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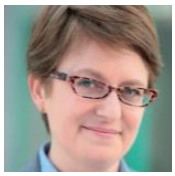

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Key words: European Green Deal, Fit for 55 package, EU ETS,, non-ETS, GHG, MSR, greenhouse gases, COP26, climate protection, climate policy, emission allowances, industry, transformation, transport, carbon leakage, hydrogen BTA, CBAM, CCS/CCU, carbon dioxide, electromobility, emissions, energy, Modernization Fund

Foreword

We have the pleasure to present to you the third issue of **'$GO_2$50'**, a publication of the National Centre for Emissions Management at the Institute of Environmental Protection – National Research Institute.

The year 2022 was certainly the time which we will all remember because of the very difficult geopolitical situation in the world caused by Russia's aggression against Ukraine. The war came during an unfolding global post-COVID recovery in the economy struggling with disrupted supply chains, causing rises in the prices of raw materials and energy carriers, which contributed to the highest inflation growth in the world since the 1970s and the energy crisis in the EU. The need to change the directions of fossil fuel supplies, mostly less carbon-intensive gas, as a result of Russia's attack on Ukraine, intensified the process of the revaluation of, and changed the approach to, climate and energy policy. In these new circumstances, there were significant changes in the list of European priorities in favour of supply security and as quick cessation of fuel imports from Russia as possible. This does not mean, however, that climate policy and greenhouse gas emission reductions, particularly those of emissions from the combustion of fuels, in the EU lost prominence. On the one hand, this interest is manifested in the enhanced activity of the opponents of ambitious climate policy who refer to the current situation as an argument for, at least temporarily, halting climate actions. On the other hand, a wide group of experts and politicians believe that, quite on the contrary, the present circumstances are a splendid opportunity for speeding up certain actions, including those to increase the share of renewable energy sources and improve energy efficiency in the EU, thus also responding to the risks arising outside climate policy itself and bringing a positive synergy effect. With consideration given to the wider context, including a very difficult economic situation, which adversely affects industry and individual consumers in Europe, it seems well-advised to take a toned-down and balanced approach to climate and energy policy.

Mindful of the importance of the circumstances outlined above, we have the pleasure to present to you studies by our Authors who address issues which are and will be in the nearest time the subject matter of heated discussions as part of progress in the implementation of the Fit for 55 package. One of the key prerequisites for success is a reform of the present EU ETS system, including the expansion of its scope to cover new sectors or the introduction of new regulatory instruments, such as the carbon border adjustment mechanism (CBAM). Given the scope of necessary measures, there is a need to tackle the costs which the EU Member States will have to incur as part of the energy transition on the pathway to achieve the climate neutrality goals. In this context, the EU support measures will be indispensable, including, among others, Just Transition, to mitigate the impacts of the transition, the new European Bauhaus, to support cities and citzens, or the introdction of equivalent measures to reduce emissions. Actions will also need to be taken at the international level, specifically, to operationalise and implement the market mechanisms under Article 6 of the Paris Agreement or to achieve at the international scale the carbon border adjustment mechanism (CBAM), which could contribute to enhancing the reduction effects in the world.

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The situation on the EU ETS emission allowance market in 2022 and the prospects for price growth in the future years

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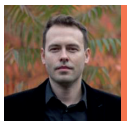
The situation on the EU ETS emission allowance market in 2022 and the prospects for price growth in the future years

Keywords: emission allowance price, EUA, Fit for 55 package, EU ETS, MSR reserve, allowance supply, commodities, carbon market



Author:
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Summary

The aim of the present article is to examine the current situation on the CO_2 market in EU ETS, to identify the main price drivers which had the greatest impact to the EUA[1] price development in 2022 and the attempt to estimate the impact of structural factors, such as proposed changes to the EU ETS, and the geopolitical factors on EUA prices in the nearest months and years. In the article, an attempt is also made to estimate the possible range of the future price movements by using the technical analysis of charts.

The article demonstrates that the most characteristic feature of the CO_2 market in 2022 was the very high volatility of EUA prices which could change in a very short period of time by 35% to even 45%. Undoubtedly, the reason for this situation was the uncertain geopolitical circumstances caused by the Russian invasion of Ukraine in February 2022 driving the present energy crisis in the EU. The need to become independent from energy supplies from Russia, particularly gas, made it necessary for the EU to switch to other sources, among others, by increasing coal consumption. One of the negative effect was high energy prices, leading to limit the industrial output in Europe and lower emissions. Moreover, in order to become independent from fuels from Russia, the EU has decided to use part of the proceeds from the EU ETS. To this end, it plans to increase the supply of allowances in the nearest years through their additional sales at auctions, as part of the REPowerEU Plan. Most likely the idea of increasing the allowances supply in the system is already taken into account by investors in the current EUA prices as on December 14, 2022, a preliminary agreement was reached between the European Commission, the European Parliament and the EU Council on this increasing. The EUA prices should also include the most important elements of the „Fit for 55" package that have an impact on limiting the supply on the market such as a radical increase in the reduction target in the EU ETS above the level of 60%, a tightening of the operation of the MSR reserve or a gradual phasing out of free allowances from CBAM sectors. All of the above elements in very similar shapes were previously

1 European Union Allowance.

proposed by the European Commission, the European Parliament and the EU Council. Therefore, the conclusion of the negotiations on the EU ETS reform in mid-December 2022 did not affected the EUA prices at the end of 2022. However, it cannot be ruled out that during the time of implementation the law, these elements will affect the current EUA supply and prices.

As part of the technical analysis, the short-term and long-term scenarios are presented in this article for EUA prices. In the former short-term it is more probable that by the end of the first quarter of 2023, EUA prices will drop to EUR 60, whereas in the long-term scenario the increase potential extends to even as much as EUR 150. However, the prerequisite for the latter scenario is a permanent breakthrough through the level which investors has so far failed to go through, i.e. a price level of EUR 100. Perhaps a price of EUR of 150 may be achievable in the first quarter of 2024, as indicated by the harmonic pattern of the EUA prices.

High volatility on CO_2 market in 2022

The strong uptrend in the EUA market has lasted essentially since mid-March 2020. The rate of these increases significantly accelerated in November 2020, among others, as a result of the post-COVID recovery, the announcement of the preparation of an anti-COVID vaccine and the plan for raising the EU reduction target (the European Council approved to increase it from 40% to at least 55% vs. 1990), creating a new, steeper uptrend line as shown in Chart 1. A two-year uptrend line was ultimately broken at the end of August 2022. At the same time, the EUA prices entered the area of a horizontal trend which developed at the end of 2021. The range of this trend is very wide, since it falls within the interval between EUR 65 and about EUR 98. In technical terms, the lower support line at a level of EUR 65 is very important as when it is permanently broken this can mean a reversal to the downtrend. What generated the so high volatility on the CO_2 market in 2022? There is no doubt that a pivotal moment on the CO_2 market in 2022 was the Russian invasion of Ukraine which lead to EUA price collapse in February almost the same as during the COVID panic on February/ March 2020, falling from the level of approx. EUR 100 to EUR 65 means a 35% decrease (reaching even EUR 56 on a daily basis). Although the market recovered from all the losses in less than 6 months and reach values close to EUR 100 in mid-August. However, each time this level proved to be a strong technical resistance for buyers. In early September 2022, the prices broke down again and the level of EUR 65 was retested. At that moment, there was a certain rebound, in light of growing energy prices and rises on other markets, as a result of which the allowance prices varied about EUR 75 (as of 25 November 2022).

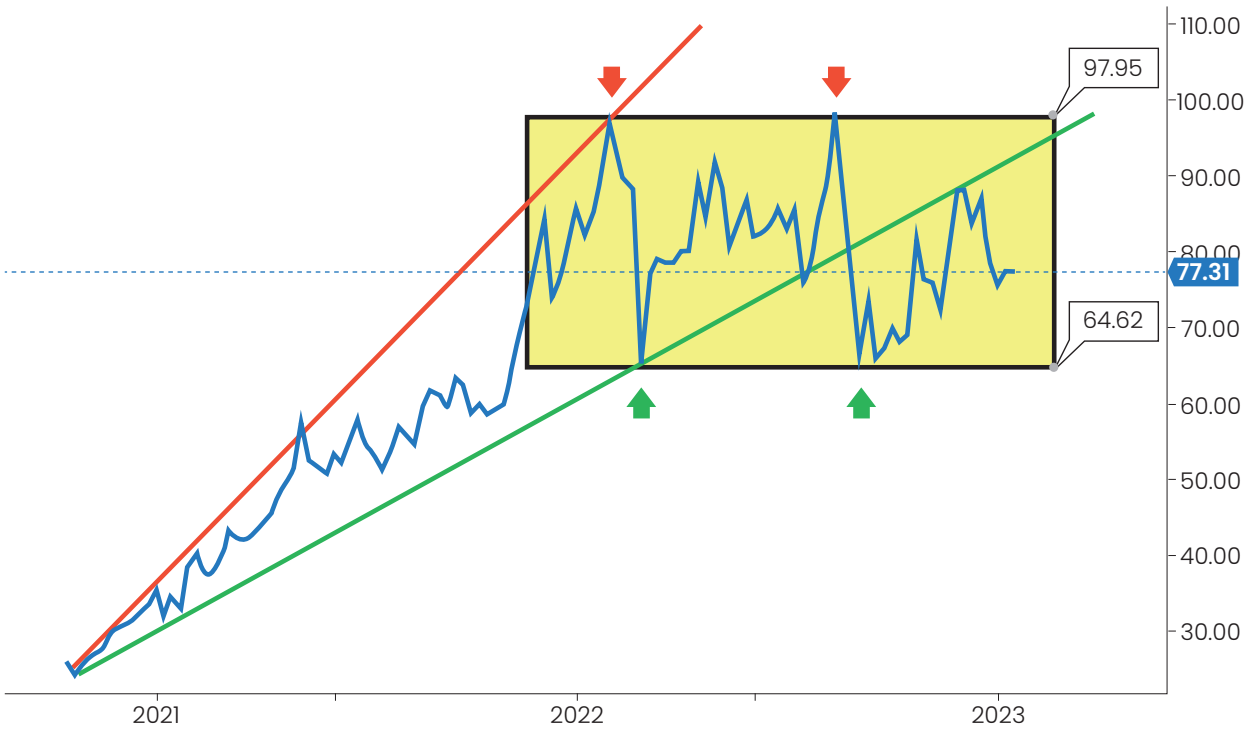
“

On the CO_2 market in 2022 was the Russian invasion of Ukraine which lead to EUA price collapse in February almost the same as during the COVID panic on February/ March 2020, falling from the level of approx. EUR 100 to EUR 65 means a 35% decrease (reaching even EUR 56 on a daily basis). Although the market recovered from all the losses in less than 6 months and reach values close to EUR 100 in mid-August. However, each time this level proved to be a strong technical resistance for buyers.

In the context of the price volatility, what is surprising is not only the depth or scale of declines (35%), but also the time in which they occurred (from 3 weeks to a month). In both of these cases, probably this was already a market panic, caused, among others, by an outburst of stop-loss orders on the CO_2 futures market. What could have caused this? In consequence of Russian invasion of Ukraine, investors probably began to price in the uncertain geopolitical situation in the world (the limitation of supplies from Russia might speed up the recession in Europe) and preferred to take their profits by investing money in safer assets, such as e.g. US dollar. On the August and September market crash a very big impact could have the surging energy prices (grows by 25% in a one single day) as they affected the industrial output levels in Europe (some plants, e.g. chemical ones, were forced to curb their production), the announcement of a significant increase the supply of EUA's at auctions in the EU ETS by monetising them in the nearest years as part of the REPowerEU plan (for the purpose to generate resources to make the EU independent from fuels from Russia), and the risk of a further economic slowdown (or even a recession) in Europe.

Table 1 shows the EUA prices against other assets in 2022. The over 5% decrease in EUA prices since the beginning of 2022 is the closest to the decrease in gas prices, which in August was worth even 326% more than at the beginning of 2022, which was the result of the ongoing energy crisis in the EU. The prices of the second important energy

CHART 1. THE QUOTATIONS OF THE PRICES OF FUTURES CONTRACTS ON EMISSION ALLOWANCES WITH THE MATURITY DATE OF MARCH 2023 (TICKER: CFI2H3) IN WEEKLY INTERVALS OVER THE LAST 2 YEARS WITH A MARKED UPTREND LINE (GREEN COLOUR) AND THE CONSOLIDATION ZONE (YELLOW SQUARE) IN THE AREA OF ABOUT EUR 65 – 98.



Source: Own elaboration by KOBiZE based on data from investing.com (accessed: 17 January 2023)

commodity - coal, whose prices increased by as much as 103% in 2022, were completely different, which was related to the very high demand for this commodity to replace fuels imported from Russia (gas and oil). It is worth noting that the US market so far strongly correlated with CO_2 market, brought a loss of approx. 20% in 2022 because the global financial markets are currently in a bear market. Very poor market sentiment in 2022 may also be evidenced by low price quotations on the copper market (approx. -14%), the real estate market (approx. -24%) and cryptocurrencies (approx. -66%). It seems investors in these markets began to price in the scenarios concerning fighting with high inflation by central banks and the future economic slowdown or even recession. On the other hand, assets like gold and the US dollar, treated as a "safe haven" during any bear market by investors, earned approximately 1.5% and 7.5% in 2022, respectively. It cannot be ruled out that it was these groups of assets that global investors preferred to liquidate assets on other more risky markets such as EUA's.

