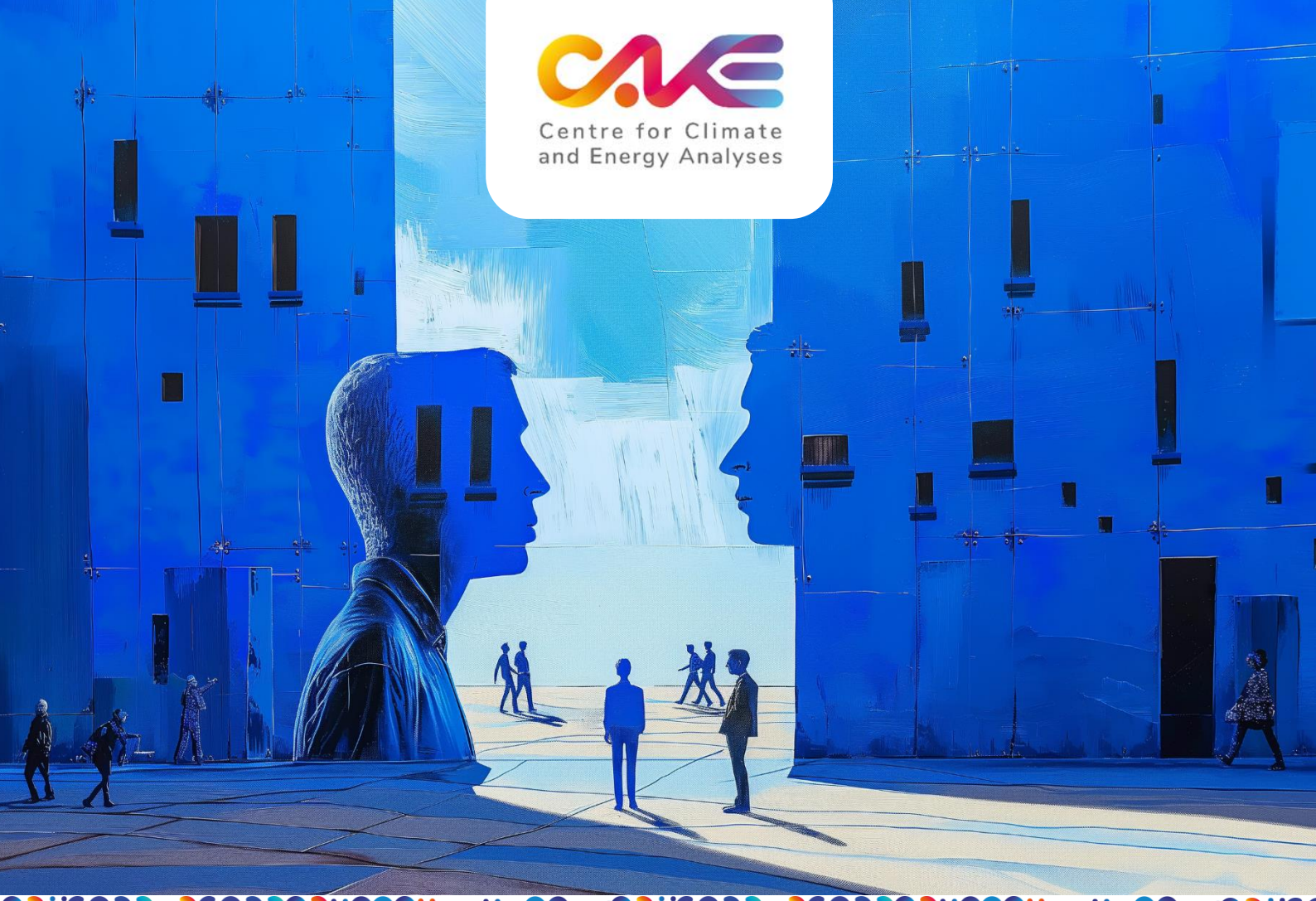

Centre for Climate and Energy Analyses

VIIEW 2050

EXPLORING SYNERGIES BETWEEN THE EU ETS AND OTHER EU CLIMATE POLICY MEASURES - CARBON REMOVAL, HYDROGEN, AND SECTORAL TRANSPORT POLICY

