the policy evaluations, public consultation or

[9] Note that the goal of 43% reduction between 2005 and 2030 applies to the sectors of road transport and buildings, while a 42% goal applies for all sectors under EU ETS 2, including small industry.

the Foundations of SEP[10]), the updates should include the **goal of 2033 coal phase-out** previously declared by the government, bringing **climate targets** in line with the EU legislation, and a more concrete pathway towards deep decarbonisation by 2050 in compliance with the **EU climate neutrality target.** In Czechia, there is currently no legislation anchoring the climate targets and fossil phase-out.[11]

1.1 Total emissions target and the Climate Protection Policy

During the reference year of 1990, Czechia (as part of the then-Czechoslovakia) emitted 201 million tonnes of CO_2eq excluding LULUCF,[12] 81% coming from energy production.[13] **By 2005, the total emissions had dropped by 25% to 150 Mt CO2eq, mostly due to the economic restructuring** after 1989. This represents a considerable and above average reduction compared to other EU countries. In this period, the emissions reduction had the fastest pace, followed by 2005-2015, while the latest period between 2015 and 2021 witnessed the slowest emissions reduction. In 2021, the total emissions accounted for 119 Mt CO2eq, a **41% reduction since 1990** (or 21% reduction since 2005). Before 2017, the LULUCF sector was functioning as a carbon sink with negative emissions mostly due to forest carbon sequestration. In 2018, the bark beetle calamity turned LULUCF into a carbon emitting sector, with the absolute value of yearly emissions comparable in negative correlation to the emissions sinks of 1990. In 2020, LULUCF emissions peaked at more than 10 Mt of CO_2eq.[14]

Importantly, the **Climate Protection Policy** (equivalent to a national Long-Term Strategy) from 2017 sets the total GHG emission reduction targets for 2020 and 2030, and two indicative targets for 2040 and 2050. **The 2020 goal of 32 Mt CO2eq reduction compared to 2005[15] was met**, but only because of the covid-19 pandemic and related economic slowdown.[16] In 2021, the emissions rose again above

[10] Ministry of Industry and Trade. 'Foundations for Updating the State Energy Policy of the Czech Republic and Related Strategic Documents (Climate Protection Policy and the National Energy and Climate Plan) [Východiska aktualizace Státní energetické koncepce ČR a souvisejících strategických dokumentů]', April 2023. https://www.mpo.cz/cz/energetika/strategicke-a-koncepcni-dokumenty/vychodiska-aktualizace-statni-energeticke-koncepce-cr-a-souvisejicich-strategickych-dokumentu--273672/.

[11] However, a first step towards implementing a climate law has been made through submission of a proposal by a group of MPs in 2023. Česká pirátská strana, 'Piráti představili první český klimatický zákon', Pirati.cz, November 2023, https://www.pirati.cz/jak-pirati-pracuji/pirati-predstavili-prvni-cesky-klimaticky-zakon/.

[12] Total emissions, including indirect emissions, excluding LULUCF and memo items, such as international bunker, aviation, navigation, biomass CO2 emissions or transport and storage of CO2, based on the official accounting published in 2023. The Climate Protection Policy uses the data from the year 2015 which are slightly different: 196 Mt CO_2eq for 1990, 146 Mt CO_2eq for 2005. This means small deviations for the targets expressed in percentage. CHMI, 'National Greenhouse Gas Inventory Report of the Czech Republic (Reported Inventories 1990–2021): Submission under UNFCCC and the Kyoto Protocol', April 2023, https://www.chmi.cz/files/portal/docs/uoco/oez/nis/NIR/CZE_NIR-2023-2021_UNFCCC_allinone_ISBN.pdf.

[13] CRF sector 1: Energy, based on the common reference framework, including energy, manufacturing and construction industries and transport.

[14] CHMI, 'National Greenhouse Gas Inventory Report of the Czech Republic (Reported Inventories 1990–2021): Submission under UNFCCC and the Kyoto Protocol', April 2023, https://www.chmi.cz/files/portal/docs/uoco/oez/nis/NIR/CZE_NIR-2023-2021_UNFCCC_allinone_ISBN.pdf.

[15] The goal was to reduce emissions by 32 Mt, that is to reach 114 Mt by 2020, which corresponds to a 22% reduction relative to 2005, or 42% relative to 1990, based on the CPP data. The measure includes indirect emissions, and excludes LULUCF emissions. The common 2020 EU target was 20% emissions reduction compared to 1990. Small inaccuracies may apply due to the different emissions accounting.

[16] In 2019, a 5.3% reduction was needed to meet the 2020 goal, which would have been very ambitious without the covid-related deceleration. Ministry of the Environment, 'Roundtable on the Updating of the Climate Protection Policy in Czechia [Kulatý stůl k aktualizaci Politiky ochrany klimatu v ČR]', 2023, https://www.mzp.cz/C1257458002FoDC7/cz/politika_ochrana_klimatu_jednani/$FILE/oeok-Prezentace_KS_POK-20230710.pdf.

the targeted level.[17] As for the 2030 target, while the EU goal for total net GHG emissions reduction is set at 55% compared to 1990, **the outdated 2030 Czech goal corresponds to a 48% reduction**.[18] The expectations are that it will be raised to 55%, corresponding to the EU ambition.

The indicative goal anticipates emissions at the level of 70 Mt CO_2eq in 2040, ie. a 64% decrease relative to 1990. The outdated CPP does not aim at climate neutrality by 2050, but only targets the emissions level of 39 Mt CO_2eq, corresponding to an 80% emissions reduction relative to 1990.

Besides the emissions targets, the outdated CPP presents scenarios reaching an 80% reduction target by 2050 and lays out specific policy measures, such as a carbon tax, investment priorities, compensation schemes, support of municipalities etc., including policies specific to different sectors. The 2021 evaluation of the CPP concludes that nearly three-quarters of the CPP measures were fulfilled,[19] while an independent review concluded otherwise.[20]

In the current policy debates, it is accepted that the new national LTS (CPP) needs to reflect the Fit for 55 package and the EU climate neutrality by 2050 goal, including the new ESR targets, LULUCF goals as well as the EU ETS and ETS 2 targets, and the REPowerEU. The results of the public consultation for CPP update show that the engaged public most often refers to the 2030 and 2050 horizons, while the 2040 is less frequently mentioned.[21]

The SEEPIA model, used also in the updated NECP (see below) shows that **the 47% reduction goal relative to 1990 as in CPP is relatively easily reachable**, given that it derives from the older climate targets and demands few adjustments compared to the 2021 levels. The modelling also shows that even the goal of 55% total emissions reduction relative to 1990 is realisable without extensive efforts for Czechia, being overachieved in all decarbonisation scenarios.[22] According to these emissions projections, in 2030 the Czech Republic can achieve a reduction in emissions of 73% to 78% compared to 1990.

1.2 NECP and the partial climate targets

The drafted update of the National energy and climate plan from 2023-2024 brings the first major revisions to the Czech climate policy. It sets RES and energy efficiency targets, among others, and it is also **the first governmental document which comes**

[17] From 114 Mt to 119 Mt. CHMI, 'National Greenhouse Gas Inventory Report of the Czech Republic (Reported Inventories 1990–2021): Submission under UNFCCC and the Kyoto Protocol', April 2023, https://www.chmi.cz/files/portal/docs/uoco/oez/nis/NIR/CZE_NIR-2023-2021_UNFCCC_allinone_ISBN.pdf.

[18] In the Climate Protection Policy, the target is defined as 44 Mt CO_2 eq. decrease by 2030 compared to the year 2005, that is by 30% relative to 2005 with the CCP data. It corresponds to 102 Mt CO_2eq in 2030, or 48% reduction relative to 1990.

[19] Cenia. 'Evaluation of the Climate Protection Policy in Czechia [Vyhodnocení Politiky ochrany klimatu v ČR]'. Ministry of the Environment, September 2021. https://www.mzp.cz/C1257458002FoDC7/cz/politika_ochrany_klimatu_2017/$FILE/OEOK_POK_vyhodnoceni_20211101.pdf.