TABLE 1. PERCENTAGE GROWTH RATES OF THE PRICES OF DIFFERENT ASSET CLASSES IN THE PERIOD FROM 2 JANUARY TO 22 NOVEMBER 2022

STOCKS	COMMODITIES						REAL ESTATE	CRYPTO	CURRENCIES
S&P500	Gas	Coal	Brent crude oil	EUA	Copper	Gold	ETF	Bitcoin	USD
-19.61%	-5.12%	103.43%	5.77%	-5.49%	-13.76%	1.39%	-23.75%	-65.36%	7.39%

**The above percentage price changes are represented by: S&P500 (US futures index), gas (TTF Dutch futures), coal (API2 Rotterdam futures), EUA (ICE futures), crude oil WTI (futures), copper (futures), gold (futures), ETF reflecting global real estate prices (Xtrackers International Real Estate ETF), Bitcoin in USD and the USD index on the futures market.*
Source: Own elaboration by KOBiZE based on data from investing.com and ICE Futures Europe

Potential EUA price drivers in the future years

a) Structural changes in the EU ETS

Higher CO_2 reduction target in EU ETS

There is no doubt that the structural changes to the EU ETS system are one of the most important drivers which could the greatest impact on the CO_2 prices in the future years of the current EUA trading phase. On December 18, 2022, the so called trilogue negotiations between the EU Council, the European Parliament (EP) and the European Commission (EC) on the key elements of the EU ETS system reform as part of the „Fit for 55" package ended. As a result of the implementation of this agreement, it is certain that the EU ETS target will be increased from the current 43% to 62% in 2030 (vs. 2005). Due to the need to implement the regulations only from 2024, the „cuts" of allowances will have to be stricter. Therefore, it is proposed to increase the LRF reduction factor from the current 2.2% to 4.3% in 2024-2027 and 4.4% in 2028-2030. The LRF factor is calculated in such a way that it reflects the linear reduction of emissions from 2021 and takes into account the reduction target for 2030. The higher LRF factor will be supplemented by the reduction of allowances under the so-called rebasing. The original proposal of the EC

assumed the introduction of 117 million allowances in just one year. However, in the trilogues it was agreed that it will be divided into two years, i.e. in 2024 and 2026, in which 90 million and 27 million EUA's will be subject to the reduction, respectively.

Strengthening the MSR reserve

The reduction of allowances in the EU ETS will also result from the operation of the MSR reserve itself, which is subject to revision as well. In this case, it is certain that the percentage rate of the transfer of allowances to the MSR reserve (i.e. the so--called "intake rate") will be raised from 12% to 24% in the 2024-2030 period. There is no doubt that it will accelerate reduction of the allowances sold at auctions, means a higher transfers to the MSR and faster surplus reduction on the market (the so-called TNAC[2]) to the MSR upper threshold. In later years, this effect should be mitigated by the introduction of an additional MSR threshold in the range of 1096-833 million and a different intake rate (the difference between the surplus of allowances and the threshold of 833 million).

Higher benchmarks for industry and phasing out free allocation in the CBAM sectors

Moreover, it is planned that the requirements for free allocation of allowances will become more stringent due to the strengthening of the so-called benchmarks for industry and phasing out free allocation in the EU ETS sectors subject to the CBAM from 2026, which will undoubtedly increase the pressure on allowance purchases on the market and the need for greater involvement of the compliance entities functioning in EU ETS.

Limiting the pace of too fast increases in allowance prices and speculation

The existing mechanism protecting the market against excessive EUA price spikes, so called Article 29a of the EU ETS Directive, was also under review. A key amendment is to trigger this mechanism in an automatic manner and to lower the current multiplier of the average price from the present "3.0" to "2.4" which should make this mechanism more responsive. Specifically, it will respond much more quickly to unexpected EUA price jumps in the future. The proposal to eliminate from the market financial institutions suspected of speculating on the EUA's did not find recognition among EU decision-makers. To this end, the European Parliament previously proposed limiting the allowance market only to EU ETS operators and entities purchasing allowances on their behalf and on their account. The rest of the entities were to be excluded from the market, i.e. all financial institutions buying on their own account. The disadvantage of the EP amendment was that it concerned only physical trading on the allowance market, i.e. transactions on the primary market (auction) and spot market (spot). However, it did not apply to the derivatives market (futures, options), because there is no obligation to settle derivatives on the basis of physical delivery of allowances (the vast majority of which is finance settled). It should be noted that the derivatives market has the largest share in the emission allowances market, reaching approximately 90%, while the rest of the market is divided between the spot, auctions and the OTC market. This means that the largest part of the market where speculation can take place would not be covered. This also applies to ETF funds which have been very active recently. They make it possible for individual (retail) investors to participate in the market.

2 Total Number of Allowances in Circulation.

TABLE 2. AN OVERVIEW OF SELECTED PROPOSALS AS PART OF THE EU ETS REFORM

SELECTED COMPONENTS		EUROPEAN COMMISSION	EUROPEAN PARLIAMENT	COUNCIL OF THE EUROPEAN UNION (GENERAL APPROACH)	TRILOGUE
EMISSION TARGET/EU ETS CAP	**REDUCTION TARGET**	61% (vs 43%)	63%	61%	62%
	LRF	4,2% from 2024 (z 2,2%)	4,4% (from 2024); 4,5% (from 2026); 4,6% (from 2029)	4,2% from 2024	4,3% in 2024-2027 and 4,4% in 2028-2030
	REBASING	2024 (117 mln)	2024 (70 mln) and 2026 (50 mln)	2024 (117 mln)	2024 (90 mln) and 2026 (27 mln)
MSR	**INTAKE RATE (IR)**	24% x TNAC by 2030	24% x TNAC by 2030	24% x TNAC by 2030	24% x TNAC by 2030
	MAIN THRESHOLDS	833 mln - 400 mln	700 mln - 400 mln (to fall from 2025 as the LRF decreases)	833 mln - 400 mln	833 mln - 400 mln
	ADDITIONAL THRESHOLD	1096-833 mln (IR = TNAC-833 mln)	921-700 mln (IR = TNAC-700 mln)	1096-833 mln (IR = TNAC-833 mln)	1096-833 mln (IR = TNAC-833 mln)
	CANCELLATION OF ALLOWANCES	Up to 400 mln in the MSR	No information	Up to 400 mln in the MSR	Up to 400 mln in the MSR
FREE ALLOCATION	**BENCHMARKS**	From 1,6% to 2,5% (max) or from 0,2% (min) from 2026	From 1,6% to 2,5% (max) or from 0,2% to 0,4% (min) from 2026	From 1,6% to 2,5% (max) or from 0,2% (min) from 2026	min 0,3%
	CBAM SECTORS (PHASING OUT FREE ALLOCATION OF EUAS)	From 2026 to 2035	-7% (2027), -9% w (2028), -15% (2029), -19% (2030), -25% (2031), 25% (2032)	-5% (2026- 2028), -7,5 % (2029-2030), - 10% (2031 -2032), - 15% (2033-2034), -20% (2035)	-2,5% (2026- 2027), -5% (2028), -12,5% (2029), - 26% (2030), -12,5%(2031-2033), -14% (2034)
SAFEGUARD MECHANISMS	**ART. 29A**	No change	Lowering the multiplier from „3" to „2" to trigger the mechanism = 100 mln from MSR (based on decision)	Lowering the multiplier from „3" to „2.5" to trigger the mechanism = 75 mln from the MSR (automatically)	Lowering the multiplier from „3" to „2.4" to trigger the mechanism = 75 mln from the MSR (automatically)
	„SPECULATION"	No change	Only EU ETS entities (or those that buy/sell on their behalf) can keep allowances in the registry	No change	No change
AVIATION	**FULL AUCTIONING**	From 2027	From 2025	From 2027	From 2026

Source: Market report by KOBiZE – December 2022 (No. 129)

In general, these funds invest in allowances on the futures market rather than on the spot market. In summary,the EP amendment would not have eliminated the problem of speculation, but could lead to an additional increase in price volatility limiting market liquidity.

b) Increasing the allowance supply to finance the REPowerEU Plan

On the other hand, the effects of the higher reduction target in the EU ETS and the impacts of the increased MSR reserve should be mitigated by the proposal for financing the REPowerEU Plan with allowances sold in the EU ETS. It should be recalled that to date three proposals have been considered[3].

- **ENVI proposal:** the monetisation of an unspecified number of allowances by way of auctions in the 2023-2025 period from the future auctions (from 2027 to 2030) equivalent to EUR 20 billion.
- **European Commission proposal:** the monetisation of an unspecified number of allowances at auctions in the period from 2023-2026 transferred from the MSR, equivalent to EUR 20 billion.
- **EU Council proposal:** the monetisation of an unspecified number of allowances held in the Innovation Fund and from the future auctions, equivalent to EUR 20 billion (with 75% from the IF and 25% from auctions, respectively).

In the end, a completely new option was chosen, partially taking into account all three sources of financing which were considered in separate proposals of the EC, the EP and the EU Council. According to the initial agreement in trilogies the allowance are to come from:

- **Frontloaded auctions** from 2026-2030 and sale could bring EUR 8 billion, i.e. their share in EUR 20 billion will be 40%. The sale of these allowances (about 94 million at today's prices) is to take place in 2023-25.
- **Innovation Fund (IF)** and the sale could bring EUR 10 billion, i.e. their share will be 50%. The sale of allowances from IF (ca. 117 million) will most likely take place at the same time as the sale of allowances from frontloaded auctions.
- **MSR** and the sale could bring EUR 10 billion, i.e. their share will be 50%. The sale of allowances from IF (ca. 117 million) will most likely take place at the same time as the sale of allowances from frontloaded auctions.

It should be noted that the subject of additional supply on the market by 2025 may be approx. 250 million allowances (calculated at EUR 80 for EUA prices), which translates into over 50% of the auction pool sold in 2022. It is therefore a significant amount, which should definitely contribute to reducing the price pressure in the coming years.

c) Risk of a strong economic slowdown in Europe or even a recession

At present, Europe as a whole faces a very difficult economic and geopolitical situation. The post-COVID recovery, a disruption of supply chains and Russian invasion of Ukraine caused drastic increases of commodities and energy prices thus contributing to the highest increase in the inflation rate since the 1970s. As part of their combat against increasingly high inflation, most of European banks decided to raise interest rates, which had an adverse effect on the situation of producers and consumers, since it meant higher credit costs. All this can bring about lower disposable household incomes and, as a result, lead to increased savings and lower consumer expenditures for the economy. And this is already a ready recipe for recession[4]. The European Com-

3 Carbon Pulse, Euractiv.

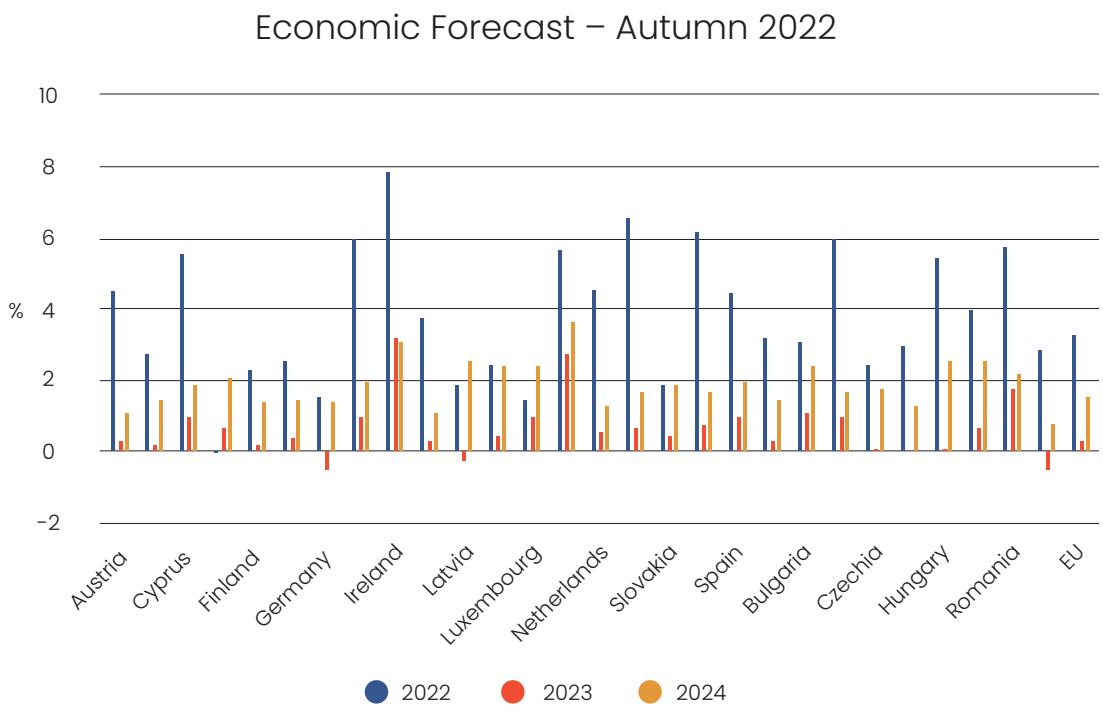
4 In accordance with the established definition, a recession occurs when the real GDP falls in two consecutive quarters of the year or consecutive years.

mission itself forecasts a strong slowdown of the economy. The recently published forecasts[5] indicate that the EU GDP will fall from 3.3% forecasted for 2022 to barely 0.3% in 2023. In turn, in 2024 it will grow to 1.6%. It can be confidently assumed that the lower level of the EU GDP in the next years will strongly affect the emission levels in the EU ETS and lower emissions will mean lower demand for EUA's and their falling prices. The present situation on the word stock indices can be regarded as a forecast of the coming recession. Most of them have been in a bear markets for several months and the most important indices have fallen by 20-30% from their peaks.

d) Persistently high gas and energy prices

The extremely high gas prices brought the energy producers fuel switching to twice carbon-intensive coal sources. This in turn generated higher demand for EUA's which needed to be purchased for compliance reason. At the same time, the increase in the demand for the allowances and coal raised their prices. Although recently the gas and energy prices significantly fell, due to the very high gas storage levels and low temperatures in Europe, the problem related to the supplies of this commodity and its replacement in the context of the conflict between Russia and Ukraine can persist for another few years. Greater coal use in Europe in the nearest years will also be favoured by lower water levels in Europe, which already generates problems related to the availability of nuclear energy (especially in France).