– SUMMARY & POLICY RECOMMENDATIONS –

LIFEVIIEW2050

KOBiZE

Warsaw, April 2024

IOŚ-PIB

AUTHORS AND COPYRIGHT

Maciej Pyrka, Robert Jeszke, Jakub Boratyński, Jan Witajewski-Baltvilks, Marek Antosiewicz, Igor Tatarewicz, Wojciech Rabiega, Adam Wąs, Michał Lewarski, Sławomir Skwierz, Marta Rosłaniec, Sebastian Lizak, Izabela Zborowska, Marzena Chodor, Paweł Kobus, Maciej Cygler, Artur Gorzałczyński, Aneta Tylka, Izabela Lewarska, Paweł Mzyk, Monika Sekuła

The authors would like to thank the members of The LIFE VIIEW 2050 Advisory Board: Antonio Soria (Joint Research Centre), Karsten Neuhoff (DIW Berlin), Artur Runge-Metzger (former European Commission), Simone Borghesi (European University Institute), Stefano F. Verde (University of Siena), Wojciech Burkiewicz (The Chancellery of Prime Minister of Poland), Jos Delbeke (European University Institute).

Upon quoting, please refer to the source, as follows:

Pyrka M., Jeszke R., Boratyński J., Witajewski-Baltvilks J., Antosiewicz M., Tatarewicz I., Rabiega W., Wąs A., Lewarski M., Skwierz S., Rosłaniec M., Lizak S., Zborowska I., Chodor M., Kobus P., Cygler M., Gorzałczyński A., Tylka A., Lewarska I., Mzyk P., Sekuła M. (2024). VIIEW on EU ETS 2050: Exploring synergies between the EU ETS and other EU climate policy measures - carbon removal, hydrogen, and sectoral transport policy, Institute of Environmental Protection - National Research Institute / National Centre for Emissions Management (KOBiZE), Warsaw.

This document was prepared in the Centre for Climate and Energy Analyses (CAKE) established in the National Centre for Emissions Management (KOBiZE), part of the Institute of Environmental Protection - National Research Institute (IOŚ-PIB).

This document was prepared within the scope of the project: "The impact assessment of the EU Emission Trading System with the long-term vision for a climate neutral economy by 2050 (LIFE VIIEW 2050)" - LIFE19 GIC/PL/001205 – LIFE VIIEW 2050.

If you have any comments or questions regarding this document, please contact cake@kobize.pl.

The document was completed in March 2024.

Disclaimer: The findings, interpretations, and conclusions expressed in this document are those of the authors, and not necessarily of the organisation with which the authors are affiliated. This document is distributed in the hope that it will be useful, but the IOŚ-PIB shall not be held liable for any damage caused as a consequence of the use of its content. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

Design, cover and editing: Robert Jeszke & AI.

Contact:

Address: 32 Słowicza St., 02-170 Warsaw
WWW: www.climatecake.pl
E-mail: cake@kobize.pl
Phone.: +48 22 56 96 570
Twitter: @climate_cake

The project "The impact assessment of the EU Emission Trading System with the long-term vision for a climate neutral economy by 2050 (LIFE19 GIC/PL/001205 - LIFE VIIEW 2050)" is co-funded from the European Union LIFE programme and the resources of the National Fund for Environmental Protection and Water Management.