[20] Jungwirth Březovský, Tomáš. 'Climate Protection Policy in the Czech Republic: Words Lost in the Wind [Politika ochrany klimatu v Česku: Slova ztracená ve větru]'. Klimatická koalice, CDE, 2020. https://www.cde-org.cz/media/object/1613/cde_politika_klimatu_v_cr_2.pdf.

[21] 200 answers. Ministry of the Environment, 'Evaluation of the Public Consultation on the Update of Climate Protection Policy in Czechia [Vyhodnocení veřejné konzultace k aktualizaci Politiky ochrany klimatu v ČR]', June 2023, https://www.mzp.cz/C1257458002FoDC7/cz/vyhodnoceni_verejne_konzultace/$FILE/oeok-Vyhodnoceni_verejne_konzultace_POK-20230710.pdf.

[22] Milan Ščasný et al., 'Energy and Industry Modelling: TIMES-CZ [Modelování energetiky a průmyslu: TIMES-CZ]' (SEEPIA, January 2024), https://seepia.cz/wp-content/uploads/2024/01/SEEPIA_Seminar_Prumysl.pdf.

close to the climate neutrality goal[23] in its scenarios. The scenarios included in the drafted NECP update are based on SEEPIA modelling (see below),[24] which became the most relevant model for the Czech climate and energy policy development, creating the basis for the NECP update. The NECP WAM3 from SEEPIA scenario is currently perceived as the template for Czechia's decarbonisation.

The Czech emissions within the **EU ETS framework** from energy production and industry decreased by 30% between 2005 and 2021. For 2030, the goal is a 62% reduction in **EU ETS 1** sectors for the EU as a whole, compared to 2005, without specifications for the Member States (see Figure 1). Similarly, the **EU ETS 2** creates a framework for emissions trading in the road transport, buildings and additional sectors, mainly small industry, starting in 2027/28, aiming at a 42% emissions reduction by 2030 relative to 2005 for the EU as a whole, and 43% for the road transport and buildings for the same period.[25] The Czech emissions from road transport and buildings decreased by 17% between 2005 and 2021, less than half of the common EU goal, and there is no concrete national goal for this section of emissions. Furthermore, the aggregate decrease hides the steady increase of emissions in transport.

Czech emissions outside of EU ETS, **covered by the ESR** and coming from domestic transport, buildings, agriculture, small industry and waste, decreased by 10% in the period of 2005-2021 (see Figure 1), while the 2020 national target under the ESR enabled an increase of maximum 9% by 2020 relative to 2005. The current common EU target consists of a 40% emissions reduction under ESR by 2030, compared to 2005, a target which increased together with the strengthened EU climate ambition. **The updated Czech binding target within ESR is a 26% emissions reduction by 2030 relative to 2005** (increasing from the previous 14%).[26] As only a 10% emissions reduction was reached by Czechia by 2021, the pace needs to increase in order to meet the aforementioned goal.[27]

[23] Reaching approximately 6 Mt CO_2eq in 2050 in the scenario with additional measures (NECP WAM3) including BECCS.

[24] Seepia.cz. 'SEEPIA CZ: Center for Socio-Economic Research on Environmental Policy Impact Assessment'. https://seepia.cz/en/.

[25] 'Directive (EU) 2023/959 of the European Parliament and of the Council of 10 May 2023 amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union and Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading system', May 2023, http://data.europa.eu/eli/dir/2023/959/oj.

[26] 'Regulation (EU) 2023/857 of the European Parliament and of the Council of 19 April 2023 Amending Regulation (EU) 2018/842 on Binding Annual Greenhouse Gas Emission Reductions by Member States from 2021 to 2030 Contributing to Climate Action to Meet Commitments under the Paris Agreement, and Regulation (EU) 2018/1999', April 2023, http://data.europa.eu/eli/reg/2023/857/oj.

[27] The Commission's NECP assessment states that based on the provided scenarios (both WEM and WAM), Czechia is not on track to meet its national greenhouse gas target of -26% in 2030 compared to 2005 levels, it is not clear however how these conclusions communicate with the SEEPIA results. "The draft updated NECP projects ESR emissions to be above this target, both with existing and with additional planned measures, highlighting the need for more ambitious climate action in the sectors involved. In the WEM scenario, Czechia falls short of the target by 9.1 percentage points, while in the WAM scenario Czechia still underachieves by 7.3 percentage points in the most optimistic scenario. In 2021, Czechia's ESR emissions were below the annual emissions allowance (AEA) by 4.8 Mt CO_2eq." EC. 'Assessment of the Draft Updated National Energy and Climate Plan of Czechia', December 2023. https://commission.europa.eu/publications/commission-recommendation-assessment-swd-and-factsheet-draft-updated-national-energy-and-climate-11_en.

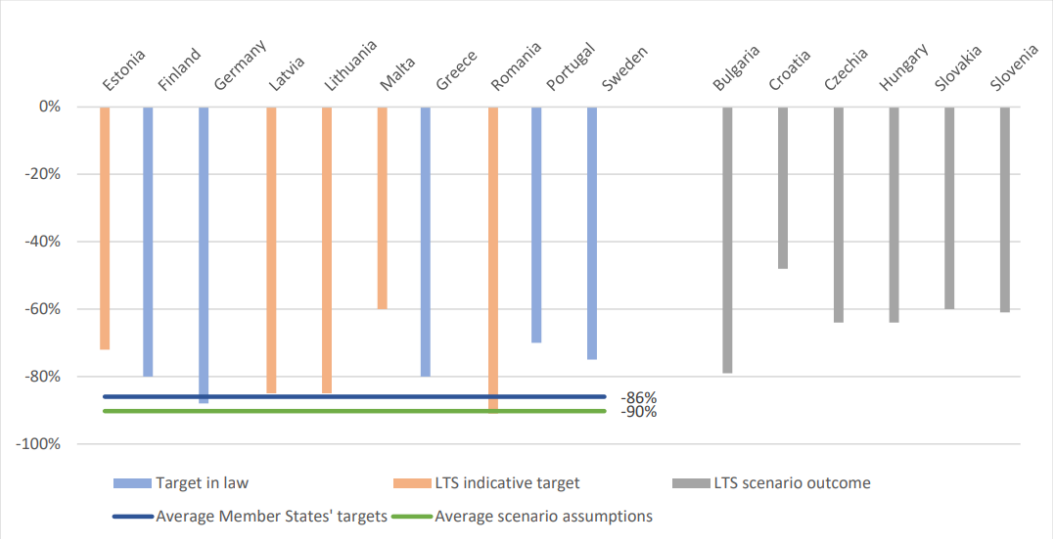
2 Czech outlook on 2040

2.1 Contributions to the 2040 target as already existing in national law and policies

In order to achieve climate neutrality by 2050 within the EU, the 2040 climate target must demand a substantial and appropriate effort, taking into account the challenge posed by the increasing difficulty in mitigating residual emissions. In the February 2024 communication, the European Commission recommends a 90% emissions reduction target compared to 1990, based on a detailed impact assessment of possible pathways towards net zero. While a final decision must undergo the entire EU legislative process, it is now clear that **the combined targets of Member States are not in line with the recommended pathway** (see Figure 2).

In Czechia, the preparation of the Czech climate targets and strategy for 2040 in line with the EU ambition is in its preliminary stages, given the present concentration on the 2030 horizon and the gradual updating of the policy documents. The original Climate Protection Policy **sets a non-binding indicative 2040 target of 64% reduction compared to 1990.** The ambition is expected to increase, **with the NECP WAM3 scenario reaching 82% emissions reduction by 2040 compared to 1990.** Other relevant scenarios exist, reaching even higher emissions reductions, **ranging from 77% to 86%,** all without LULUCF. Let us summarise the existing Czech models and scenarios.