CHART 2. FORECASTED GDP GROWTH RATE IN THE EU IN THE PERIOD FROM 2022 TO 2024



Source: European Commission

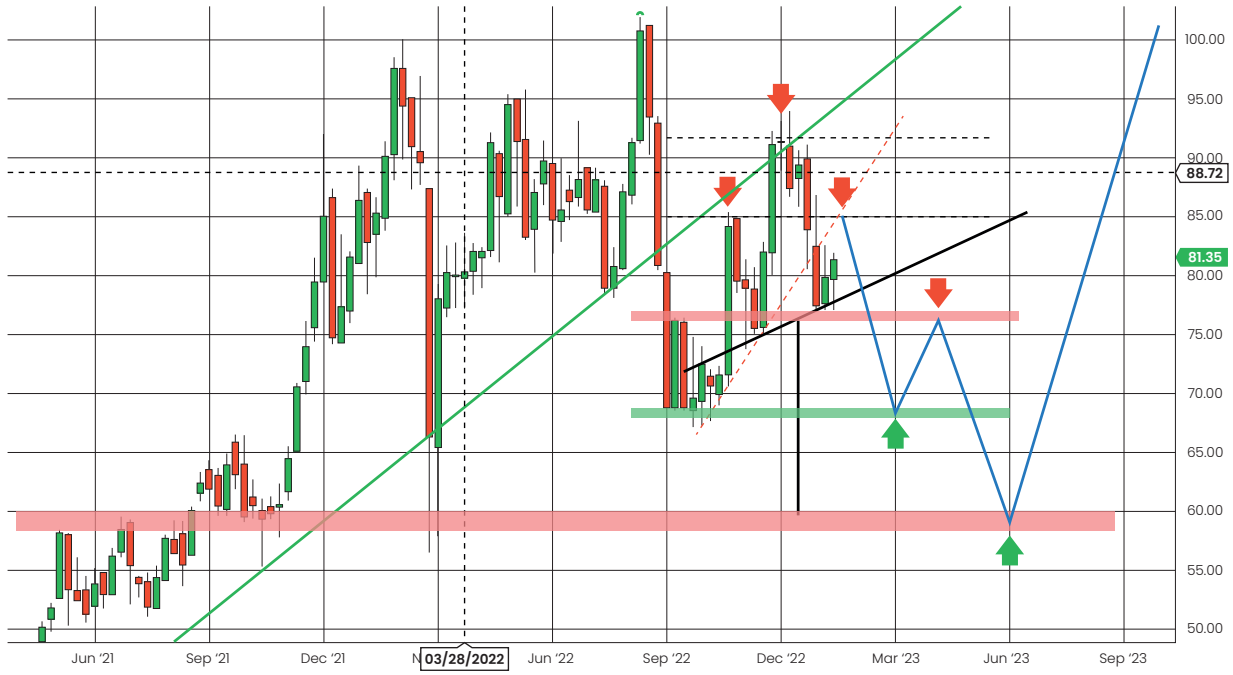
5 https://economy-finance.ec.europa.eu/economic-forecast-and-surveys/economic-forecasts/autumn-2022-economic-forecast-eu-economy-turning-point_en

Technical outlook at the CO_2 market – the potential of EUA price dynamic[6]

a) Short-term scenario for emission allowance prices

In the mid-August period EUA prices managed to reach around EUR 100 - a technically very important resistance level set at the end of January 2022. However, investors failed to break through it, which signalled the start of a sell--off. As a result, EUA's lost over 30% in less than 3 weeks, falling to approx. EUR 67, i.e. levels close to the closing prices of February 2022, when Russia invaded Ukraine. EUA prices in November 2022 recovered almost all losses and reached the level of approx. EUR 95, but in December there was a quick counterattack by sellers which lead to price drop to approx. EUR 76. As can be seen in Chart 2, this level is extremely important because it can be the so-called "neck line" (red bar line in chart 2) in the developing Head and Shoulders pattern ("RGR"). In technical analysis, it is one of the most effective price formations. The condition for the complete formation of the RGR is the full creation of the second shoulder (but the level of EUR 85 can't be broken), and then the price drop below the neckline, i.e. breaking the level below EUR 76. The technical downward range of this correction, determined by the distance from the „neck line" to the „head line", may bring prices down to approx. EUR 60 in the first half of 2023. However if

FIG. 2. CANDLESTICK CHART OF THE QUOTATIONS OF THE PRICES OF DECEMBER EUA FUTURES CONTRACTS (SYMBOL CKZ23) ON A WEEKLY BASIS SHOWING A HEAD AND SHOULDERS FORMATION (RGR) SCENARIO RESULTING IN A PROBABLE DECREASE IN EUA PRICES IN THE COMING MONTHS TO AROUND EUR 60.



Source: Own elaboration by KOBiZE based on data from barchart.com (accessed on 18-th January 2023)

6 It is exclusively the Author's subjective vision and it should not be treated as a recommendation or investment device.

there is an effective defence of buyers at the level of EUR 76, this formation will be negated and the prices will probably move upwards and the January and mid-August 2022 highs will be corrected. The downward scenario should be supported by fundamental factors, i.e. an increase in the supply of allowances from REPowerUE and an economic slowdown in the EU (or even recession), which may result in a decrease emissions in 2023. Depending on how long the market includes the above factors in prices, the downward trend should continue on the market. The fall in prices to the level of EUR 60 should set a „hard bottom" for prices, from which prices should rebound upwards towards EUR 100.

> The short-term scenario is supported by a wider technical pattern, which indicates the development of a falling head and shoulders pattern. Given the range of this pattern, it can be presumed that the allowance prices will drop to EUR 60 in a closed weeks where is also the resistance line that briefly stopped price declines in March 2022 after Russia invasion of Ukraine.

FIG. 3. QUOTATIONS OF THE EUA PRICES (FUTURES CONTRACTS FOR DECEMBER 2023 - SYMBOL CKZ23 ON A MONTHLY BASIS) IN THE SCENARIO OF THE UPWARD BREAKTHROUGH FROM THE RISING FLAG PATTERN WITH THE POTENTIAL PRICE RANGE OF ABOUT EUR 150.

Fig. 3. Own elaboration by KOBiZE in a special programme for technical analysis at barchart.com (accessed on 20 January 2023)

b) Medium-term scenario for emission allowance prices

For nearly 2.5 years the EUA prices were in an uptrend which brought increases from a level of about EUR 15 to EUR 100 (the first rising wave with the price range of up to EUR 85). EUR 100 remained a significant barrier level for investors. Each time when the prices came close to this level there was a quick supply rebound. This was the situation at the turn of February and March 2022 during Russia invasion of Ukraine, when the EUA prices dropped to the 50% Fibonacci retracement (EUR 58 EUR) and in August 2022 when the level of the 61.8% Fibo retracement (about EUR 68) supported the prices. This second Fibo level also set the lower band of the upward flag formation. Breaking its upper band (the decreasing red line drawn along the peaks in 2022) may push prices up to EUR 150. These are the results of measuring the range of increases between 2020 and 2022 (EUR 100 - EUR 17 = EUR 83) and measuring this range from EUR 67 (EUR 67 + EUR 83 = EUR 150). Interestingly, the level of EUR 150 is also indicated by the level of 161.8% Fibonacci retracement. Assuming the market will react in the same way as in the 2020-2022 rally, the EUR 150 prices could be reached already in the first quarter of 2024. Perhaps investors in this period will already priced in the reduction of supply of allowances in the EU ETS from 2026 as a result of implementing the REPowerUE plan or phasing out free allocation in CBAM sectors.

> The breakout from the rising flag pattern and the EUR 100 level should give a signal for the continuation of increases even to a level of EUR 150 to EUR 152.

TABLE 4. THE MOST IMPORTANT FUNDAMENTAL AND TECHNICAL DRIVERS FOR EUA PRICES IN THE NEAREST MONTHS AND YEARS.

CATEGORY	GROWTH FACTORS	DECLINE FACTORS
FUNDAMENTAL FACTORS (STRUCTURAL IN THE EU ETS AND GEOPOLITICAL)	• The persistently high gas prices, the limitation of the operation of nuclear reactors in Europe and greater coal use. • The increased activity of investment funds; easier access of individual investors to ETF funds. • An economic recovery which should come after a period of economic slowdown or recession in 2023 or 2024 (as the next phase of the business cycle); this should translate into higher emissions.	• Frontloading EUA's sales at auctions (equivalent to EUR 20 billion) to finance the REPowerUE Plan (with an impact on prices – until 2026). • The strengthening of the energy efficiency target (from 9% to 13%) and the RES target (from 40% to 45%) as part of the REPowerUE Plan. • An economic slowdown or a risk of recession in Europe in relation to the growing inflation and raising interest rates (higher operating costs of enterprises, lower consumer demand and reduced demand for energy and emissions). The effect in the form of a lower GDP in the EU should be more visible in 2023 or even in 2024. • The introduction of instruments protecting against excessive price increases: a revision of Article 29a to make it more responsive and automatic
TECHNICAL FACTORS	• In the short term: maintaining the support line by buyers at the level of approx. EUR 76 will testify to the strength of demand and should give a signal for a change in the upward direction. In such a scenario, it is possible to correct the peaks of January and August 2022, i.e. the level of EUR 100. • In the medium term: an upward breakout from the rising flag pattern and the EUR 100 level may give a signal for the continuation of the increases to the level of approx. EUR 150, which is 161.8% of the Fibo level and the range set by the flag formation. The period when prices may reach the level of EUR 150 may take place as early as the first quarter of 2024.	• In the short term: A drop below the neck line of the RGR pattern, i.e. below EUR 76, will confirm the implementation of this pattern and the downward trend, which should bring the prices to around EUR 60. • In the medium term: the downward breakthrough through a level of EUR 65 may give a signal for declines to a level of about EUR 47, which provided support for the prices from June to August 2021, and the 38.2% Fibo retracement.

Source: Own elaboration by KOBiZE

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1. Decision (EU) 2015/1814 of the European Parliament and of the Council of 6 October 2015 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading scheme and amending Directive 2003/87/EC (OJ L 264, p. 1).
2. Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC (OJ L 275, p. 32, as amended).
3. Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community (OJ L 140, p. 63).
4. ESMA, Final Report Emission Allowances and associated derivatives, published on 28 March 2022.
5. KOBiZE, Raport z rynku CO_2 [Report on the carbon market – in Polish], December 2022 (No. 129).
6. European Commission, Report on the functioning of the European carbon market (the report for 2020), 26 October 2021.
7. Murphy John J., Technical Analysis of the Financial Markets, 1999.

Challenges of Poland's and EU energy transition in the face of an energy crisis

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Challenges of Poland's and EU energy transition in the face of an energy crisis

Keywords: Energy transition, energy crisis, EU climate and energy policy, national power system, electricity generation, zero-emission technologies, RES

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Abstract

Russia's unprovoked invasion of Ukraine brought far-reaching impacts on the global and European energy systems, disturbing the supply and demand structure and breaking long-lasting trade relations. It caused increases in energy prices which had not been seen since the 1970s on the global markets, translating almost directly into higher energy prices for many consumers and enterprises, harming households, industry and entre economies. As one of Russia's largest trade partners on the gas and crude oil markets, the European Union faced the huge challenge of becoming independent from fuel supplies from this source. That challenge was additionally aggravated by the growing prices of raw materials used to produce RES technologies, which may contribute to slowing the energy transition process in the nearest years. In light of this, several EU Member States already now announced their temporary return to hard coal use in order to ensure the security of energy supply, thus filling in the gaps arising from limitations of natural gas imports from Russia. This process will be particularly conspicuous in Poland which, given its very tight energy balance, is not in a position to shut down coal-fired power units, at least until it commissions a significant number of new, zero-emission sources; therefore, the role of natural gas as a transitional fuel needs to be limited. This article analyses the impact of the cu-

List of abbreviations:

CAKE - Centre for Climate and Energy Analyses
CCS - Carbon Capture and Storage
d-PLACE - Dynamic version of the PLACE model (a CGE model created in the Polish Laboratory)
DSR - *Demand Side Response*
EPICA - Evaluation of Policy Impacts on Climate and Agriculture Model
„Fit for 55" - A package of legal EU acts implementing the assumptions of the European Green Deal, including the target of a 55% greenhouse emission reduction in 2030
GHG - *Greenhouse gases*
KOBiZE - National Centre for Emissions Management
MEESA - Model for European Energy System Analysis
RES - Renewable Energy Sources
PRIMES - PRice-Induced Market Equilibrium System
TR³E - Transport European Emission Economic Mode – a transport sector model built and developed at the CAKE

rrent energy crisis on the electricity generation structure in Poland and the European Union in the timeframe until 2030, with a vision until 2050. Two scenarios are compared: the first one providing for the course of the energy transition consistent with the assumptions of the Fit for 55 package from before the outbreak of the crisis (the NEU scenario) and the scenario taking into account the present situation, i.e. limitations of energy resources imports from Russia and the persistently high fuel prices on the global markets (the NEU_HPRICE scenario). The areas posing the greatest challenges for Poland and the EU in the energy transition process are indicated.