Aims of the report

- This report is structured to analyze the dynamic interactions between complementary policies and emission trading systems, notably the EU Emissions Trading System (EU ETS) and the new ETS2. The report focus on understanding policy interactions. In particular, it examines:
  - How pricing for CO_2 removals through mechanisms like BECCS (Bioenergy with Carbon Capture and Storage) and afforestation of arable lands, interact with existing emission trading frameworks.
  - Additionally, it evaluates strategies aimed at decarbonizing the transport sector, including the implementation of emission standards for heavy-duty vehicles and policies accelerating the the scrapping of old fossil fuel cars.
  - The report also delves into the subsidization of green hydrogen, examining its role and integration within the broader EU climate strategy.
- The emission reduction targets in the scenarios are consistent with the net-zero path as outlined in the European Green Deal and the 'Fit for 55' package. The report also considers the impact of the European Commission's recent proposals for ambitious climate targets for 2040 on key macroeconomic indicators.
- Through this multi-dimensional approach, the report aims to contribute substantively to the ongoing discourse surrounding the development of EU climate policy. The report seeks to offer valuable insights that are crucial for making informed decisions in the context of the European Union's ambitious climate goals, thereby supporting policymakers in the strategic planning and implementation of effective climate actions.

Policy Recommendations

- **Revised Targets:** Considering the discrepancy between the CAKE reduction path projection and the European Commission's (EC) proposed targets, a thorough reassessment of reduction objectives for 2040 is recommended. This involves aligning targets more closely with potential future achievements and ensuring realistic yet ambitious milestones in the pursuit of climate neutrality by 2050. The 2040 target proposed by the EC will require significant energy efficiency improvement and implementation of new technologies, including those currently in the pre-commercial stage (such as e-fuels and DACCS). These technologies have uncertain future commercialisation costs, and their implementation may be delayed. If we adopt the milestones proposed by the EC without vast implementation of these technologies, there's a risk of exceeding emission limits. In this context, to ensure economically acceptable realisation of climate policy, the following actions may include:
    - Integration of international emission offsets as per Article 6 of the Paris Agreement to enhance flexibility.
    - Increasing the role of carbon removals (BECCS technologies, afforestation of arable lands, and increasing carbon sequestration in the LULUCF sector),
    - Linking the EU ETS and ETS2 with other trading systems in other regions outside the EU to enhance market liquidity and cost-effectiveness, ensuring that stringent emissions caps do not lead to economic dislocation.
- **Enhanced Support for Carbon Removal Technologies:** Recognising the key role of carbon removal technologies, particularly in sectors facing technical challenges, a strategic integration plan should be developed to strengthen incentives for these technologies. Priority should be given to the pricing of removals, with particular attention to BECCS and afforestation, taking into account country-specific considerations such as the increased importance of afforestation in Poland. Higher pricing for negative emissions and enhanced financial and regulatory support for the deployment of these technologies across the EU, will help lower carbon prices and boost economic indicators such as GDP and consumption.
- **Implementation of ETS for Other Sectors:** The introduction of the new ETS system for sectors not covered by existing emission schemes (EU ETS, ETS2) in the EU,

should be optimized for maximum effectiveness. While recognizing its negligible macroeconomic consequences, careful consideration of both sector-specific and country-specific implications is essential, both at the EU level and, importantly, in Poland.

- **Establishment of a European Carbon Central Bank (ECCB):** While the removal units ETS trading as well as the agri sector and ETS2 could be integrated with the existing EU ETS, measures addressing potential risks related to market liquidity, stability and coherence seem to be necessary. Establishment of a European Carbon Central Bank (ECCB) that would serve as a regulatory authority, managing the supply and demand for EU allowances and CO2 removal units, is recommended.

- **Support for Green Hydrogen Production:** Recognising the dependence of green hydrogen production on subsidies, a sustained and strategic approach is needed to support its development, particularly in the critical period 2030-2035. This includes careful assessment of the impact on GDP and consumption.

- **Balanced Subsidies and Emission Standards in Transport:** Subsidies and emission standards in the transport sector should be carefully balanced to ensure effective emission reductions. While acknowledging the tangible impacts on emissions, variations in efficacy across passenger and freight segments should be considered, ensuring a comprehensive approach to sustainable transport policies.