Figure 2: 2040 GHG emissions reductions targets and scenario outcomes of EU Member States compared to the average scenario assumptions for 2040



Source: Meyer-Ohlendorf et al. 2023[28]

1. Scenarios based on SEEPIA modelling, including the NECP WAM3 scenario.[29] The SEEPIA model creates pathways towards near climate neutrality (with 6,5 Mt CO_2eq residual emissions), selecting a technology mix based on total cost of technology (incl. CAPEX, OPEX, fuels etc.) with a cost optimization model TIMES-CZ validated through the PLEXOS model, and determining macroeconomic impacts

[28] Meyer-Ohlendorf, Nils, Deyana Spasova, Jakob Graichen, and Sabine Gores. 'Designing the EU 2040 Climate Target: Political Context, Level of Ambition, Implications for Member States and Sectors'. Ecologic Institute, 2023. https://www.ecologic.eu/sites/default/files/publication/2023/60028-2040-Target-Overview-Report.pdf.

[29] Seepia.cz. 'SEEPIA CZ: Center for Socio-Economic Research on Environmental Policy Impact Assessment'. Accessed 2 March 2024. https://seepia.cz/en/.

through the E3ME and other models. The modelling does not encompass the sectors of agriculture, waste and LULUCF, where assumptions of emissions pathways are made based on external sources.
The model provides two types of scenarios, WEM and WAM (with variations, mainly NECP WAM3). Contrary to WEM, WAM includes the more ambitious ETS1 pathway,[30] it enforces coal phase-out by 2033 at the latest, a ban on internal combustion engines in new cars by 2035 and a progressive renovation strategy. The authors make assumptions based on political input, capping some variables (maximum new installed capacity of PV at 26,1 GWe and wind turbines at 5,5 GWe in 2050, both being reached, maximum energy savings and imports) and enforcing minimum new installed capacity of nuclear power (3,7 GWe by 2050), fixing the fleet of passenger cars, among others. There remain some residual emissions in 2050, concretely 6 Mt CO2eq, accounting for LULUCF and CCS (removing 3 Mt each). For 2040, the NECP WAM3 scenario projects 82% emissions reduction compared to 1990, without LULUCF.

2. AMO Net-Zero 2050 scenario based on the Climact 2050 Pathways Explorer tool, created by the Association of International Affairs (AMO).[31] Pathways Explorer is a dynamic model, using inputs such as socio-demographic and technological development, socio-behavioural variables, and economic indicators, assessing impacts on GHG emissions, energy consumption, share of renewable or fossil resources indicators and ex post calculation on CAPEX, OPEX and fuel costs.[32]

The AMO Net-Zero 2050 scenario reaches a RES share of 33% in the final energy consumption by 2030, 59,7% by 2040 and 79,9% in 2050 (30% and 62% in NECP WAM3 for 2030 and 2050, respectively); the energy consumption in buildings decreases by nearly 40%. The installed capacity reaches 21,8 GWe for solar PV (with 15,3 in 2040), 9 GWe for wind (8,3 GWe in 2040) and 2,3 GWe for nuclear in 2050 (presuming a full phase-out of one of the two existing plants and no new installed capacity). For 2040, the AMO Net-Zero 2050 scenario assumes an 86% emissions reduction compared to 1990, without LULUCF.

3. McKinsey & Company carbon-neutral Czech Republic 2050 scenario.[33] The McKinsey scenario published in 2020 is the earliest Czech scenario to reach climate neutrality. It uses the McKinsey's Decarbonization Pathways Optimizer, a toolkit exploring cost-optimal ways of decarbonisation, accounting for resources availability and supply chain constraints without incorporating behavioural patterns. As the oldest one of the scenarios and the least ambitious, we do not fully explore it in the sectoral analysis.

In 2050, the scenario reaches 20,3 GWe of PV and 7,9 GWe of wind installed capacity, adding 2,4 GWe of nuclear capacity (with similar capacity being decommissioned). The scenario accounts for a 51% RES share on the final electricity consumption, while 27 TWh of electricity (27%) would be imported. The final electricity demand increases by 20% compared to 2017 due to wide electrification. In 2050, 9 Mt CO_2eq are assumed to be absorbed by LULUCF and 8 Mt by CCS. By 2040, the model assumes an emissions reduction of 77% compared to 1990, without LULUCF.

[30] Harmonised central trajectories by DG Climate Action.
[31] Climact, and AMO. '2050 Pathways Explorer for the Czech Republic: AMO Net-Zero 2050'. Accessed 2 March 2024. http://cz.pathwaysexplorer.climact.com/.
[32] Jungwirth Březovský, Tomáš. 'Low Carbon Trajectories for the Czech Republic Using Pathways Explorer'. AMO, 2023. https://www.amo.cz/wp-content/uploads/2023/03/Nizkouhlikove-trajektorie-pro-Cesko-2023.pdf.
[33] Hanzlík, Viktor, Vít Javůrek, Bram Smeets, and Daniel Svoboda. 'Pathways to Decarbonize the Czech Republic: Carbon-Neutral Czech Republic 2050'. McKinsey & Company, 2020. https://www.mckinsey.com/cz/our-work/pathways-to-decarbonize-the-czech-republic.

Table 2: Comparison of GHG emissions reduction by 2040 in Czech decarbonisation scenarios

Original goal of the CPP	-64% (to 70 Mt CO2eq)
McKinsey & Co scenario	-77% (excl. LULUCF)
SEEPIA WEM scenario	-76% (excl. LULUCF)
SEEPIA WAM3 scenario	-82% (excl. LULUCF)
AMO Net-Zero 2050	-86% (excl. LULUCF)

Source: authors

2.2 The gap between 2040 target scenarios and existing Czech commitment

If we consider the current Czech goals in general, a higher ambition would be desirable, and also feasible. According to Anderson and Calverley (2021) who elaborate on the fair carbon budget in relation to a case of Czech climate litigation, the adequate Czech carbon budget is 800 Mt CO_2eq for energy[34] starting in 2021. Considering the current annual emissions from energy, 100 Mt CO_2, it would be used up in 8 years at the current pace. Based on the carbon budget, with the sharp decline of emissions in the early period slowing down later, a goal of 84% emissions reduction by 2030 relative to 1990 would be adequate for fulfilling the Paris agreement according to the study. However, **the Czech emissions accounting and target setting typically unfolds from decade to decade, and does not consider the question of an adequate carbon budget** contrary to EU climate law.[35]

Concretely, the outdated indicative Czech 64% reduction target is far from the EU Member State target average of 86% for the year 2040, counted as an average of the existing indicative and binding targets. It is yet further away from the average 2040 emissions reductions proposed in EU energy scenarios to reach climate neutrality, which account for 90%, ranging between 86% and 97%. **The 82% reduction stemming from the NECP WAM3 scenario reaches much closer.**

3 Sectoral contributions to the 2040 climate target

Two methodologies for sectoral classification are being used in the emissions accounting and modelling, making the **comparability of different scenarios limited**. For this reason, we are constructing two sectoral overviews. The first one (Table 3) using the sectors corresponding to the common reference framework (CFR) in combination with the EU ETS 1 and ESR categories and the second one (Table 4) with a more detailed perspective. The first method enables tracking the EU and national targets in respective domains and is utilised in the official emissions accounting as well as the SEEPIA model. The second (Table 4) provides a perspective suitable for policy making in different sectors (transport, buildings etc.) and disaggregates the energy sector based on the respective fuel use into power and heat generation, transport, buildings and agriculture. It is utilised in the Pathways Explorer and McKinsey scenarios. The two approaches are not compatible, for example **the first perspective accounts only the emissions from land use into agriculture,**

[34] CRF1: Energy, corresponding to 75% of Czech emissions.

[35] Meyer-Ohlendorf, Nils, Deyana Spasova, Jakob Graichen, and Sabine Gores. 'Designing the EU 2040 Climate Target: Political Context, Level of Ambition, Implications for Member States and Sectors'. Ecologic Institute, 2023. https://www.ecologic.eu/sites/default/files/publication/2023/60028-2040-Target-Overview-Report.pdf.

while the second one adds to that the emissions from fuel combustion in agriculture.