Introduction

The fuel crisis, resulting from the post-COVID rebound in demand for fuels and, to a dominating extent, from Russia's attack against Ukraine, put into question the plans of the European Union for the achievement of net climate neutrality by 2050. In particular, it threatened the implementation of the plan set out in the Fit for 55 package[1], among others, in light of a surge in the transition costs. An additional factor contributing to disturbing the process of a shift to clean energy in the EU turned out to be disruptions of existing energy supply chains, which could already be felt in 2021, caused by the Russian attempts to force the commissioning of the Nord Stream 2 pipeline. These disruptions caused, among others: the need to use hard coal again in the EU and to take measures to reduce energy consumption and measures enabling new RES capacity to be built faster in order to fill in the gap left by the undelivered natural gas. The same problems also affected Poland, which, just as many EU Member States, faced one of the greatest fuel crises since the 1970s. The natural gas supplies from Russia as part of the Jamal contract were stopped in April 2022. At the same time, an embargo was imposed on coal imports from Russia. In consequence of this, Poland faced the need to take a number of measures to safeguard energy supplies to end-users, including electricity and district heat generating units, and to redefine the directions of the development of the sector, taking into account the new conditions. These new conditions primarily include the commitment to making the national economy completely independent from fossil fuels imported from Russia.

The aim of the analyses described in the article is to attempt to examine whether the electricity system can be balanced under the conditions of high fuel prices and limited supplies of the blue fuel and to carry out a preliminary assessment of the impact of the factors listed above on the directions of the development of electricity and district heat generators in Poland and the EU.

This article is based on the results of calculations carried out by the Team of the Centre for Climate and Energy Analyses (CAKE), as presented in the analysis "Poland net-zero 2050: Transformation of the Polish and EU energy sector until 2050."[2] This study presents the optimum pathway for achieving the Community's emission reduction target by 2050 in the new legal and market circumstances. The GHG emission reduction targets as set out in the cited Report were updated in line with the assumptions of the Fit for 55 package. The ar-

1 European Commission, 2021. (https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en).

2 Tatarewicz, I., Lewarski, M., Skwierz, S., Pyrka, M., Boratyński, J., Jeszke, R., Witajewski-Baltvilks, J., Sekuła, M. (2022). Polska net-zero 2050: Transformacja sektora energetycznego Polski i UE do 2050 r. [Poland net-zero 2050: Transformation of the Polish and EU energy sector until 2050 – in Polish; with an English summary]. Institute of Environmental Protection - National Research Institute / National Centre for Emissions Management (KOBiZE), Warsaw.

ticle examines further the issue of the impact of higher natural gas prices and limitations of the imports of this fuel from Russia on the electricity sector in Poland, following the assumptions set out in the NEU_HPRICE scenario.

The effects of the present fuel crisis in different timeframes

The crisis which we are now facing exhibits many features of the energy crisis which took place several dozen years ago. Just as the one in the 20th century, it was mainly caused by limitations of international trade (an embargo on imports/halting of exports), mainly resulting from an armed conflict. While we know the effects which the crisis in the last century had on the global and European economies (it was the main reason for the emergence of stagflation which was painful for part of society, but, surprisingly, it also contributed to the adoption of a number of solutions to rationalise consumption and to implement the idea of sustainable development in many countries, the benefits which we feel to date), the present one is still unpredictable and we do not know in which direction it will develop. Many commentators believe that the present energy crisis will contribute to accelerating the decarbonisation process in the medium and long term. However, one should not really expect that despite substantially increased outlays in the short term the development of RES alone would significantly contribute to improving the situation in the EU energy balance, since in the nearest future it will be hampered by the growing prices of construction materials which quite often simply run out. Europe will not manage to build a sufficient number of RES sources in such a short time so as to fill in the gap caused by the shortage of fossil fuels at power plants and CHP plants. In the longer terms, it can really contribute to accelerating the decarbonisation process and to changing the approach to the energy use by end-users, since limitations of supplies and high prices of energy carriers will make it necessary to save energy.

The short-term effects of the energy crisis can already be seen now. They primarily include inflation spikes in the prices of not only energy resources, but generally most products, including food, too. The high prices of fuels, energy carriers and products, persistent over a longer period, will have a destructive effect on the economy. In turn, Russia's actions consisting in the imposition of restrictions on gas exports can cause temporary limitations of supplies to end-users already in the coming winter season (first affecting industrial users and then households). Therefore, the EU must now do everything it can to secure supplies to EU citizens through: introducing and supporting solutions to rationalise energy consumption, educating the public in energy efficiency and energy saving, fuel imports from alternative sources and replacing wherever possible natural gas by other energy carriers.

With respect to the latter of the solutions listed here, Poland plans to temporarily increase coal use in order to meet in this way the consumers' needs. In this context, it is planned that a number of 200 MW class units will be modernised, extending their service life and improving their flexibility. The analyses presented in this article concern, among others, the possibility of increasing generation at coal-fired generating units in the Polish power system. It also examines the role of coal and natural gas as transitional fuels in the national power system. Moreover, it identifies the scope and pace of the development of the other technologies of key importance from the point of view of the commitment to fully decarbonise the sector, i.e. RES sources and nuclear power plants. At the same time, it verifies the pace and scope of the development of RES sources in the new conditions.

Methodology

The results of the analyses presented in this article were obtained using a set of tools; specifically, a macroeconomic model (d-PLACE[3]) and sectoral models – on energy (MEESA[4]), transport (TR^{3}E[5]) and agriculture (EPICA[6]). The article focuses on the selected aspects of the energy sector and, therefore, primarily on the results of the MEESA energy model. Nevertheless, it should be emphasised that these results were obtained in the process of an exchange of information (iteration) with other models – first of all, the d-PLACE macroeconomic model, which made it possible to investigate the response of the economy to the modernisation of the energy sector through changes in the costs of CO_2 emissions and changes in energy demand.

The MEESA energy model applied in the analyses is a linear optimisation model covering the electricity and district heating sectors of the whole EU so it can find solutions in the form of the optimum selection of generating units under predetermined conditions and constraints, taking into account the present generation structures in the particular EU Member States, the potential of renewable sources, the national energy policies and, primarily, the Community's medium- and long-term emission reduction targets. It should be emphasised that an important feature of the application of the energy model when coupled with a CGE class model at the European scale is the possibility of taking into account all the sectors covered by the EU ETS system, as a result of which the CO_2 emission costs, of key importance for the transition of the energy sector, are endogenous values determined in the process of iteration between the models rather than an element of external assumptions.

The optimisation criterion applied in the model is the minimisation of total discounted costs of the energy system within the timeframe considered (now it has been defined as the timeframe until 2050). The results are generated in 5-year time intervals from 2020 to 2050. The variables having a decisive effect on the shape of the future structure of the generating capacity primarily include: fuel prices, the technical and economic parameters of generating units and the assumptions of the climate and energy policies of the state and the EU as a whole, determining the future levels of CO_2 emission allowance prices and the required share of RES in the electricity generation structure.

MEESA enables the modelling of all the phases of the energy flows from supply to demand, which is generally referred to as energy chain.

The MEESA model defines about 50 different types of technologies, including the existing and new thermal units, RES, energy storages, electrolysers and DSR services. The model also takes into account the effect of the charging of electric vehicles on the operation of the power system.

The technical and economic data used in the MEESA model were based on the assumptions providing the basis for the preparation of the PRIMES Reference Scenario 2020[7] (PRIMES REF 2020). In addition, the possible data gaps were filled in with information from studies carried by well-e-

3 Boratyński, J., Pyrka, M., Tobiasz, I., Witajewski-Baltvilks, J., Jeszke, R., Gąska, J., Rabiega, W. (2022). The CGE model d-PLACE, ver. 2.0, Institute of Environmental Protection - National Research Institute / National Centre for Emissions Management (KOBiZE), Warsaw.

4 Tatarewicz, I., Lewarski, M., Skwierz, S. (2022). The MEESA Model, ver. 2.0, Institute of Environmental Protection - National Research Institute / National Centre for Emissions Management (KOBiZE), Warsaw.

5 Rabiega, W., Sikora, P., Gąska, J., Gorzałczyński A. (2022). The TR^{3}E Model, ver. 2.0, Institute of Environmental Protection - National Research Institute / National Centre for Emissions Management (KOBiZE), Warsaw.

6 Wąs, A., Witajewski-Baltvilks, J., Krupin, V., Kobus, P. (2022). The EPICA Model, ver. 2.0, Institute of Environmental Protection - National Research Institute / National Centre for Emissions Management (KOBiZE), Warsaw.

7 Primes Reference Scenario 2020, Final Assumptions, E3-Modelling, Brussels 2021.

stablished research centres, engaged in the modelling of the energy sector and investment processes, such as the International Energy Agency, the Joint Research Centre[8]*, Tractebel, Ecofys or Frontier Economics.

The model differentiates the demand for electricity and district heat by reflecting the daily demand variability for selected characteristic days in different seasons, different weather conditions and final demand levels. This provides the basis for setting out the operational modes of particular units in the system. This solution also enables an analysis of the level and direction of cross-border exchange.

The cross-border exchange capacity was adopted on the basis of data from ENTSO-E – both historical data and those on the planned development. The MEESA model takes into account the cross-border exchange in a wide range as an important element of the operation of the wholesale electricity market at the level of each country, but security of supply is ensured by maintaining the capacity reserve at the level of each country - import capacity is not included to the power reserve balance.

A detailed methodological description of the model can be found in the documentation of the MEESA model.

The scenarios considered

The article presents the results on the development of the electricity sector in Poland against the background of the EU for two scenarios:

- **NEU** – the neutrality scenario assuming the implementation of the EU climate policy targets for GHG emission reductions consistent with the Fit for 55 package published by the EC.
- **NEU_HPRICE** – the neutrality scenario assuming the same GHG reduction targets and potentials of energy technologies as provided for in the NEU scenario, but based on the projection of higher fossil fuel price and taking into account the limitations of the availability of natural gas.

The key assumption adopted in both scenarios was the achievement of the EU targets for emission reductions consistent with the Fit for 55 package published by the EC. This package sets out the pathway for achieving by 2030 the target of a 55% net (taking into account removals) emission reduction compared with 1990. In accordance with the proposals of the Commission as put forth in the Fit for 55 package, it was assumed in the NEU scenario that in 2030 the EU ETS sectors would have to reduce their emissions by 61%, while the non-ETS sectors would have to reduce them by 40% compared with 2005 levels. The scenario analysed also assumed the GHG emission reduction target for 2050 in the EU at a level of 90%. Taking into account removals, this would mean a net-zero emission reduction.

The timeframe was defined as the period from 2020 to 2050, in order to take into account the period of key importance for the assessment of the effect of climate and energy policy and the achievement of the Community's GHG reduction targets.

In both scenarios, the fuel prices were adopted on the basis of the PRIMES REF 2020 projection. However, in order to reflect the present situation on the fuel market, the following changes were made to the assumptions:

- **In both scenarios,** in the period until 2025, the gas prices were raised 3 times, the coal prices were doubled and the crude oil prices were increased 1.5 times compared with the PRIMES REF 2020 projection.

8 *The Joint Research Centre is one of the Directorates-General of the European of the European Commission with the mission to provide scientific and technical support for the conception, development, implementation and monitoring of EU policies.

• **After 2025,** in the NEU scenario the fuel prices return to the pathway in the PRIMES REF 2020 projection, while in the NEU_HPRICE scenario it was assumed that the fuel prices would be only slightly corrected downwards and remain at much higher levels until the end of the period analysed (twice as high for gas, 1.5 times as high for coal and 1.25 times as high compared with the PRIMES REF 2020 projection).

In addition, in the NEU_HPRICE scenario, a limit was imposed on the use of natural gas in the energy sector at the maximum level of about 120% of its consumption in 2020. It was applied for 7 Member States (Germany, Poland, the Czech Republic, Greece, Romania, Bulgaria and Croatia) able to temporarily increase their use of coal (both hard coal and lignite) in order to reduce the natural gas consumption.

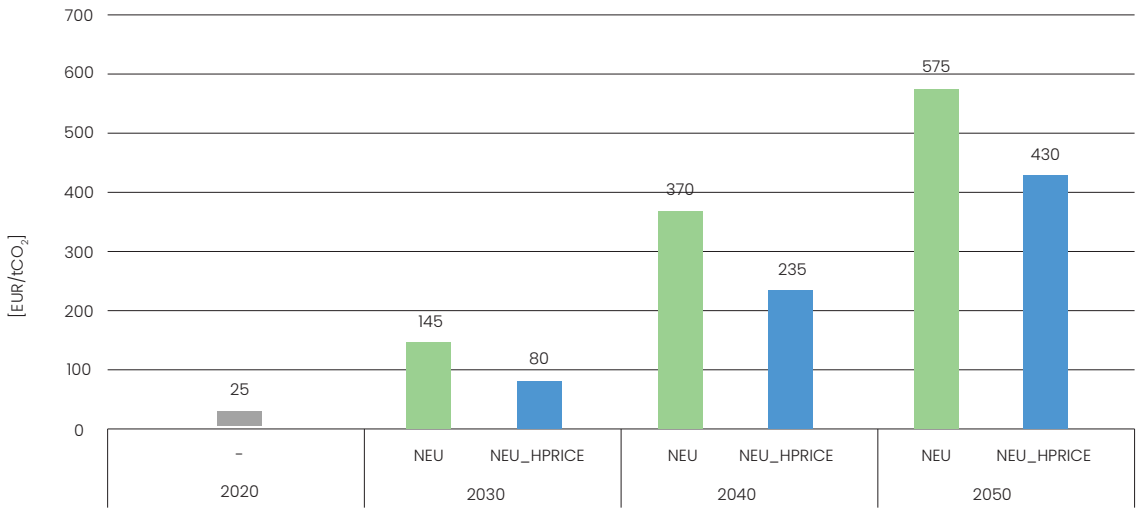
Costs of CO_2 emission allowances

The costs of CO_2 emission allowances are determined in the process of iteration with the d-PLACE model and the sectoral models. Changes in this parameter cause changes in the energy mix and affect the allowance balance in the EU ETS system, translating into their quotations. At this point, it is important to note that the model results provide the marginal cost of emission reductions rather than the market-based allowance price (the tools applied in the calculations do not take into account all the nuances of the EU ETS market, including the operation of the Market Stability Reserve (MSR) or the strategies and market behaviour of its participants). Nevertheless, although the allowance prices are not identical with the marginal reduction costs, especially in the long term it can be assumed that the average allowance prices in the EU ETS will develop at the levels set out by the marginal reduction cost.