- **Careful Design of GHG Removal Subsidies in Agriculture:** The formidable challenges posed by economic mechanisms for GHG reduction in agriculture necessitate a judicious application of GHG removal subsidies. Financial burdens on the agricultural sector can be alleviated with carefully designed support mechanisms, contingent on appropriate funding levels.

- **Market Stabilization Measures for Agriculture:** Climate policy assumptions aiming for carbon neutrality in agriculture should be accompanied by measures to stabilize markets, especially in regions like Poland. Balancing production declines and price spikes is crucial, and proactive policies can help mitigate the impact on farmers. However creating an ETS solely for agriculture would be immensely challenging. It's important to note that while industries covered by the current ETS systems can potentially cut emissions to near-zero, the unique nature of agriculture doesn't offer the same possibility. It wouldn't be feasible to directly impose a carbon price on

farms. One alternative could be to pass the cost to food on consumers, though this approach would likely face resistance.

- **Comprehensive Dialogue and Stakeholder Engagement:** Essentially, as the EU strives for climate neutrality, it faces a delicate balance between environmental sustainability and economic viability. Strategic interventions, encompassing pricing mechanisms, targeted subsidies, and calibrated policy frameworks, are imperative to navigate these challenges effectively. Moreover, fostering robust dialogue and stakeholder engagement, particularly in sectors like agriculture, is indispensable to ensure the equitable distribution of costs and benefits, fostering a transition that is not only environmentally sound but also socially and economically just.

Main conclusions

European Green Deal and 'Fit for 55' background

- As a result of the implementation of the European Green Deal, the 'Fit for 55' package and the net zero target in 2050, **the emission intensity of the GDP in the EU countries will decrease by around 80% between years 2020 and 2050, while GDP will grow by 60%, resulting in a reduction of almost 70% in gross emissions** (i.e. emissions excluding removals other than the industrial CCS). However, mitigation opportunities are not evenly distributed across sectors.

- **The largest reductions in emission intensity are observed in the electricity and households sectors**. On the other hand, **reducing emissions from transport – especially shipping and aviation – and industry is proving more challenging. Two sectors show a reduction in activity – fossil fuels and agriculture.** In the case of fossil fuels, a sharp drop in activity is linked to a reduction in demand for non-renewable energy sources. In the case of agriculture, the result actually signals the exhaustion of mitigation options, with further emission reductions leading to a decline in production, raising concerns about food security and carbon leakage. **The role of carbon sinks on the path to net zero emissions is crucial. Bioenergy with CCS (BECCS) and afforestation of agricultural land develop significantly from 2040 onwards, but their scale depends on the pricing of removals.**

Macroeconomic results

- **The complementary policies to the EU ETS allow a significant reduction in carbon prices.**
  This reduction translates into welfare gains in some cases, although this latter result is not general and some complementary measures (such as hydrogen subsidies) lead to welfare losses.

- **The impact of pricing removals and their large-scale deployment is positive in all dimensions: it leads to a significant reduction in carbon prices, higher GDP and consumption.** Allowing for full pricing of removals leads to a drop in the EU ETS price

from 880 EUR/tCO_2 to 310 EUR/tCO_2 in 2040. A similar price reduction is observed in 2050. It also reduces carbon cost in non-ETS sectors in all regions.