Table 3: Czech GHG emissions in 2021 and 2040 according to SEEPIA WEM and WAM3 scenarios, split into ETS1 and ESR

Sectors in Czechia	Shares 2021[36]	2005-2021 change	2021-2040: SEEPIA WEM	2021-2040: SEEPIA WAM3
ETS1	49%	-30%	-74%	-90%
ESR (without Agri and Waste)	40%	-14%	-50%	-56%
Agriculture	7%	0%	-15%	-15%
Waste	5%	+33%	-77%	-77%
LULUCF	7%	+117%	-148%	-148%
Total emissions (excl. LULUCF)	100%	-21%	-60% (or 76% /1990)	-70% (or -82% /1990)

Source: authors, based on SEEPIA, Eurostat and Facts about climate

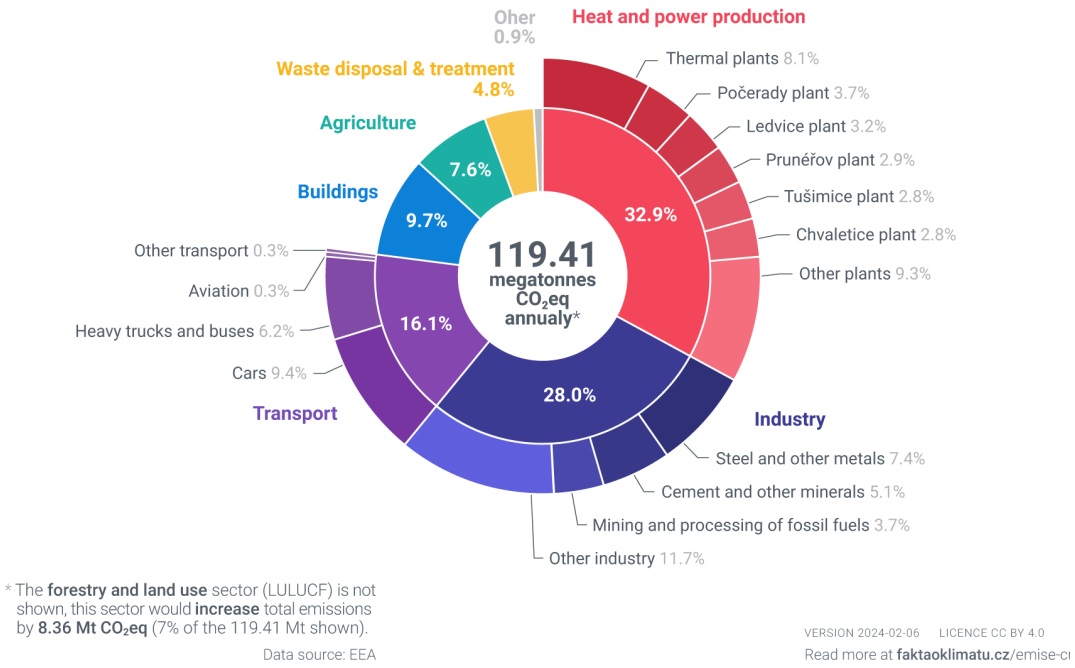
Table 4: Czech GHG emissions in 2021 and 2040 according to AMO Net-Zero 2050, split into sectors

Sectors in Czechia	Shares 2021	1990-2021 change	2021-2040: AMO Net-Zero
Energy (heat and power production)	33%	-28%	-83%
Industry	28%	-58%	-82%
Transport	16%	+62%	-62%
Buildings	10%	-62%	-86%
Agriculture	8%	-52%	-57%
Waste	5%	+72%	-65%
LULUCF	7%	+197%	-199%
Total emissions (excl. LULUCF)	100%	-41%	-86% (or -77% /2021)

Source: authors, based on AMO Net-Zero 2050, Eurostat and Facts about climate

[36] The total is counted as emissions without LULUCF, in line with the text.

Figure 3: Greenhouse gas emissions in Czechia by sector in 2021



Source: Facts on Climate 2024

3.1 Energy

The primary energy sources in Czechia in 2021 were solid fossil fuels (mostly lignite and hard coal, 30%), oil (22%), natural gas (18%), nuclear heat (18%) and renewables including biofuels (13%).[37] Electricity and heat production (as part of the energy sector) has the highest emissions out of all sectors with a 33% share, **almost half of it (15% of total emissions) being emitted by the biggest five coal power plants**.[38] Emissions from the electricity and heat production sector were 39 Mt CO_2eq in 2021, increasing from 37 Mt CO_2 eq in 2020 due to the post-covid recovery, but decreasing in the long run (by 28% since 1990). All the emissions of the sector are covered by the EU ETS, together with industrial emissions.

Key goals for the sector mentioned in the 2023 NECP draft **include decreasing the share of fossil fuels** without CCS on primary energy consumption to 50% by 2030, **phasing-out coal** use in electricity and heat production by 2033, **and climate neutrality by 2050**, without defining the 2040 target. In the NECP WAM3 scenario, the emissions presently covered by the EU ETS are expected to fall by 68% by 2030 compared to 2005, and by approximately 93% by 2040.[39]

As for renewables, they accounted for a 17,7% share in Czechia's final energy consumption in 2021.[40] The initial goal of achieving a 13% RES share by 2020 was

[37] Bufka, Aleš, and Miloslav Modlík. 'Aggregate Energy Balance of the Czech Republic [Souhrnná energetická bilance České republiky]'. Ministry of Industry and Trade, 2022. https://www.mpo.cz/assets/cz/energetika/statistika/energeticke-bilance/2022/12/SEB-2010-2021.pdf.
[38] The sector's official name: Fuel combustion in public electricity and heat production. Eurostat. 'Greenhouse Gas Emissions by Source Sector', 2023. https://ec.europa.eu/eurostat/web/products-datasets/-/ENV_AIR_GGE.
[39] Milan Ščasný et al., 'Energy and Industry Modelling: TIMES-CZ [Modelování energetiky a průmyslu: TIMES-CZ]' (SEEPIA, January 2024), https://seepia.cz/wp-content/uploads/2024/01/SEEPIA_Seminar_Prumysl.pdf.
[40] Note that the share of RES is 13% for the primary energy sources, but almost 18% for the final energy consumption. The difference is due to the high inefficiencies in converting the primary energy sources to final energy consumption for fossil fuels. Cenia, 'Evaluation of the Climate Protection Policy in Czechia [Vyhodnocení Politiky ochrany klimatu v ČR]' (Ministry of the Environment, September 2021),

met already in 2012. While the updated EU goal for RES share stands at 42,5% by 2030, **the updated draft of the Czech NECP increases the goal to 30% RES share by 2030 from the previous 22%.**[41] The adequate contribution to the common goal would range between 32-35% by 2030;[42] and correspondingly, the European Commission concludes in the NECP assessment that the **Czech target should not fall below a 33% share** while pointing out the absence of trajectories for renewables in electricity, transport and heating and cooling.[43] There is no 2040 target but the SEEPIA modelling accounts for 38% RES share in the NECP WAM3 scenario used in the updated NECP. By 2030 (and 2050, respectively), the model assumes an installed capacity of 10,1 (26) GW of grid-connected photovoltaic power plants and 1,5 (5,5) GW of wind power plants.[44]

3.2 Industry

Together with the economic transformation during the 1990s, which entailed the transition to a market economy and orientation towards new markets, the volume of industrial production was significantly reduced in Czechia. As a result, industrial emissions have fallen by almost 60% since 1990, yet **the sector remains the second largest source of greenhouse gases domestically**.[45] In 2021, industry accounted for 28% of Czechia's emissions, producing 33 Mt CO_2eq. The production of metals, especially steel (9 Mt CO_2eq), and minerals, especially cement (6 Mt CO_2eq), had a high share. The extraction and processing of fossil fuels (4 Mt CO_2eq) was also a significant contributor.[46]

Regarding policy, there is a **lack of a strategic framework for industrial policy** that would effectively and in a clear timeframe guide the transformation of industry towards a low-carbon economy, as highlighted by the current Climate Protection Policy. Currently, the updated 2023 NECP draft limits itself to stating that due to the considerable diversity of technologies used and the specific needs of the sector, this sector is not addressed in detail within the document. At the same time, it envisages the rapid development of a separate industrial policy for the period to 2030 with a view to 2050. In this context, **the National Economic Strategy 2030 is being prepared,** which will include an updated National Investment Plan.[47]

---

https://www.mzp.cz/C1257458002FoDC7/cz/politika_ochrany_klimatu_2017/$FILE/OEOK_POK_vyhodnoceni_20211101.pdf.