The model calculations carried out as part of this analysis show significant differences between the CO_2 reduction costs developing in the two scenarios considered. They are presented in Fig. 1.

In the scenario based on higher prices of energy carriers, the CO_2 emission allowance costs develop at a much lower level than in the NEU sce-

FIG. 1. MARGINAL COSTS OF EMISSION REDUCTIONS IN THE EU ETS SECTOR IN THE NEU AND NEU_HPRICE SCENARIOS [EUR'2015/tCO_2].



Source: Own elaboration by CAKE/KOBiZE

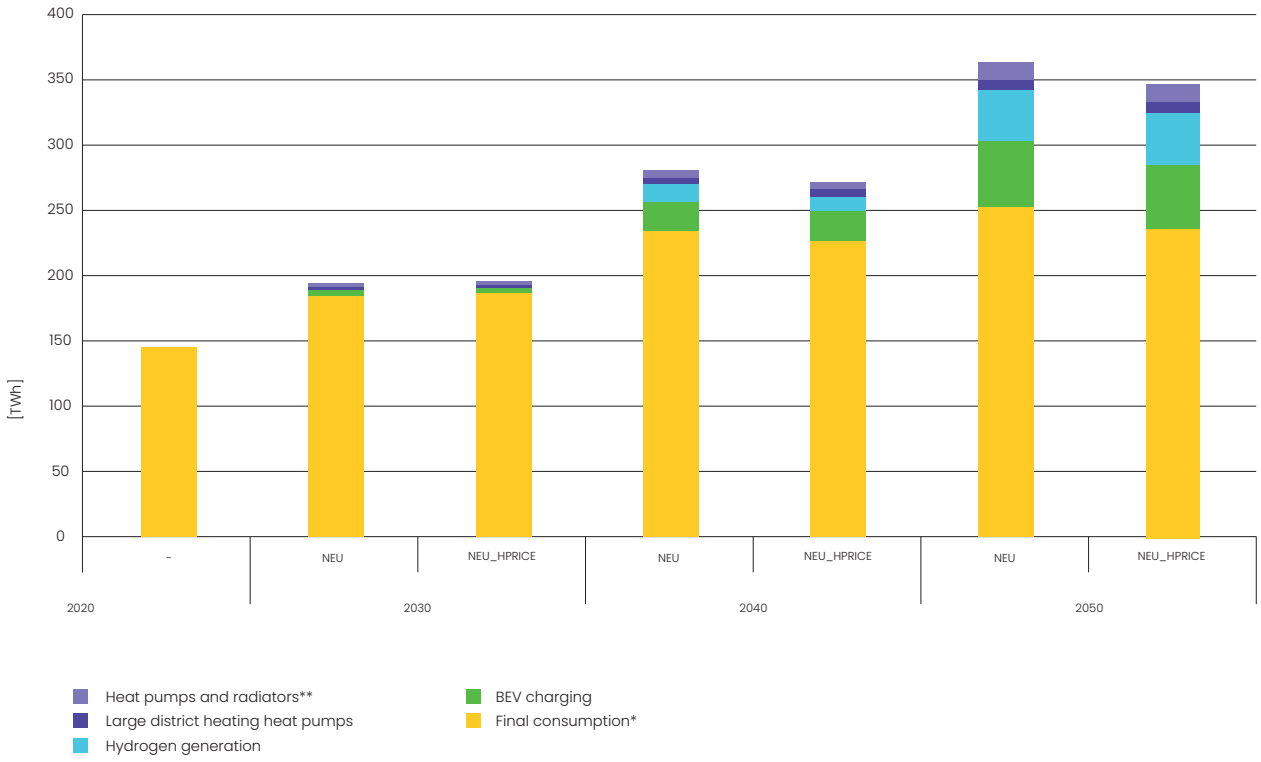
nario, as in 2030 they are lower by about 65 EUR/tCO_2, in 2040 lower by about 135 EUR/tCO_2 and in 2050 lower by about 145 EUR/tCO_2. High fuel prices reduce the demand for fuels in the NEU_HPRICE scenario, as a consequence of which, the achievement of the same emission reduction level does not require such a higher pressure exerted through the allowance prices in the EU ETS system as in the NEU scenario.

Electricity demand

The electricity demand is determined in the process of iteration between the MEESA model, the d-PLACE macroeconomic model and the sectoral models on transport – TR^{3}E and agriculture – EPICA. At the level of the MEESA model, additional demand is generated to account for heat pumps and energy storage. Fig. 2 shows the thus generated demand in Poland, which is the key input to the optimisation model and determines to a large extent its results.

Until 2030, the demand in both scenarios grows at a similar pace. In the subsequent years, the high costs of all the energy carriers encourage efficiency-oriented measures to reduce the electricity demand. In 2040, the demand in the NEU scenario is already higher by about 9 TWh and in 2050 it is higher by about 15 TWh than in the NEU_HPRICE scenario.

FIG. 2. ELECTRICITY DEMAND IN POLAND UNTIL 2050 IN THE SCENARIOS CONSIDERED [TWh].



Source: Own elaboration by CAKE/KOBiZE

**final consumption (taking into account part of the energy sector, i.e. refineries, coking plants)*
*** only to the extent where they substitute for district heat*

The results on the changes in demand demonstrate that higher fuel prices slow down the pace of the increase in the electricity demand. Nevertheless, the difference in the demand between the scenarios considered is not so large. This results from the fact that in both scenarios there is the same reduction target, while the pressure to reduce the use of fossil fuels is exerted in different proportions by the fuel price and CO_2 emission cost. In other words, in the NEU scenario, the lower fuel price is compensated for by a higher CO_2 cost; this leads to a relatively small difference in the energy generation costs and, in consequence, in the electricity demand in the two scenarios.

The electricity generation structure and the challenges for Poland and the EU

In order to grasp the key changes in the direction of the development of the electricity sector in Poland resulting from the higher prices of fossil fuels and the emergence of limitations of the availability of natural gas, the two scenarios analysed, NEU and NEU_HPRICE, were compared. The analyses indicate that the role of natural gas as a transitional fuel, as planned in the strategic documents of both Poland and the EU, needs to be reconsidered. The commitment to become independent from natural gas supplies from Russia makes it necessary to replace natural gas in the energy sector by other fuels and generation sources.

The governments of the EU Member States plan to speed up the development of RES and delay the process of decommissioning of nuclear power plants and some of them resume the operation of coal-fired power plants. In Poland's case, a natural direction is to postpone the process of shutting down hard coal-fired power plants. The longer service life of coal-fired units in Poland should not, however, curb the transition towards renewable sources, although, unfortunately, in the timeframe until 2030 it is likely to contribute to a slower pace of emission reductions in the energy sector. It can be seen in Fig. 3 below that the greater use of coal-fired units will cause a significant limitation of the electricity generation in natural gas-fired units in the national power system. This is consistent with the objectives related to Poland's commitment to becoming independent from natural gas supplies from the Russian Federation. The decline in the electricity generation from natural gas favours the growing generation in hard coal-fired power plants and CHP plants, higher RES generation and imports. In the scenario with high fuel prices, the electricity generation gas in 2030 is lower by about 36 TWh than in the NEU scenario; in turn, the coal use grows by about 17 TWh, the RES generation is higher by about 13 TWh (including biomass, biogas, PV and offshore wind, while only the share on onshore wind energy does not change, given its high growth rate already in the NEU scenario) and imports also grow by about 9 TWh.

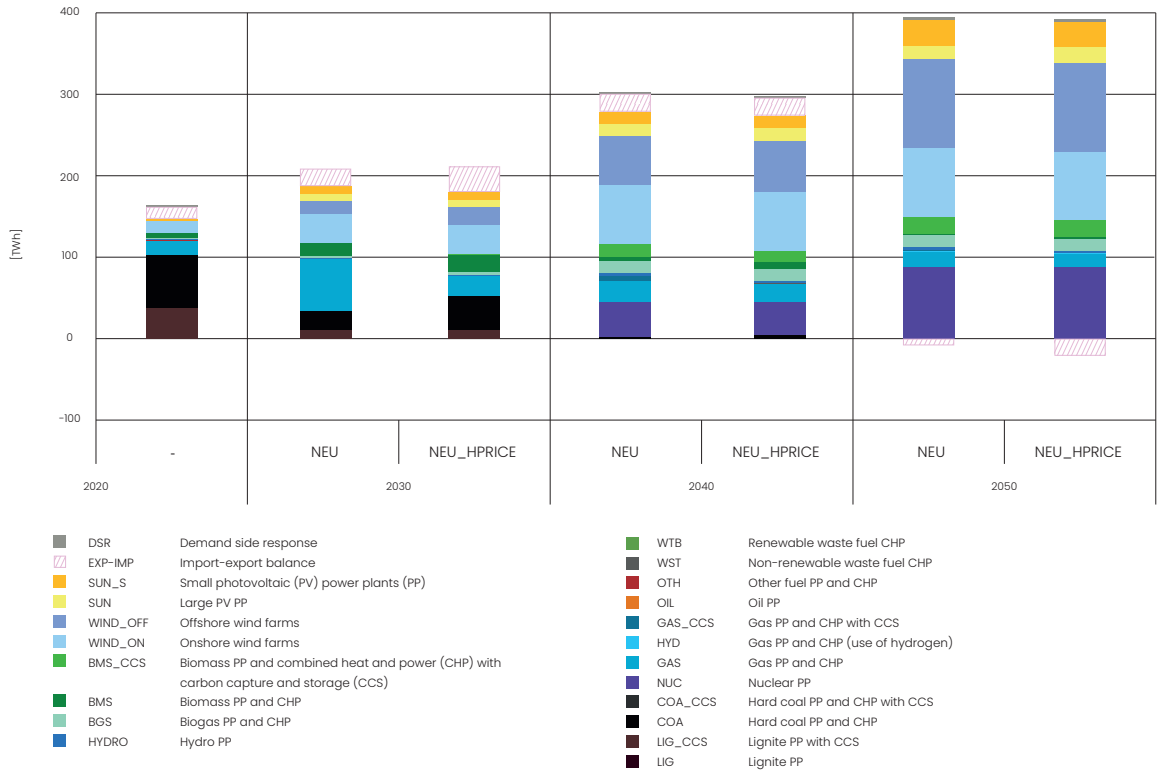
> **The analyses indicate that the role of natural gas as a transitional fuel, as planned in the strategic documents of both Poland and the EU, needs to be reconsidered. The commitment to become independent from natural gas supplies from Russia makes it necessary to replace natural gas in the energy sector by other fuels and generation sources.**

> **The analyses which have been carried out show the need for greater use of coal-fired units roughly until 2030. Until then coal-fired units will continue to play a key role in the national power system; all the more so as – given the situation of a fuel crisis – the role gas-fired sources will be substantially limited.**

The analyses which have been carried out show the need for greater use of coal-fired units roughly until 2030. Until then coal-fired units will continue to play a key role in the national power system; all the more so as – given the situation of a fuel crisis – the role gas-fired sources will be substantially limited. However, the government faces the challenge of having to ensure in the transitional period that coal-fired units will receive revenues at levels covering the costs of their operations. This will be extremely difficult after 1 July 2025, i.e. from the moment when emission-intensive units may not be supported as part of the capacity market, given that, in its Article 22(4b), Regulation (EU) 2019/943[9] prohibits the application of capacity mechanisms[10] from 1 July 2025 for units: which started commercial production before 4 July 2019 and emit more than 550 g of CO_2 originating from fossil fuels per kWh of electricity and more than 350 kg CO_2 originating from fossil fuels per year on average per 1 kWe of installed capacity.

Another important conclusion is the need to accelerate the pace of the development of RES sources (both wind, solar, biomass- and biogas--fired power plants). Alongside with wind power plants, photovoltaics is a key technology enabling the achievement of the emission targets. A particularly large potential is available from small, household-based installations; however, financial resources should first be allocated to the expansion and modernisation of distribution networks in order to unlock the opportunities for the development of prosumer energy generation. This is one of the greatest challenges facing Poland in the context of the energy transition. Other challenges include the unlocking the potential of onshore wind power plants and the development of offshore wind energy generation. These two technologies are of key importance for the whole energy transition. In turn, the biomass and biogas technologies will complement the system by supplying stable RES energy to it.

FIG. 3. ENERGY GENERATION IN POLAND UNTIL 2050 IN THE SCENARIOS CONSIDERED [TWh].



9 Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (OJ 158, 14.6.2019, p. 54).

10 Capacity mechanisms are measures to ensure security of electricity supply. Such mechanisms usually offer additional payments to capacity providers on top of the receipts from the sales of energy on the market in return for the maintenance of the existing capacity or investment in new capacity. This additional payment can affect the competition in the internal market for electricity and must be assessed in terms of the EU rules on state aid.

Regarding the directions of the development of the electricity sector of the EU as a whole in the context of the fuel crisis, the results obtained show a clear shift away from natural gas, which is a natural consequence of the higher prices of this resources and limitations of imports. In the NEU_HPRICE scenario, natural gas loses the status of a transitional fuel, whereas it undoubtedly played such a function in the NEU scenario (the electricity generation from natural gas in 2030 is lower by almost 180 TWh in the NEU_HPRICE scenario than in NEU scenario).

Regarding the directions of the development of the electricity sector of the EU as a whole in the context of the fuel crisis, the results obtained show a clear shift away from natural gas, which is a natural consequence of the higher prices of this resources and limitations of imports. In the NEU_HPRICE scenario, natural gas loses the status of a transitional fuel, whereas it undoubtedly played such a function in the NEU scenario (the electricity generation from natural gas in 2030 is lower by almost 180 TWh in the NEU_HPRICE scenario than in NEU scenario).