- **Systemic integration of removal technologies into climate policy can increase the number of carbon allowances, allowing sectors with high abatement costs to purchase additional allowances instead of investing resources in costly decarbonisation options.** This releases resources in the economy that can be used in the same or other sectors to increase production.
- At the macroeconomic level, pricing removals increases EU consumption by 0.9% in 2040 and 1.9% in 2050. The simulations also show a positive impact on GDP (by 0.6% in 2040 and 2050). In Poland, consumption in 2040 is 1.1% higher in the scenario with full pricing of removals than in the scenario without pricing. In 2050, the difference in consumption increases to 3.8%.
- **Pricing negative emissions from BECCS lowers the price in the EU ETS and pricing emissions from afforestation lowers the cost of carbon in non-ETS sectors.** Both measures contribute to consumption gains, but at the EU level the contribution of pricing BECCS is much larger than that of pricing afforestation. Pricing afforestation is more important in Poland than in other countries.
- **Subsidies for hydrogen lead to lower prices in the EU ETS.** In 2035, in the scenario with subsidies, the EU ETS price reaches a level of 270 EUR/tCO_2, which is 30 EUR lower than in the scenarios without subsidies. In 2040 the price difference remains at 30 EUR/tCO_2 and in 2050 it is 15 EUR/tCO_2.
- **However, the introduction of hydrogen subsidies leads to a decrease in GDP and consumption at the EU level.** In 2030 the loss in EU consumption is 0.3%. In 2040 and 2050 the loss is less than 0.1%. The predicted consumption loss at EU level can be explained by the distortionary effect of subsidies, which is in line with the predictions of the economic literature. In Poland, however, the low prices of the EU ETS lead to a consumption gain of 0.8% in 2050.
- **The main effect of additional policies introduced in the transport sector is a reduction in the carbon price in ETS2.** In 2030, the price in the scenario with transport policies is 55 EUR/tCO_2, which is 10 EUR/tCO_2 lower than in the scenario without the measures. In 2040 the difference is 150 EUR/tCO_2 and in 2050 it is 300 EUR/tCO_2.

- **Based on the emission reduction target for 2030 and 2050,** in our scenarios the EU achieves a 75% reduction in 2040 compared to 1990 levels, without taking into account the level of absorption from the LULUCF sector. Including the LULUCF sector (about -396 Mt CO_2 eq. in 2040), **the achieved net reduction target in 2040 is about 83% compared to 1990 levels.**
- **The economic costs of the accelerated reduction (90% reduction by 2040) proposed by the European Commission are an order of magnitude higher than the costs of the most ambitious least-cost path considered by the IPCC.** According to the macroeconomic analysis of the total costs of the transition presented in the Sixth Assessment Report (Working Group 3), the difference in consumption growth between the most ambitious scenario (C1) and the BAU scenario is 0.04 p.p. Acceleration of decarbonisation in Poland brings reduction in the consumption growth rate in 2030s by 0.4 p.p. (1.8% annual growth in Fit55_S2+ scenario vs 2.2% in Fit55+), according to our analysis. At the EU level, consumption growth slows down by 0.2 p.p.
- **Economic loss due to acceleration varies significantly across regions.** In the accelerated scenario (Fit55_S2+), consumption in 2040 in Western Europe is expected to be around 0.8% lower than in the Fit55+ scenario. In Poland and Southern Europe, the loss is projected to exceed 4%.

Energy sector

- **BECCS is one of the technologies that can deliver negative emissions. However, it requires additional revenues for the negative emissions achieved.** BECCS technology significantly reduces the marginal cost of CO_2 abatement in sectors covered by the EU ETS. In the 100% subsidy scenario, the carbon price in the EU ETS is 30% lower than in the 50% subsidy scenario. **In the scenarios with high revenues for negative emissions, the sector achieves carbon neutrality for the EU before 2040.** For Poland this process is only slightly slower.
- **The pace of development of green hydrogen production, especially in the 2030-2035 period, is strongly dependent on subsidies** - in the reference scenario (Fit55) green hydrogen is still minimally used, whereas in the hydrogen subsidy scenario green hydrogen technologies start to be used as early as 2030 and the initial pace of development of these technologies accelerates significantly.