[41] The outdated State Energy Policy outlines the RES share within the range of 17-22% only by 2040 (18-25% in electricity production).

[42] Jan Krčál, Laura Otýpková, and Kateřina Kolouchová, 'Development of Renewable Energy in the Czech Republic until 2030 [Rozvoj obnovitelné energie v Česku do roku 2030]' (Facts about Climate, March 2023), https://faktaoklimatu.cz/studie/2023-rozvoj-obnovitelne-energie-v-cesku-do-2030.

[43] Based on Annex II of the Regulation (EU) 2018/1999 on the Governance Regulation of the Energy Union and Climate Action EC. 'Assessment of the Draft Updated National Energy and Climate Plan of Czechia', December 2023.
https://commission.europa.eu/publications/commission-recommendation-assessment-swd-and-factsheet-draft-updated-national-energy-and-climate-11_en.

[44] Milan Ščasný et al., 'Modelling the Decarbonisation of the Czech Economy: Scenarios for NECP and How to Proceed? [Modelování dekarbonizace české ekonomiky: Scénáře pro NKEP a jak dále?]' (SEEPIA, January 2024),
https://seepia.cz/wp-content/uploads/2024/01/SEEPIA_Seminar_Modely-MakroEkon.pdf.

[45] Facts on Climate, 'Greenhouse Gas Emissions in the Czech Republic 1990-2021 [Emise skleníkových plynů v ČR v letech 1990–2021]', 2023, https://faktaoklimatu.cz/infografiky/emise-cr-vyvoj.

[46] Facts on Climate, 'Greenhouse gas emissions in the Czech Republic by sector [Emise skleníkových plynů v ČR podle sektorů]', 2023, https://faktaoklimatu.cz/infografiky/emise-cr.

[47] See p. 80: Ministry of Industry and Trade, 'Update of the National Energy and Climate Plan of the Czech Republic (draft)', 2023, https://www.mpo.cz/cz/energetika/strategicke-a-koncepcni-dokumenty/aktualizace-vnitrostatniho-planu-ceske-republiky-v-oblasti-energetiky-a-klimatu--277532/.

McKinsey's analysis puts the industrial emissions target for 2030 at 25 Mt CO_2eq, which would mean a 28% decline compared to 2021.[48] The target rate of decline over the time horizon (about 0,9 Mt CO_2eq per year) has been met so far, but the decline in industrial emissions after 2030 will need to accelerate further to achieve the low-carbon transformation targets. Based on the data presented, the target for 2040 should be somewhere around 14 Mt CO_2eq. The AMO Net-Zero 2050 scenario, prepared by the Association for International Affairs using the Pathways Explorer tool, models the 2040 emissions level at 6,9 Mt CO_2eq.[49]

3.3 Transport

The transport sector was responsible for 19 Mt CO_2eq of Czechia's emissions in 2021. Its overall share across sectors was then 16%.[50] The problem is that, unlike most other sectors, **transport emissions have been rising steadily** except for the intermission during the covid-19 pandemic. Since 1990, there has been a 62% increase.[51] The majority of transport-related emissions are produced by the operation of passenger cars (11 Mt CO_2eq), the number of which have increased by 40% since the beginning of the last decade from 4,6 to 6,4 million.

The 2019 Clean Mobility Plan update, with reference to a calculation based on the original NECP targets, mentions the need to reduce emissions in the transport sector at a rate of 0,2 Mt CO_2eq per year by 2030.[52] The updated NECP lists projected GHG emissions for the transport sector in 2040 of 12,2 Mt CO2eq (in the WEM scenario) and aims at 11,9 Mt in the WAM3.[53] Similar to the mentioned Clean Mobility Plan, it states that **significant potential could be provided by the transfer of transport performance from road to railway**, together with further electrification of railway lines. The problem, however, is that the implementation of these measures is conditional on investments, which so far are directed mainly to road infrastructure.

The Net-Zero 2050 scenario in Pathways Explorer arrives at 14,7 Mt CO_2eq in 2030 and 7,2 CO_2eq in 2040.[54] McKinsey's scenario calculates a relative decrease of only 1 Mt CO_2eq by 2030 (approximately 5% of the sector's current emissions). This is due to two conflicting factors - on the one hand, emissions are to be reduced by 4 Mt CO_2eq due to the electrification of road transport and higher efficiency of internal combustion engines, while on the other hand this decrease is to be compensated by higher use of road transport. At the same time, the report states that transport in Czechia can be fully decarbonised by 2050 as a result of the complete

[48] Hanzlík, Viktor, Vít Javůrek, Bram Smeets, and Daniel Svoboda. 'Pathways to Decarbonize the Czech Republic: Carbon-Neutral Czech Republic 2050'. McKinsey & Company, 2020. https://www.mckinsey.com/cz/our-work/pathways-to-decarbonize-the-czech-republic.

[49] Climact, and AMO. '2050 Pathways Explorer for the Czech Republic: AMO Net-Zero 2050'. Accessed 2 March 2024. http://cz.pathwaysexplorer.climact.com/.

[50] Facts on Climate, 'Greenhouse gas emissions in the Czech Republic by sector [Emise skleníkových plynů v ČR podle sektorů]', 2023, https://faktaoklimatu.cz/infografiky/emise-cr.

[51] Facts on Climate, 'Greenhouse Gas Emissions in the Czech Republic 1990-2021 [Emise skleníkových plynů v ČR v letech 1990–2021]', 2023, https://faktaoklimatu.cz/infografiky/emise-cr-vyvoj.

[52] Ministry of Industry and Trade, 'Update of the National Energy and Climate Plan of the Czech Republic (draft)', 2023, https://www.mpo.cz/cz/energetika/strategicke-a-koncepcni-dokumenty/aktualizace-vnitrostatniho-planu-ceske-republiky-v-oblasti-energetiky-a-klimatu--277532/.

[53] See table 63, p. 213: https://www.mpo.cz/assets/cz/energetika/strategicke-a-koncepcni-dokumenty/2023/10/Aktualizace_NKEP_10_2023_final.pdf
Ministry of Industry and Trade, Aktualizace Vnitrostátního plánu České republiky v oblasti energetiky a klimatu, 2023, https://www.mpo.cz/cz/energetika/strategicke-a-koncepcni-dokumenty/aktualizace-vnitrostatniho-planu-ceske-republiky-v-oblasti-energetiky-a-klimatu--277532/.

[54] Climact, and AMO. '2050 Pathways Explorer for the Czech Republic: AMO Net-Zero 2050'. Accessed 2 March 2024. http://cz.pathwaysexplorer.climact.com/.

transformation of the vehicle fleet to electric cars as well as the electrification of the remaining railway transport.[55]

3.4 Buildings

In 2021, the buildings sector in Czechia emitted 11,6 Mt CO_2eq, making up 10% of the total GHG emissions. This covers the emissions from heating, hot water (if not connected to district heating) and gas cooking in households, offices and institutions. **The emissions decreased by 61% compared to 1990, most of it in the 1990s due to gasification and energy efficiency increase**. If we consider the consumption of electricity and district heating in buildings, the sector emitted around 44% of the total emissions in 2014, according to the 2023 NECP.

The energy efficiency targets are closely related to this sector. The updated EU goal for energy efficiency is premised on an 11,7% decrease of final energy consumption compared to the EU Reference scenario PRIMES 2020 in 2030.[56] For Czechia, quantifying the overall energy savings target means a decrease of final energy consumption from 1060 PJ in 2020 to 846 PJ in 2030 (non-binding target based on Article 3 of the Directive (EU) 2023/1791 on energy efficiency). This seems very ambitious, given that the progressive scenario from the long-term renovation strategy arrives at 945 PJ final energy consumption by 2030.[57] The original NECP target aimed at a maximum 990 PJ final energy consumption by 2030, while capping the energy intensity of the economy at 0,157 MJ/CZK by 2030, ie. about a 30% decrease compared to the baseline.[58] **The binding Czech target (Article 7) consists of yearly savings of 145 PJ in 2030** (669 PJ cumulatively, 8-20 PJ added every year),[59] which is almost a threefold increase from the 2020 target.[60] Generally, this area is assessed as robust and comprehensive by the Commission.[61] Anyway, meeting the current energy efficiency goals requires speeding up the renovation wave in buildings.