Regarding the development of RES, it is similar in both scenarios, which results from the fact that already in the NEU scenario it is essentially based on constraints, reflecting the technical and regulatory barriers to the development of RES in the model. Therefore, it is will be very important to implement technical and institutional solutions enabling an acceleration of investments in RES, in particular, in the offshore wind energy segment and to a lesser extent in the onshore segment. The development of wind energy generation on such a scale will certainly be a huge challenge for the EU in both technical and financial terms. It will also require the effective management of the supply chain of materials needed to carry out such an ambitious undertaking. It should be emphasised that as a result of this the dependence of the EU on imported fuels will certainly diminish, but it should also be noted that without the active promotion of innovation and the circular economy Europe will become even more dependent on imported materials needed to carry out this type of undertakings.

Nuclear energy must remain a significant element of the energy security of the EU. In none of the scenarios analysed, the level of the electricity generation from these sources falls (its annual level is about 1,000 TWh). Hence, in the context of the present crisis, the countries which plan to design from nuclear energy should reanalyse their objectives in this area. Photovoltaics also plays an important role in the electricity generation balance. A challenge for the development of this technology is the adaptation of transmission and distribution networks and the maintenance of units ensuring flexibility.

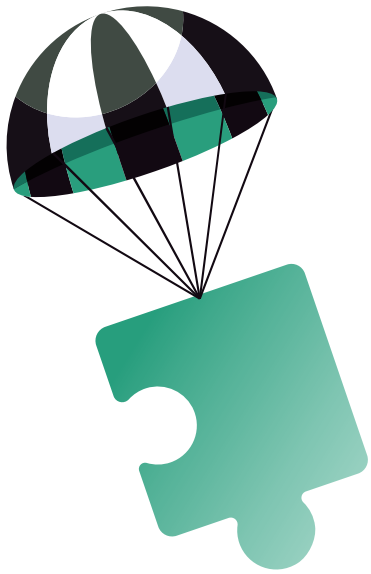
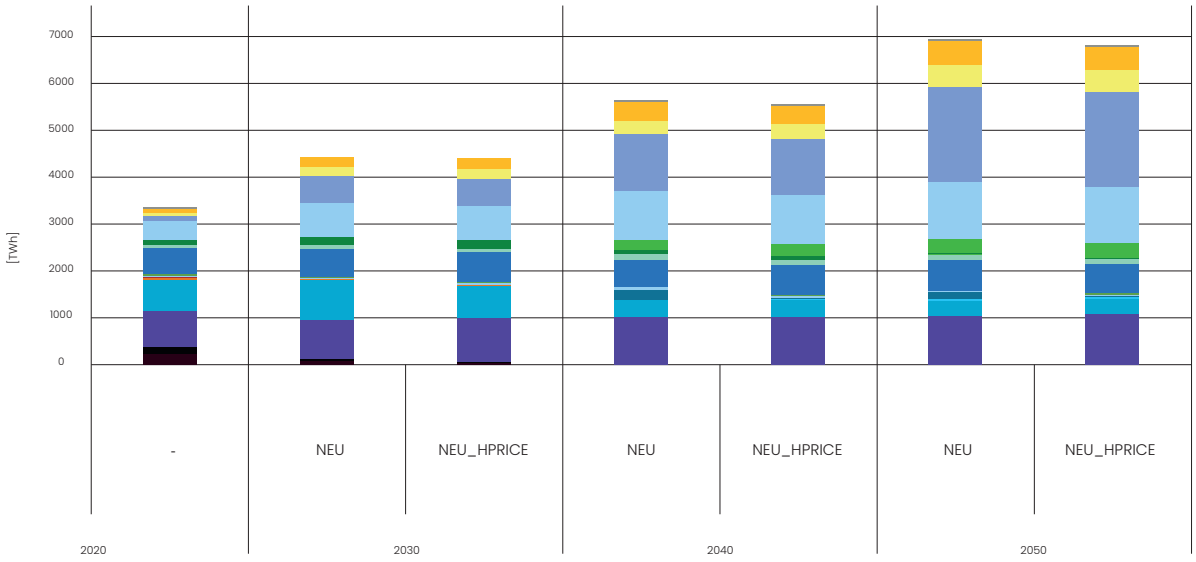


FIG. 4. ELECTRICITY GENERATION IN THE EU UNTIL 2050 IN THE SCENARIOS CONSIDERED [TWh]



DSR	Demand side response	OTH	Other fuel PP and CHP
SUN_S	Small photovoltaic (PV) power plants (PP)	OIL	Oil PP
SUN	Large PV PP	GAS_CCS	Gas PP and CHP with CCS
WIND_OFF	Offshore wind farms	HYD	Gas PP and CHP (use of hydrogen)
WIND_ON	Onshore wind farms	GAS	Gas PP and CHP
BMS_CCS	Biomass PP and combined heat and power (CHP) with carbon capture and storage (CCS)	NUC	Nuclear PP
		COA_CCS	Hard coal PP and CHP with CCS
BMS	Biomass PP and CHP	COA	Hard coal PP and CHP
BGS	Biogas PP and CHP	LIG_CCS	Lignite PP with CCS
HYDRO	Hydro PP	LIG	Lignite PP
WTB	Renewable waste fuel CHP		
WST	Non-renewable waste fuel CHP		

> The energy crisis which we have faced since the second half of 2021 in Europe and globally implies the need to take determined actions to protect consumers and economies against an excessive burden caused by increased supply costs. In addition, after Russia' aggression against Ukraine, both Poland and the EU as a whole faced the huge challenge of becoming independent from supplies of Russian fossil fuels.

Conclusion

The energy crisis which we have faced since the second half of 2021 in Europe and globally implies the need to take determined actions to protect consumers and economies against an excessive burden caused by increased supply costs. In addition, after Russia' aggression against Ukraine, both Poland and the EU as a whole faced the huge challenge of becoming independent from supplies of Russian fossil fuels. It must be done as soon as possible and, unfortunately, this necessitates recourse to coal resources which can substitute for the undelivered quantities of natural gas. These actions are of a transitional character, although the outcomes of these actions can still be seen for several years to come. In Poland's case, it seems necessary to maintain coal-fired units at least until 2030, which poses an additional challenge in terms of its ability to fulfil certain components of the Fit for 55 package being now negotiated in the EU. However, this period should be used to speed up the pace of the implementation of zero-emission electricity generation sources. In this scope, Poland primarily faces the challenge of unlocking the potential of onshore wind and solar power plants and increasing the role and potential of energy storages. In the nearest time, the financial resources coming from the EU should be allocated as a priority to the adaptation of the distribution networks to the growing shares of intermittent sources. An adequate number of flexible sources also needs to be ensured so as to provide reserve capacity in periods when intermittent RES sources cannot be relied on. As regards the EU as a whole, the energy crisis which we are facing should speed up the process of transition towards RES sources and should also contribute to a deep reflection on the future and role of nuclear energy; and, in the short term, at least to a change of the decision and maintaining the existing level of the electricity generation at nuclear power plants.

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2. European Commission, 2021. (https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_pl (accessed on 9 August 2022)

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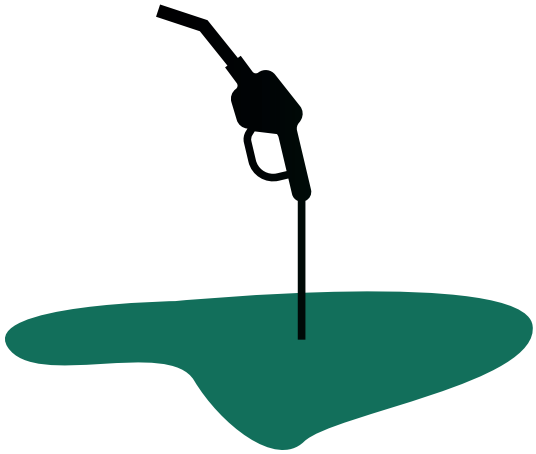

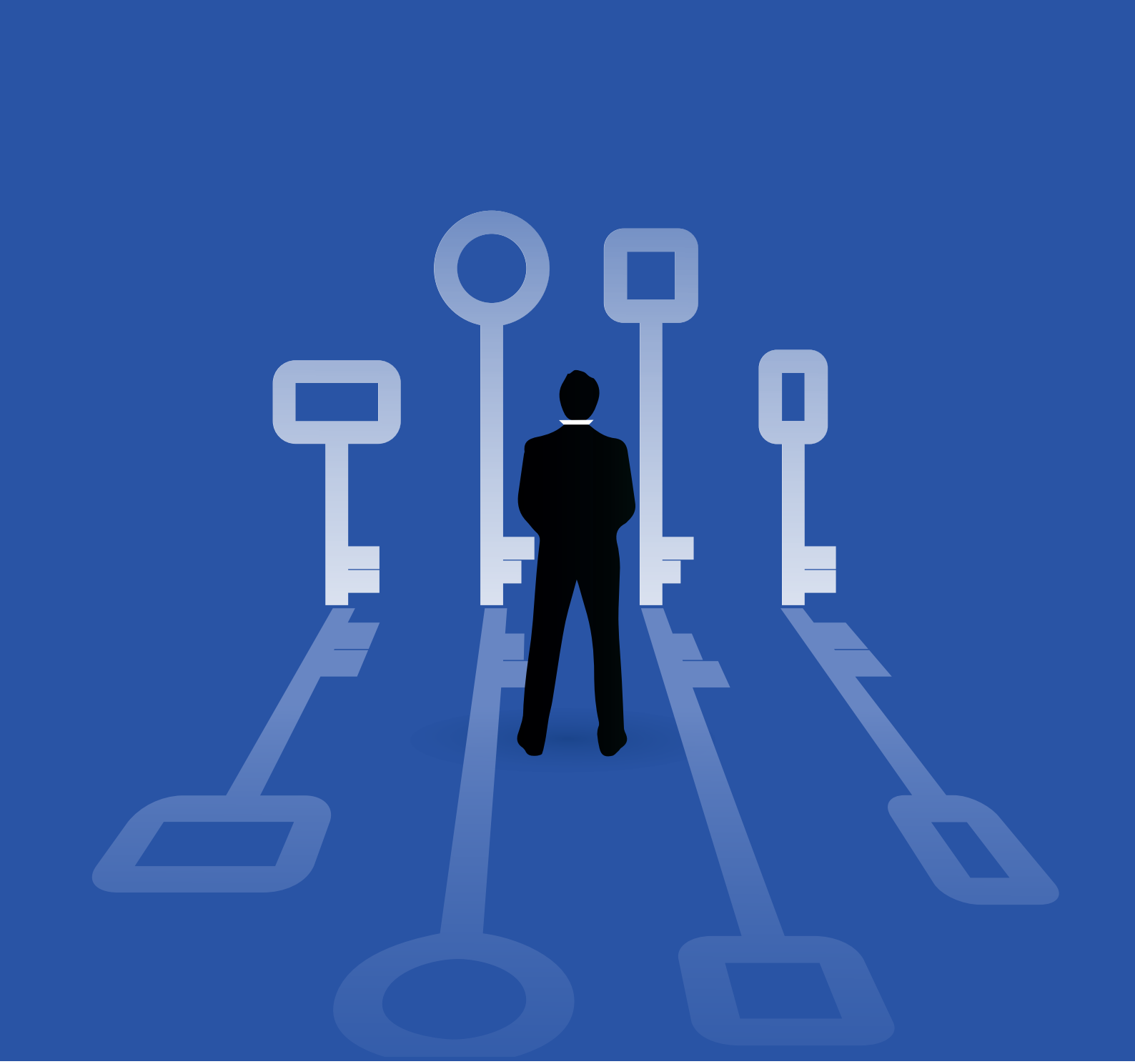

The costs and challenges for the Polish economy related to the achievement of the climate policy targets by 2050

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The costs and challenges for the Polish economy related to the achievement of the climate policy targets by 2050

Keywords: Low-emission transition, climate policy costs, GHG emission reduction targets, Fit for 55 package, European Green Deal, EU climate neutrality

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Abstract

The achievement of climate neutrality by the EU by 2050 will involve the need to incur the costs of the transition of the economy. The aim of the article is to present the estimated transition costs for Poland in accordance with the EU climate policy objectives as declared in the European Green Deal and proposed by the European Commission (EC) in the Fit for 55 package[1] and to compare these costs with the average costs of the EU as a whole. The article also includes an assessment of changes in the basic economic indicators, i.e. household consumption, GDP and investment volume.

The results presented in this article were obtained in analyses carried out as part of the implementation of the LIFE Climate CAKE PL project by means of the d-PLACE recursive dynamic computable general equilibrium model coupled with the MEESA energy system model (MEESA covers the electricity and district heat generation), the TR^{3}E transport model and the EPICA agriculture model.

The article demonstrates that the variability of the investments in time depends on a number of factors; therefore, this indicator should not be used as a basic measure of the long-term costs

1 European Commission, 2021. (https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en ; (Accessed on 5 October 2022).