- **Demand for hydrogen is mainly in the transport and industrial sectors, but additional hydrogen consumption will occur in the energy sector, where hydrogen will be used as a long-term energy storage and backup technology to replace natural gas.** This additional demand could reach about 30-35% of total hydrogen production in 2050.
- In the EU, the electricity demand for BEVs in the transport policy scenario is about 13% higher than in the reference scenario over the whole analysis period. The electricity demand for electrolyzers is more than 6% higher in 2030-2050 in the same scenario comparison.
  The impact of the analysed transport policy in Poland is even more obvious. The total electricity demand for charging electric cars in the transport policy scenario is about 25% higher in the period 2030-2050 than in the reference scenario. The total electricity consumption in electrolysers in 2030-2050 is about 16% higher in the scenario with additional transport policies.

Transport sector

- **Raising emission standards for heavy-duty vehicles is a key policy to reduce emissions from road freight transport** in the EU+UK area, contributing to a reduction from 69.8 to 23.7 Mt CO_2 in 2050.
- The measures adopted in the 'Fit for 55' package (in particular the ban on ICE cars and vans) are already have a significant impact on reducing passenger car emissions, but additional measures such as **accelerating the scrapping of fossil fuel vehicles could be important in eliminating the emissions remaining in 2050.** This policy reduces the share of fossil fuel cars in 2050 by about 2 p.p., both across the EU+UK area and in Poland.
- **Hydrogen subsidies have a stronger impact on freight transport than on passenger transport.** However, the impact of this policy is rather limited as it only increases the share of hydrogen trucks in the fleet by 1.5 p.p. in Poland and 1.1 p.p. in the EU+UK area.
- **In the long term, both households and companies can benefit financially from transitioning to zero-emission vehicles.** The total cost of ownership of the entire vehicle fleet in Poland could be up to 8% lower in 2045 due to the quicker transition to ZEVs, which have lower costs.

Agriculture sector

- If attempts are made to use economic mechanisms in line with the polluter pays principle to force GHG emission reductions in the agricultural sector, the negative income effect of carbon pricing in the EU agricultural sector would reach a staggering EUR 179 billion per year in 2050 (in the scenario without subsidies), exceeding the support provided by the Common Agricultural Policy (EUR 55 billion per year).
- **Setting a price for removal units, generated from afforestation of arable land, helps reduce the financial burden of climate policy on EU agriculture.** However the net income effect of the net zero policy still remains negative reaching -84 billion EUR in scenario with the highest subsidies for GHG removals.
- The introduction of climate policy assumptions leading to the carbon neutrality of the EU economy has a strong impact on the agricultural market. On average, agricultural production in the EU falls by around 25%, while prices rise to 300% of the base year level.
- From the 2050 perspective, there are no significant differences between following country-specific carbon prices and a common EU carbon price for agriculture and the rest of non-ETS sectors in terms of GHG emissions, market situation and economic impacts. However, the adjustment path in 2025-2045 differs slightly between regions and scenarios. The common EU carbon price scenarios provide a smoother and more predictable transition path.
- In Poland, climate policy has a relatively stronger negative impact on the agricultural sector than the EU average in terms of production losses and price increases. Hence, **pricing removals units, generated from afforestation of arable land, have a greater impact on the mitigation of negative net income effect in the Polish agricultural sector.**
- **Increasing payments for removals beyond 25% of the carbon price assumed in the model does not lead to an increase in the GHG removal rate by the agricultural sector**. However, payments exceeding 25% lead to a discernible environmental effect, while improving financial situation of farms.

LIFE VIIEW 2050

Vision on Impact & Improvement of the EU ETS Working by 2050

Co-funded by the European Union

LIFE VIIEW 2050

Centre for Climate and Energy Analyses

National Centre for Emissions Management
Institute of Environmental Protection
National Research Institute

Funded by
NATIONAL FUND
FOR ENVIRONMENTAL PROTECTION
AND WATER MANAGEMENT

Project entitled „The impact assessment of the EU Emission Trading System with the long-term vision for a climate neutral economy by 2050 (LIFE VIIEW 2050 – LIFE19 GIC/PL/001205)" is co-funded by the Life Programme of the European Union and the National Fund for Environmental Protection and Water Management.