In the updated Czech NECP, emissions for buildings are not isolated, but the SEEPIA model accounts for a 48% reduction of ESR emissions by 2040 compared to 2019 (including buildings, transport, and small industry, excluding waste and agriculture). Finally, the Net-Zero 2050 scenario in Pathways Explorer accounts for an 85% emissions reduction for buildings compared to 2021, with 1,8 Mt CO_2eq by 2040.[62]

[55] Hanzlík, Viktor, Vít Javůrek, Bram Smeets, and Daniel Svoboda. 'Pathways to Decarbonize the Czech Republic: Carbon-Neutral Czech Republic 2050'. McKinsey & Company, 2020. https://www.mckinsey.com/cz/our-work/pathways-to-decarbonize-the-czech-republic.

[56] Council of the EU, 'Council and Parliament Strike Deal on Energy Efficiency Directive', March 2023, https://www.consilium.europa.eu/en/press/press-releases/2023/03/10/council-and-parliament-strike-deal-on-energy-efficiency-directive/.

[57] Ministry of Industry and Trade, 'Long-Term Renovation Strategy Established Pursuant to Article 2a of Directive 2010/31/EU [Dlouhodobá strategie renovací]', 2020, https://www.mpo.cz/assets/cz/energetika/energeticka-ucinnost/strategicke-dokumenty/2020/6/_20_III_dlouhodoba_strategie_renovaci_20200520_schvalene.pdf.

[58] Starting from 0.225 in 2016.

[59] For example, adding 8 PJ of savings in 2022, 8 PJ in 2023, and 20 PJ of savings in 2024, one adds 36 PJ of savings by 2023, but cumulatively, one saves 60 PJ of energy.

[60] See table 6 in the NECP draft. The binding target for the public sector is reaching 124 TJ by 2030 (from 148.6 TJ).

[61] EC. 'Assessment of the Draft Updated National Energy and Climate Plan of Czechia', 2023. https://commission.europa.eu/publications/commission-recommendation-assessment-swd-and-factsheet-draft-updated-national-energy-and-climate-11_en.

[62] Climact, and AMO. '2050 Pathways Explorer for the Czech Republic: AMO Net-Zero 2050'. Accessed 2 March 2024. http://cz.pathwaysexplorer.climact.com/.

3.5 Agriculture

In 2021, agricultural activities resulted in 7,6% of total GHG emissions in Czechia, amounting to 9,1 Mt CO_2eq. The main contributors to the sector's emissions are methane from animal enteric fermentation (4,4 Mt CO_2eq), nitrous oxide emissions from agricultural soils (3,1 Mt CO_2eq), and fuel combustion (1,2 Mt CO_2eq).[63] **Emissions from the agricultural sector fell by 52% between 1990 and 2021 as a result of the reduction in livestock numbers.**[64] However, they are expected to increase in the coming years, especially in the categories of manure management and enteric fermentation, due to the projected increase in the livestock population planned by the Ministry of Agriculture.[65]

Neither the NECP, nor the sectoral strategies attempt to model decarbonisation in the agricultural sector and the available scenarios show a wide range of emissions projections. Based on the strategy of the Ministry of Agriculture with an outlook to 2030 and consultations with experts on policies and measures in agriculture and rural development, the updated NECP projects GHG emissions from agriculture to reach 9,2 Mt CO_2eq in 2040 under the WEM scenario,[66] and the NECP WAM3 scenario from the SEEPIA model assumes a level of around 6,6 Mt in 2040, reaching 6,3 Mt in 2050. The NECP also cites projections from other studies suggesting that GHG emissions can fall to 6,6 Mt CO_2eq in 2040, again under both WEM and WAM3.[67] Finally, the Pathway Explorer Net-Zero 2050 scenario projects agricultural emissions to fall much more swiftly to 3,8 Mt in 2040.[68] **No available scenarios suggest that Czechia's agriculture could achieve carbon neutrality by mid-century.** Residual GHG emissions from agriculture will therefore need to be offset by the use of natural or technological carbon sinks.

There is no official sectoral target for 2040. Existing measures to reduce GHG emissions from agriculture are mainly supported through operational programmes and the Common Agricultural Policy (CAP). These include the construction and efficient use of biogas plants to enable methane recovery and avoidance through the processing of agricultural residues. The development of organic farming aims to further reduce the use of mineral fertilisers and several CAP instruments support carbon sequestration in agricultural soils. Further reductions are possible with incentives to reduce consumption of animal products. According to a study cited in the NECP, the largest dietary change scenario, which would require a 15% reduction in the consumption of all animal products by 2030 and a 50% reduction by 2050,

[63] Based on data from the European Environment Agency. Facts on Climate, 'Greenhouse Gas Emissions in the Czech Republic by Sector [Emise skleníkových plynů v ČR podle sektorů]', 2023, https://faktaoklimatu.cz/infografiky/emise-cr.

[64] Based on Eurostat data. Facts on Climate, 'Greenhouse Gas Emissions in the Czech Republic 1990-2021 [Emise skleníkových plynů v ČR v letech 1990–2021]', 2023, https://faktaoklimatu.cz/infografiky/emise-cr-vyvoj.

[65] Ministry of Agriculture, 'Strategy of the Ministry of Agriculture of the Czech Republic with an Outlook to 2030 [Strategie resortu Ministerstva zemědělství České republiky s výhledem do roku 2030]', 2016, https://eagri.cz/public/portal/-q264647---bQaIYrPS/strategie-resortu-ministerstva-1.

[66] Here, however, the combustion of fuel in agriculture isn't accounted for, which constitutes 13% of the current emissions in agriculture. See page 200-204. Ministry of Industry and Trade, 'Update of the National Energy and Climate Plan of the Czech Republic (Draft)', 2023, https://www.mpo.cz/cz/energetika/strategicke-a-koncepcni-dokumenty/aktualizace-vnitrostatniho-planu-ceske-republiky-v-oblasti-energetiky-a-klimatu--277532/.

[67] SEEPIA and ARAMIS, 'Assessing the Impact of the EU Climate and Energy Package Fit for 55 on the Czech Republic [Hodnocení dopadů klimaticko-energetického balíčku EU Fit for 55 na Českou republiku]' (Ministry of the Environment, 2022), https://seepia.cz/wp-content/uploads/2022/10/Shrnuti-hodnoceni-dopadu-FF55-MZP-SEEPIA-ARAMIS.pdf.

[68] Climact, and AMO. '2050 Pathways Explorer for the Czech Republic: AMO Net-Zero 2050'. Accessed 2 March 2024. http://cz.pathwaysexplorer.climact.com/.

would result in emissions of 4,73 Mt in 2050, a reduction of 1,54 Mt compared to the baseline projection.[69]

3.6 Waste

Czechia's emissions in the waste sector have been rising for years, mainly due to the landfill of the increasing amount of municipal waste. In 2021, they stood at 5,7 Mt CO_2eq – nearly twice the amount quantified for 1990 (3,3 Mt).[70] With a number of waste management measures envisioned by the national policies, the European Commission's Reference Scenario[71] expects Czechia's emissions from waste and F-gases to keep falling until they reach 2 Mt CO_2eq in 2050, and the same number is used in the SEEPIA model.

There is no official sectoral target for 2040, and neither the NECP, nor national waste management strategies attempt to model the relevant GHG emissions in the upcoming decades, **making the waste management sector perhaps the least explored part of the national decarbonisation process.** According to the AMO Net-Zero 2050 scenario modelled in Pathways Explorer, the sectoral emissions by 2040 could be cut to a third (2 Mt CO_2eq), if ambitious policies are implemented.[72]

The figures mentioned above are non-energy related. The updated NECP assumes that more waste will be diverted from landfills to incinerators in the future. And while the country plans to capture and store up to 8 Mt of CO_2 in 2050, there are no indications whether the new waste incinerators are to be equipped with CCS, possibly extending the carbon footprint of waste management in Czechia into the energy sector.