List of abbreviations:

BRT ETS – Emissions Trading System for buildings and road transport
CAKE – Centre for Climate and Energy Analyses
CGE – Computable General Equilibrium
d-PLACE – A recursive dynamic computable general equilibrium (CGE) model developed at the CAKE
EC – European Commission
ESR – Regulation of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States by 2030 in non-EU ETS sectors
EPICA – Evaluation of Policy Impacts on Climate and Agriculture Model – an agriculture sector model built and developed at the CAKE
EU ETS – European Union Emission Trading System
Fit for 55 – A package of legal EU acts which the Member States plan to use to achieve new targets for energy, climate and transport.
GDP – Gross Domestic Product
GHG – Greenhouse gases
KOBiZE – National Centre for Emissions Management
MEESA – Model for European Energy System Analysis – an energy sector model built and developed at the CAKE
non-ETS – Sectors not covered by the European Union Emission Trading System
RES – Renewable Energy Sources
TR^{3}E – Transport European Emission Economic Model – a transport sector model built and developed at the CAKE

of the implementation of climate policy. From the perspective of households much better indicators include a change in consumption caused by higher GHG emission reduction targets and a decline in the economic growth rate. In the scenario providing for the implementation of GHG emission reduction targets declared in the European Green Deal in the period from 2021 to 2050, the household consumption in Poland will fall by about 3%. The declines in the consumption will be caused, among others, by the necessary investment expenditures on the purchase and implementation of low-emission technologies, in particular, in the energy sector. In the period from 2021 to 2040, the investment volume in Poland will grow by about USD'15 145 billion (EUR'15 130 billion[2]). As the results obtained indicate, after the implementation of GHG emission reduction targets declared in the European Green Deal the average GDP growth rate in Poland will fall in the period from 2021 to 2040 by about 1% and in the period from 2041 to 2050 by about 6%. Against the EU as a whole, Poland belongs to the group of Member States which are vulnerable to the climate policy impacts. Depending on the period analysed, the average GDP decline observed in the EU as a whole is several times lower than the one in Poland (as a maximum, 3 times lower in 2050).

It is important to note that the investment expenditure volume also depends on the economic growth rate which will decrease after the implementation of higher GHG emission reduction targets, especially after 2040. As a result of lower economic growth, the investment expenditures in the period from 2041 to 2050 will fall by about USD'15 120 billion (EUR'15 110 billion) relative to the scenario providing for a more lenient climate policy. Thus, in the initial transition period the investment processes will be, on the one hand, stimulated by changes in the legal environment caused by continued high climate ambitions, whereas in the later period from 2041 to 2050 the investment expenditures will fall as a result of lower economic growth caused exactly by this policy. Partly, the difference in the investment volume also results from the fact that in the scenario without the implementation of the neutrality target a substantial part of investments in the energy sector will take place in the period from 2041 to 2050.

2 Recalculated after the NBP, link: https://www.nbp.pl/home.aspx?f=/kursy/arch_a.html

Introduction

The EU actions to revise the long-term climate policy were initiated in December 2019, in the published document entitled "The European Green Deal". That document set out a strategy for achieving the European climate neutrality targets by 2050 and gave impetus to successive steps. In June 2021, the European Climate Law[3] was adopted, laying down the legally binding targets of the GHG emission reduction in the EU by 2030 at a net level of 55% relative to 1990 and the achievement of climate neutrality in 2050. The next milestone of climate policy was the proposal for a legislative package, the so-called Fit for 55 package, presented by the EC in July 2022. As part of the package, the EC proposed, among others, amendments on the energy and climate regulations intended to align the law then in effect with new ambitious climate targets.

3 Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 (European Climate Law).

In the course of the work to revise climate policy as described above, the impact assessment for the Communication from the Commission "Stepping up Europe's 2030 climate ambition investing in a climate-neutral future for the benefit of our people"[4] was published in September 2020. That impact assessment concerned higher GHG emission reduction targets in the EU and raised doubts at many points related to the absence of detailed results in a breakdown for the Member States. Similar objections had been voiced earlier regarding the 2018 impact assessment accompanying the Communication from the Commission "A Clean Planet for all - A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy". The most recent impact assessments presented by the EC as part of the revision of climate policy concerned the Fit for 55 package and, just as the previous ones, failed to include results at the Member States' level.

Without these data, the assessment of the burden for the particular Member States related to the implementation of the proposed climate neutrality of the EU is problematic. This also concerns the scale of the necessary investment expenditures. More ambitious climate targets will entail relatively higher costs for the Member States characterised by initially higher GHG emissions and higher energy intensity. Since Poland is one of such Member States, the aim of the analysis presented in the article is to attempt to dimension the macroeconomic impacts of the implementation of the new EU climate policy for the Polish economy in the timeframe until 2050. Such impact assessments are of key importance for the appropriate creation of EU climate policy, a fair sharing of obligations among the Member States and the appropriate planning of the process of the transition of the national economy.

The manner of estimating the low-emission transition costs in the economy

The analysis was carried out on the basis of a set of models prepared at the Centre for Climate and Energy Analyses (CAKE). The results presented here come from the d-PLACE recursive dynamic computable general equilibrium model coupled with the models for the energy sector (MEESA[5]), the transport sector (TR^{3}E[6]) and the agriculture sector (EPICA[7]). A detailed methodological description of the calculations can be found in the documentation on the linking of the models available from the CAKE[8]. Due to the linking of the sectoral models with the CGE model, it was possible to capture technological changes in the sectors of key importance for climate policy (energy, transport and agriculture) and, in consequence, the impacts of these changes on the other branches of the economy represented in the d-PLACE model. This approach ensures a better reflection of the transition unfolding in the economy and captures more precisely the technological changes and their costs than in the case where only the CGE is used for the calculations. This results in a more precise reflection of changes in macroeconomic indicators, such as GDP, investment volume and household consumption.

4 The Impact Assessment for the Communication "Stepping up Europe's 2030 climate ambition investing in a climate-neutral future for the benefit of our people", European Commission, Brussels, 2020, SWD(2020) 176 final.

5 Tatarewicz, I., Lewarski, M., Skwierz, S. (2022). The MEESA Model, ver. 2.0, Institute of Environmental Protection - National Research Institute / National Centre for Emissions Management (KOBiZE), Warsaw.

6 Rabiega, W., Sikora, P., Gąska, J., Gorzałczyński A. (2022). The TR^{3}E Model, ver. 2.0, Institute of Environmental Protection - National Research Institute / National Centre for Emissions Management (KOBiZE), Warsaw.

7 Wąs, A., Witajewski-Baltvilks, J., Krupin, V., Kobus, P. (2022). The EPICA Model, ver. 2.0, Institute of Environmental Protection - National Research Institute / National Centre for Emissions Management (KOBiZE), Warsaw.

8 Boratyński, J., Witajewski-Baltvilks, J., Tatarewicz, I., Pyrka, I., Rabiega, W., Wąs, A., Kobus, P., Lewarski, M.,Gorzałczyński, A., Tobiasz, I., Vitaliy, K., Jeszke, R., (2021) Procedure for linking sectoral models with the CGE model, Technical documentation version 1.0, Institute of Environmental Protection - National Research Institute / National Centre for Emissions Management (KOBiZE), Warsaw.

It should be emphasised that the modelling of such a complex policy as climate policy by means of CGE models is not an easy task. CGE models fail to capture all constraints and diverse processes unfolding in the economy. It is difficult for CGE models to capture certain processes, since they are not directly related to the standard variables of this type of models or their effects are very complex and difficult to correctly implement; these are e.g. the adaptation processes or economic losses caused by climate change (among others, health losses). The Fifth Assessment Report of the IPCC indicated a number of uncertainties related to the manner of estimating the impact of climate change on the economy, among others, the large uncertainty about the scale of adaptation and the manner in which climate change will translate into economics[9,10].A full analysis of the balance of benefits and losses related to climate policy still entails a large uncertainty, given that a significant part of the failures of this policy are related to phenomena which are relatively rare, but cause substantial losses in the economy[11]. In light of the problems listed above, we do not analyse the possible benefits of the implementation of climate policy, focussing only on the estimation of the low-emission transition costs.

As a typical CGE model, the d-PLACE model which gave the results presented in this article represents the low-emission transition of the economy as a process of responses to changes in the relative prices of different energy carriers, including fuels (taking into account the emission costs). Manufacturers can replace energy by capital and labour. As the emission costs grow, the use of capital and labour increases, but the consumption of emission-generating fuels falls. In the analysis, the branches of the economy which are not represented by sectoral models are considered without taking into account detailed technological solutions. And their structure is based on nested CES functions and the Leontief production function, which are commonly applied in CGE models. More ambitious climate goals will entail relatively higher costs for the Member States characterised by initially higher GHG emissions and higher energy intensity.

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The EU climate policy scenarios considered

Two scenarios defining the EU climate policy targets, i.e. the base scenario (BASE) and the neutrality scenario (NEU), were prepared for the analysis. Table 1 shows the specific GHG emission reduction targets used in the simulations.

a) Base scenario (BASE)

The BASE scenario assumed the implementation of the climate policy targets now in effect in the legislative regulations introduced by the "Clean energy for all Europeans" package, the so-called 2030 package. That package set out, among others, the EU climate policy targets until 2030 and the target for greenhouse gases, specifically, the reduction of the EU emissions in 2030 by at least 40% compared with 1990 levels. The EC fo-

9 Kunreuther, H., Gupta, S., Bosetti, V., Cooke, R., Dutt, V., Ha-Duong, M., Held, H., Llanes-Regueiro, J.,Patt, A., Shittu, E., et al. (2014). Integrated risk and uncertainty assessment of climate change response policies. In Climate Change 2014: Mitigation of Climate Change: Working Group III Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, pp. 151–206. Cambridge University Press.

10 Gąska, J., Wpływ zmian klimatu na polską gospodarkę [The impact of climate change on the Polish economy – in Polish], Personal summary of the Ph.D. Dissertation, SGH, Warsaw, August 2020.

11 Gąska, J., Wpływ zmian klimatu na polską gospodarkę [The impact of climate change on the Polish economy – in Polish], Personal summary of the Ph.D. Dissertation, SGH, Warsaw, August 2020.

TABLE 1. REDUCTION TARGETS IN THE EU CLIMATE POLICY SCENARIOS

SCENARIO	GHG EMISSION REDUCTION TARGET FOR EU-27			BRT ETS (EMISSIONS TRADING SYSTEM FOR BUILDINGS AND ROAD TRANSPORT)
	TOTAL GHG EMISSION REDUCTION VS. 1990	GHG EMISSION REDUCTION IN THE EU ETS VS. 2005	GHG EMISSION REDUCTION IN NON-ETS VS. 2005	
2030				
BASE (2030 package)	42%	48%	30% (PL 7%)	None
NEU (Fit for 55 package")	53% (55% net *)	61%	40% (PL 17,7%)	43%
2050				
BASE	60%	69%	47% (PL 31%)	None
NEU	90% (100% net *)	93%	82% (PL 74,8%)	87%

** The achieved GHG reduction target, taking into account the removals in the LULUCF sectors and the technologies for the removal of GHGs from the atmosphere (e.g. BECSS, i.e. a technology for biomass combustion with CCS)*

Source: Own elaboration by CAKE/KOBiZE

recasts on the effects of the implementation of the 2030 package and the policies pursued by the Member States to phase out coal will result in GHG emission reductions exceeding the proposed 40% in 2030 compared with 1990 levels. Taking into account the historical data on emissions for 2021 in the EU ETS sectors, indicating that the emission reduction by about 37% compared with 2005 levels was already achieved in the EU Member States, it became necessary to revise the reduction target for 2030 with respect to the one in effect in accordance with the EU ETS Directive. This target was updated on the basis of the EC publication entitled "EU reference scenario 2020. Energy, transport and GHG emissions: trends to 2050", where the GHG emissions in the EU ETS fell by about 48% in 2030 compared with 2005 levels . For the non-ETS sectors, the EU emission reduction target was adopted in accordance with the ESR Regulation, i.e. as a 30% reduction in 2030 compared with 2005 emissions. This results from the fact the fulfilment of the obligations set out for Poland in the ESR Regulation will already require the launch of actions additional to the present national policy. The target defined in the base scenario will result in the total GHG emission reduction in all the sectors in 2030 by about 42% compared with 1990 levels[12].

12 Page 119 of the EC report entitled "EU Reference Scenario 2020 Energy, transport and GHG emissions: trends to 2050", 2021.

For 2050, the BASE scenario assumed that the GHG emission reduction in all the sectors of the economy would be 60% compared with 1990 levels, in line with the EC projections presented in the "EU reference scenario 2020 Energy, transport and GHG emissions: trends to 2050". On the basis of the same EC projection, the emission reduction target was also adopted for the EU ETS sectors, which will have to reduce by 60% their emissions by 2050 compared with 2005 levels. In the case of the non-ETS sectors, the reduction target for 2050 results from the assumptions adopted earlier and is 47% relative to 2005 emissions. In terms of the EU emission levels in 2050, the base scenario in this article is close to the base scenario of the Impact Assessment for the Communication from the Commission "Stepping up Europe's 2030 climate ambition": "By 2050, the current policies, based on the current target, would lead to a reduction of around 60% below 1990"[13].

b) Neutrality scenario (NEU)

The NEU scenario assumed the implementation of the EU climate policy targets for GHG emission reductions in line with those declared in the European Green Deal and published by the EC in the Fit for 55 package. This package set out the pathway for achieving by 2030 the target of a 55% net (i.e. including removals) emission reduction compared with 1990 levels. When excluding removals, the assumed implementation of the EU climate policy targets for GHG emission reductions was estimated at a level of 53% in 2030 compared with 1990 levels. In accordance with the EC proposals put forward in the Fit for 55 package, the NEU scenario assumed that in 2030 the EU ETS sectors would have to reduce their emissions by 61%, while the non-ETS sectors would have to cut them by 40% compared with 2005 levels.

The NEU scenario also took into account the special Emissions Trading System for buildings and road transport (BRT ETS). In accordance with the Fit for 55 package, the emission reduction target by 2030 in the BRT ETS is 43% compared with 2005 levels. The inclusion of the sectors of buildings and road transport in the new pan-European BRT ETS system, just as in the Fit for 55 package proposed by the EC, does not mean that these sectors will be excluded from the reduction area defined by the non-ETS targets. Hence, the reduction target in the non-ETS area must be met with account taken of the emissions from buildings and transport, too. In 2030, in accordance with the EC proposals put forward in the Fit for 55 package, in 2030 in the non-ETS areas Poland will have to reduce its emissions by 17.7% compared with 2005 levels. In turn, after the implementation of the BRT ETS system, this reduction effort will diminish to 11%, while in 2050 Poland's emission reduction target in the non-ETS area will decrease from 74.8% to 60%.