3.7 LULUCF

The LULUCF category is no longer a net carbon sink in Czechia and currently significantly contributes to overall national emissions. Starting in 2015, carbon removals were decreasing and LULUCF turned into a source of GHG emissions in 2018, mainly due to a heavy bark beetle outbreak followed by intense sanitation harvest, forest fires and adverse climatic factors. The outbreak peaked in 2020 and emissions have been declining since. In 2021, the net GHG flux for the LULUCF sector, estimated as the sum of emissions and removals, equaled 8,4 Mt CO_2eq. The main source of emissions in the Czech LULUCF sector comes from forest land (9,2%). Emissions primarily result from changes in living biomass carbon stock and include the non-CO_2 gases (CH_4 and N_2O) as well. The other categories involve land use conversions in forest land, each contributing less than 0,5% to the total GHG emissions balance. The category harvested wood products acts as a CO_2 offset, capturing close to 2% of the total GHG emissions in the country.[73] It is important to

[69] Ščasný, Milan, Lukáš Rečka, Vojtěch Máca, and Vladimír Kubeček. 'Modelling the Decarbonisation of the Czech Economy: Scenarios for NKEP and How to Proceed? [Modelování dekarbonizace České ekonomiky: Scénáře pro NKEP a jak dále?]'. SEEPIA, January 2024. https://seepia.cz/wp-content/uploads/2024/01/SEEPIA_Seminar_Modely-MakroEkon.pdf.
Poore, J., and T. Nemecek. 'Reducing Food's Environmental Impacts through Producers and Consumers'. Science 360, no. 6392 (June 2018): 987–92. https://doi.org/10.1126/science.aaq0216.

[70] CHMI, 'National Greenhouse Gas Inventory Report of the Czech Republic (Reported Inventories 1990–2021): Submission under UNFCCC and the Kyoto Protocol', April 2023, https://www.chmi.cz/files/portal/docs/uoco/oez/nis/NIR/CZE_NIR-2023-2021_UNFCCC_allinone_ISBN.pdf.

[71] EC, 'EU Reference Scenario 2020', 2024, https://energy.ec.europa.eu/data-and-analysis/energy-modelling/eu-reference-scenario-2020_en.

[72] Climact, and AMO. '2050 Pathways Explorer for the Czech Republic: AMO Net-Zero 2050'. Accessed 2 March 2024. http://cz.pathwaysexplorer.climact.com/.

[73] CHMI, 'National Greenhouse Gas Inventory Report of the Czech Republic (Reported Inventories 1990–2021): Submission under UNFCCC and the Kyoto Protocol', April 2023,

note that **the emissions within the LULUCF sector exhibit high inter-annual variability**, especially in recent years.

Table 5: Estimated emissions and removals for the major land-use categories and Harvested Wood Products (HWP) contribution for the entire reporting period 1990 to 2021. IE (included elsewhere) for Other land included within Settlements.

Sector	4.A Forest land	4. B Cropland	4.C Grassland	4.D Wetlands	4.E Settlements	4.F Other land	4.G HWP	4. LULUCF Total
				[kt CO_2 eq.]				
1990	-7222	116	-144	24	319	IE	-1680	-8586
1995	-9010	153	-302	12	295	IE	-827	-9677
2000	-8010	133	-365	38	306	IE	-1271	-9168
2005	-6879	98	-362	25	293	IE	-1434	-8258
2010	-5544	109	-354	41	213	IE	-1620	-7155
2015	-6325	83	-426	27	154	IE	-478	-6964
2020	14240	49	-477	36	212	IE	-2792	11268
2021	10997	48	-497	27	239	IE	-2457	8358

Source: CHMI 2023

The individual target set for Czechia by the EU for achieving net removals from the LULUCF sector by 2030 is to increase removals by 827 Kt of CO_2 compared to the average for the years 2016, 2017, and 2018, gradually aiming to achieve net removals of approximately 1,2 Mt of CO_2 annually,[74] corresponding to a 0,4% share of the EU goal (based on EU Regulation 2023/839). **Achieving this target will depend primarily on the pace of overcoming the bark beetle calamity** and the speed and quality of forest recovery.

Also, the projections prepared using the CBM-CFS3 modelling tool which is widely used to simulate the dynamics of all forest carbon pools required under the UNFCCC, show that it is expected the CO_2 removal capacity in the Czech LULUCF sector will be reduced until 2040, and then gradually recover.[75] The emissions projections for the LULUCF sector include changes in age structure (in WEM from the CBM-CFS3 model[76]) and in age structure and species composition (in WAM – more diverse Czech forests with a significantly higher share of deciduous trees). Although until 2040, the WAM scenario appears to be slightly more negative in terms of emission removals, **it should lead to more stable and resilient forests better adapted to changing environmental conditions.**

The basic reference case assumes that by 2030 the areas cleared as a result of the bark beetle outbreak will be reforested, leading to further expansion of LULUCF as a carbon sink. According to the McKinsey scenario, it is estimated that by 2040, the LULUCF sector will sequester 9 Mt of CO_2 per year and similar numbers are indicated by the AMO Net-zero 2050 scenario from the Pathways Explorer (-8,4 Mt CO_2 p.a. by 2040).[77] It is important to note that the objectives of the Czech climate policy were set without the LULUCF sector. **However, it is appropriate to set**

https://www.chmi.cz/files/portal/docs/uoco/oez/nis/NIR/CZE_NIR-2023-2021_UNFCCC_allinone_ISBN.pdf.

[74] See page 27. Ministry of Industry and Trade, 'Update of the National Energy and Climate Plan of the Czech Republic (Draft)', 2023, https://www.mpo.cz/cz/energetika/strategicke-a-koncepcni-dokumenty/aktualizace-vnitrostatniho-planu-ceske-republiky-v-oblasti-energetiky-a-klimatu--277532/.

[75] Hanzlík, Viktor, Vít Javůrek, Bram Smeets, and Daniel Svoboda. 'Pathways to Decarbonize the Czech Republic: Carbon-Neutral Czech Republic 2050'. McKinsey & Company, 2020. https://www.mckinsey.com/cz/our-work/pathways-to-decarbonize-the-czech-republic.

[76] CHMI. 'Integrated Reporting on Greenhouse Gas Policies and Measures and on Projections in the Czech Republic: Reporting under the Art. 18 of the Regulation EU No. 2018/1999', 2021. https://www.chmi.cz/files/portal/docs/uoco/oez/nis/projections/Projections_of_GHG_2021_CZ_final.pdf.

[77] Climact, and AMO. '2050 Pathways Explorer for the Czech Republic: AMO Net-Zero 2050'. Accessed 2 March 2024. http://cz.pathwaysexplorer.climact.com/.

targets including LULUCF in the future, as total net emissions are indicative for meeting the Paris Agreement targets.[78]

3.8 Technological removals

CCUS, BECCS (CCS with biomass) and DACCS (direct air carbon capture and storage) are considered relevant technologies that can be utilised to help Czechia achieve its long-term mitigation goals. **Increasingly, key strategies and policy documents rely on the presumption of their significant upscaling, even if this is often seen as speculative.**

At the time of writing, Czechia does not employ any CCUS technologies commercially, but six research projects have been underway with the first carbon storage project planned for 2024.[79] **Similarly, no national strategic documents on CCUS exist.** However, to deploy the technologies, Czechia participates in the working group on CCUS under the European Strategic Energy Technology Plan, and has already transposed the EU CCS Directive into national law. Czechia is also guided by the EU CCUS Roadmap to 2030, and follows EU-wide CDR (carbon dioxide removal) accounting and guidance on CCU.

Currently, there are no targets on technological removals either on the EU level or in Czechia. Depending on how the EU's 2040 goal is eventually designed, Czechia may have a target for emissions removals separate from emissions reductions.[80] The most comprehensive document on CCS deployment in Czechia is the CCS National Roadmap produced by an independent research consortium, which estimates significant storage potential in Northern Moravia region (<850 Mt CO_2), and defines the main obstacles (e.g. infrastructure, costs) and policy recommendations (e.g. establishment of a legal framework or revoking the limit of 1 Mt CO_2 per site for commercial storage) for the 2030 to 2050 period.[81]

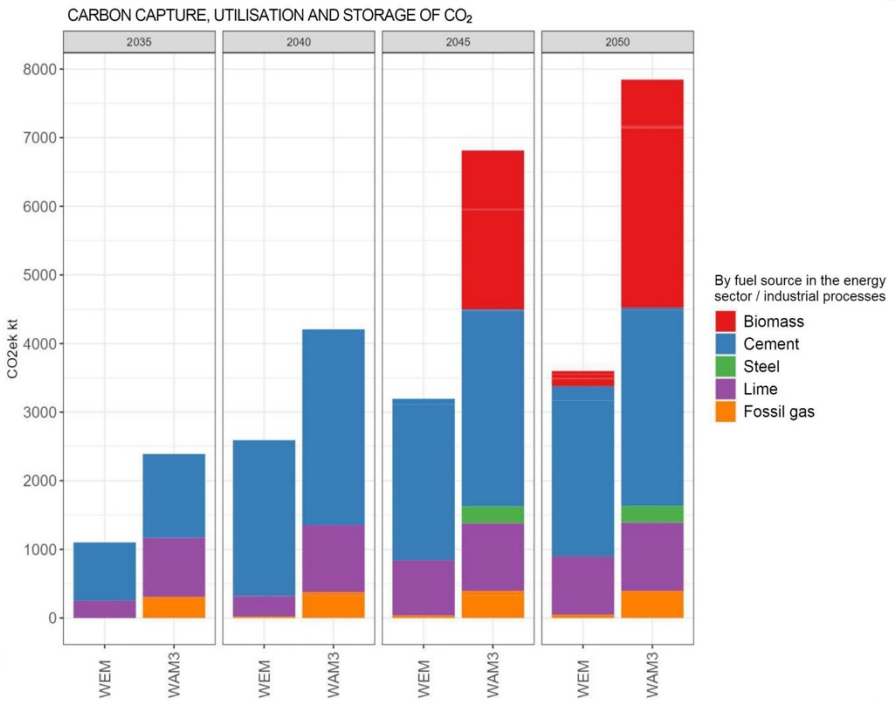
[78] See page 7. Cenia, 'Evaluation of the Climate Protection Policy in Czechia [Vyhodnocení Politiky ochrany klimatu v ČR]' (Ministry of the Environment, September 2021), https://www.mzp.cz/C1257458002FoDC7/cz/politika_ochrany_klimatu_2017/$FILE/OEOK_POK_vyhodnoceni_20211101.pdf.

[79] Michal Hrubý, Alexandra Visnerová, and Vladimír Bartovic, 'CCS National Roadmap Czechia: Building Momentum for the Long-Term CCS Deployment in the CEE Region' (CCS4CEE, 2022), https://ccs4cee.eu/wp-content/uploads/2022/06/Czechia_CCS-Roadmap.pdf.

[80] Nils Meyer-Ohlendorf et al., 'EU 2040 Climate Architecture: Target Designs and Framework Options' (Ecologic Institute, 2023), https://www.ecologic.eu/sites/default/files/publication/2023/60028-2040-Climate-Architecture-report.pdf.

[81] CCS National Roadmap Czechia.

Figure 4: SEEPIA modelling of Carbon Capture, Utilisation and Storage capacity to reduce CO2eq in Kt by fuel source employed in the energy sector (biomass, natural gas) or substance produced in the industry (cement, steel, lime)



Source: SEEPIA 2024, translated[82]

According to the updated NECP, **by 2040 Czechia should be employing CCS on natural gas for power generation, and utilising CCUS in industry to produce cement, steel and lime** (Figure 4). The WEM scenario accounts for reductions of 2,6 Mt CO_2eq in 2040 while NECP WAM3 expects 4,2 Mt CO_2eq to be captured annually. BECCS technologies are expected to be implemented at scale only post-2040 in the NECP WAM3 scenario. On the other hand, the AMO Net-Zero 2050 scenario modelled in the Pathways Explorer assumes a less prominent role for carbon capture technologies, with envisaged capture and storage amounting to 1,4 Mt CO_2eq by 2040 overall.[83]

[82] Ščasný, Milan, Lukáš Rečka, Vojtěch Máca, Matěj Opatrný, Dali Laxton, Patrik Lenz, and Lukáš Novák. 'Energy and Industry Modelling: TIMES-CZ [Modelování Energetiky a Průmyslu: TIMES-CZ]'. SEEPIA, January 2024. https://seepia.cz/wp-content/uploads/2024/01/SEEPIA_Seminar_Prumysl.pdf.

[83] Climact, and AMO, '2050 Pathways Explorer for the Czech Republic: AMO Net-Zero 2050'. Accessed 2 March 2024. http://cz.pathwaysexplorer.climact.com/.

Discussion and conclusion

As climate policy moves past the 2030 horizon and approaches the 2050 climate neutrality target, the debates will become more difficult. These debates are taking place in the EU and in Czechia, following the Commission's recommendation of a 90% emissions reduction target by 2040 compared to 1990. While the requirements for the Czech contribution towards the common EU climate goal were rather indulgent in the past (eg. for the 2020 targets), it is clear that with its present economic standing, Czechia will be required to draw level in climate ambition as well. Thus far, **the Czech official reception of the Commission's recommendation has been mixed,** criticising the insufficiencies of the impact assessment and pointing out the confident assumptions about the role of hydrogen, CCS technologies and removals.

In Czechia, at the same time, **the updating of three foundational climate and energy strategies is taking place.** These are thoroughly based on SEEPIA scenarios, providing a comparison between the scenario with existing measures (WEM) and with additional measures (especially WAM3). The similarity of these two scenarios in their ambition (both around 65% reduction for 2030 compared to 1990, and 76% and 82% reduction for 2040) might paint a picture of a "business-as-usual plus" decarbonisation. Discussions with relevant actors from the public sector, industry and expert groups, on the other hand, **reveals the perceived challenges facing the implementation of the scenarios, including impacts on households, businesses and the regional economy.**

In the next decade, Czech climate scenarios envisage coal phase-out and in general, substantive emissions reductions in the ETS sector. **These are low-hanging fruits in terms of mitigation effects, but they bring with them the challenge of accelerating the uptake of low-carbon energy sources,** especially in the heating sector, and managing the just transition in the most affected regions. Moreover, meeting the current energy efficiency goals requires the speeding up of the renovation wave in buildings. In the 2040 perspective, **overlooked sectors, especially agriculture and waste, will play an important role**, as well as **the ability to reverse the trend of rising emissions in the transport sector.** Both incentive and restriction-based policies will be needed in these areas, such as the systematic support of key infrastructure as well as the extension of the EU ETS system to buildings, road transport and more, eventually, all taking into account the respective distributive effects.

Association for International Affairs (AMO)

AMO is a non-governmental not–for–profit Prague-based organization founded in 1997. Its main aim is to promote research and education in the field of international relations. AMO facilitates the expression and realization of ideas, thoughts, and projects in order to increase education, mutual understanding, and tolerance among people.

+420 224 813 460

www.amo.cz

info@amo.cz

Žitná 608/27, 110 00 Praha 1

www.facebook.com/AMO.cz

www.twitter.com/amo_cz

www.linkedin.com/company/amocz

www.youtube.com/AMOcz

Kristina Zindulková

Kristina Zindulková is AMO Research Fellow with a focus on climate change and decarbonization. In the Climate team, she deals with the question of how to decarbonise the Czech economy while avoiding negative social impacts in the coal regions. Kristina graduated from Masaryk University with a degree in environmental and public economics with a short study visit in Canada, and is now studying socio-ecological economics in Vienna and Paris. She has been active at AMO since 2017 as a member of the Prague Student Summit preparatory team and the president of the UN Environment Assembly. In addition, she worked on sustainability issues at the Ministry of Foreign Affairs and was part of a research project at Masaryk University. She has participated in a research of mountain forests in Slovakia and Romania or mapped Czech watercourses with a project Together Against Drought and Floods.

kristina.zindulkova@amo.cz

Oldřich Sklenář, Michaela Kožmínová, Martin Abel, Barbora Chmelová,
Barbora Kvasničková, Tomáš Jungwirth Březovský