13 Page 9 of the Impact Assessment for the Communication "Stepping up Europe's 2030 climate ambition investing in a climate-neutral future for the benefit of our people", European Commission, Brussels, 2020, SWD(2020) 176 final.

The NEU scenario also assumed the long-term emission reduction target by 2050 in order to put the EU on the pathway towards the achievement of climate neutrality. Our proposal for the EU progress in the emission reductions by 2050 is to reduce the GHG emissions by 90% compared with 1990 on a net basis; when including removals, this means the emission reductions in 2050 to zero. In the NEU scenario, the reduction target for the EU ETS sectors was set at a level of 93%, corresponding to the emission reductions in the version presented in the GECO2020 projection of the European Commission for the 1.5°C scenario[14] .As a result of the adoption of a specific reduction level for the EU ETS sectors, in order to achieve the Community's reduction target assumed in the neutrality scenario at about 90% in 2050, the other sectors of the economy within the non-ETS area will need to reduce emissions in 2050 by about 83%. In turn, the reduction target assumed for the new BRT ETS system in 2050 is 87% compared with 2005 emission levels and results from the previously mentioned GECO2020 projection of the European Commission for the 1.5°C scenario. Changes in household consumption demonstrate how much we will have to reduce expenditures within our basket of goods serving to meet any types of life needs."

Changes in household consumption demonstrate how much we will have to reduce expenditures within our basket of goods serving to meet any types of life needs.

Changes in macroeconomic indicators

The adoption of new more ambitious climate policy targets by the EU will initially lead to a significant increase in the investment needs arising from the need for a technological transition and the implementation of low-emission technologies. In the first step, the strengthening of the GHG emission targets will increase the costs of enterprises characterised by high emission factors. This means that industrial sectors will increase their investments to reduce the emission factors of their production. At the macroeconomic level, this will bring about a change in the production structure by reducing the consumption of fuels and energy the prices of which will gradually grow. This will be related to technological

14 Global Energy and Climate Outlook 2020: Energy, Greenhouse gas and Air pollutant emissions balances. European Commission, Joint Research Centre (JRC) [Dataset] PID: http://data.europa.eu/89h/1750427d-afd9-4a10-8c54-440e764499e4 (Accessed on 2 October 2022), European Commission, Joint Research Centre, 2020.

changes in the economy. The use of more capital-intensive production methods will cause a deterioration of the competitiveness of the economy and GDP declines. In turn, these will cause a decline in the investment needs related to the lower output at the end of the period analysed. The growing prices of goods and services, as well as the growing demand, will also translate into declines in household consumption and thereby into a decline in prosperity measured exactly by this consumption. The economic processes described above will unfold with varying intensity in the analysed period of the projection until 2050 and will primarily depend on the initial emission factor of the economy which will result from the production structure and the fuel mix used.

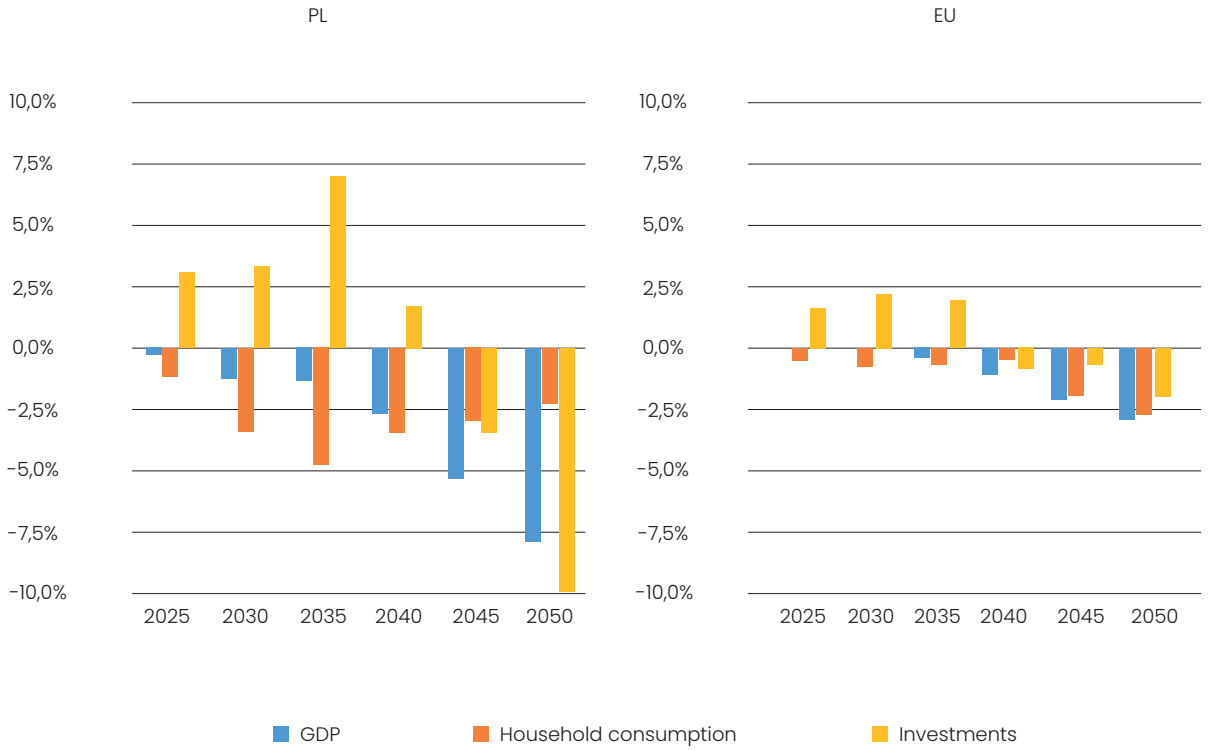
Chart 1 shows the impact of the raised reduction targets on changes in: the GDP, household consumption and investments for Poland and the EU. The values presented there are percentage deviations of a given indicator in the NEU scenario (the scenario accounting for higher climate ambitions in line with the European Green Deal) compared with the BASE scenario (the scenario assuming the continuation of the present policy until 2030 and, subsequently, a gradual easing of the climate ambitions in the EU).

In Poland's case, the strengthening of the GHG emission reduction targets in the NEU scenario will lead to higher investments in the period from 2025 to 2040. Initially, from 2025 to 2030, the investments in the NEU scenario will be higher by about 2.5% than in the BASE scenario. The greatest increase in investments, of about 6%, will come in 2035. This peak will primarily result from the need to incur the large costs of the transition in the energy sector in Poland. The need to finance investments will lead to a decline in household consumption. This will be particularly conspicuous in 2030 when a large increase in investments will bring about a more than 4% decline in household consumption in Poland. In the final period, the value of investments in the NEU scenario will fall relative to the BASE scenario; by about 3% in 2045 and by as much as 10% in 2050. There are several reasons for such changes in investments in time. Firstly, the earlier funding of technological changes in the NEU scenario will enable their limitation in the subsequent years compared with the BASE scenario. Secondly, the economic growth rate will slow down in the NEU scenario. The last reason is the significant growth of investment needs to be seen later, in the period from 2045 to 2050, in the BASE scenario in the energy generation sector, which will be related to the need to replace the infrastructure for the generation of electricity and district heat and the need to adapt to the fuel costs which will grow in the BASE scenario, too.

For Poland the raised reduction target in the NEU scenario will translate into a slower GDP growth compared with the BASE scenario. Until 2035, the difference in the total GDP values between the scenarios will not be large yet, amounting to 0.3% – 1%. In the last decade analysed, the deviations in the total values of the national GDP will already be significant and amount to about 8% in 2050. Among others, this will be an effect of the accumulation of an economic slowdown in the whole projection period analysed. Poland's economic slowdown after the implementation of the NEU scenario will be about 0.1% on average until 2035 and about 0.9% in the period from 2035 to 2050. A useful measure for comparing the situation of the Member States is a decline in the economic growth rate reflecting the condition of the economy after the implementation of higher emission reduction targets.

A useful measure for comparing the situation of the Member States is a decline in the economic growth rate reflecting the condition of the economy after the implementation of higher emission reduction targets.

CHART 1. DIFFERENCES IN THE GDP, CONSUMPTION AND INVESTMENTS BETWEEN THE NEU AND BASE SCENARIOS IN THE PERIOD FROM 2025 TO 2050 [%].



Source: Own elaboration by CAKE/KOBiZE

A comparison of the projected changes in the macroeconomic parameters in Poland and the EU indicates that Poland is a country which is significantly vulnerable to higher climate policy costs, since the effects of the implementation of higher emission reduction targets in the NEU scenario are lower for the EU as a whole than those for Poland.

The projections indicate the growth of necessary transition investments in the EU Member States until 2030 not exceeding 2.5%. The highest growth is foreseen in 2030. It will be almost 3 times as low as the growth investment in Poland in 2040 (the investment expenditures on the transition of the economy will peak in 2040). Given the lower investment needs until 2040, in the NEU scenario, a decline in consumption in the EU as a whole will also be relatively small, not exceeding 0.7% compared with the BASE scenario. It will grow only at the end of the analysed period, from 2045 to 2050, reaching values close to those observed in Poland. A decline in consumption in the EU Member States in this period will result from an increase in the prices of goods relative to the disposable household incomes.

The projections of the change in the GDP also indicate that the impact of the economic slowdown after the strengthening of climate policy will be smaller in the EU as a whole than in Poland. In the NEU scenario, until 2030 a decrease in the EU GDP will be practically invisible, growing later to reach as a maximum about 2.5% in 2050, i.e. about 3 times lower than the one projected for the same year in Poland. The slowdown of the

economic growth rate in the EU Member States after the implementation of the NEU scenario until 2035 will be practically unnoticeable, while in the period from 2035 to 2050 it will be about 0.2%.

The article demonstrates that the variability of the investments in time depends on a number of factors; therefore, this indicator should not be used as a direct and basic measure of the long-term costs of the implementation of climate policy. From the perspective of households a much better indicator will be a change in their consumption caused by higher GHG emission reduction targets. Changes in household consumption demonstrate how much we will have to reduce expenditures within our basket of goods serving to meet any types of life needs. The results of the analysis indicate that in the NEU scenario, in the period from 2021 to 2050, the household consumption in Poland will fall by about 3% compared with the BASE scenario, while the household consumption in the EU Member States will diminish by 1%. Another useful measure for comparing the situation of the Member States is a decline in the economic growth rate reflecting the condition of the economy after the implementation of higher emission reduction targets. Poland's average economic growth rate (a GDP change in time) in the period from 2021 to 2050 will be lower by about 0.5% than in the NEU scenario compared with the BASE scenario. Moreover, the average economic growth rate in the EU Member States will fall by about 0.1%.

Conclusion

The GHG emission reductions are one of the pillars of EU policy and a basic tool for forcing the economic transition which will contribute to diminishing the use of primary fuels through changes in production technologies, improvements in energy efficiency and the use of alternative fuels and RES. The energy crisis which we are now facing has demonstrated that it is necessary to become independent from supplies of energy raw materials in order to protect the European economy and ensure the energy security of the EU Member States in the future. Therefore, there is a need to change the model of production and consumption and, at the same time, the model of economic growth. The results of our analysis indicate that the transition process will entail the need to incur significant costs the levels of which were estimated from changes in macroeconomic indicators. In particular, use was made of a change in household consumption, as in economic terms it determines the level of a change in prosperity felt by citizens. It should be noted here that the basic aim of the analysis was to estimate the transition costs. Therefore, the analysis did not take into account the possible benefits of becoming independent from energy raw materials and, in consequence, unambiguous conclusions cannot be drawn about the extent to which climate policy is profitable.

Another very important issue will be the progressing adaptation costs generated by the impacts of climate warming, due to which we will have to cope, among others, with extreme weather events causing real GDP losses. Many economists point out that these losses are underestimated, since our model does not consider the costs of climate policy failures, mainly due to the time limits of our projection. The economic and social impacts of failure to take relevant actions to reduce GHG emissions will grow gradually and extend well beyond 2050.

In order to implement the transition of the economy towards climate neutrality, funds will have to be mobilised on the financial markets to cover investment expenditures, particularly in the timeframe until 2040 and particularly in the energy sector. In order to achieve climate neutrality by 2050, it will be necessary to move away from coal-based fuels and to develop renewa-

ble energy sources. In addition, it will be necessary to implement on a wide scale technologies based on GHG removal and disposal, including BECSS, CCS and CCU, massive electrification of industry and hydrogen use, to develop electromobility and to apply adequate instruments to support and develop technologies in the agriculture sector.

The cost conditions and the pace of the transition changes presented here clearly indicate the need for Poland to prepare a comprehensive and multidimensional strategy to guide its sectors in the course of the transition and to set out a financing framework to ensure the adequate availability of capital for the required investments.

In light of this, the shift towards the low-emission transition should not be delayed, e.g. until the end of the crisis now caused by the war in Ukraine and/or the COVID-19 pandemic. Failure to take action in this scope can lead to major economic consequences in the future. The challenge for Poland should be primarily its engagement in adequate and proactive ongoing negotiations on the shape of climate policy until 2050 to level out the disproportions in the costs of achieving the GHG emission reduction targets among the different EU Member States. It should also be emphasised that for the future generations the transition costs now incurred will result in more stable economic growth in our region.

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CBAM – what can we expect from the new EU climate policy instrument?

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Keywords: CBAM, Carbon Border Adjustment Mechanism, greenhouse gas emissions, EU climate policy.

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Abstract

This article expounds the carbon border adjustment mechanism (CBAM) being designed in the EU[1], which is expected to constitute a new EU climate policy instrument complementing the greenhouse gas allowance trading system (EU ETS). The aim of the article is to present the objectives expected to be achieved by the CBAM, the concept of its operation reflected in the draft now undergoing a legislative process[2] in the EU and what obligations it will most likely impose on which entities[3]. The article will elucidate the most contentious issues addressed during the legislative process and the challenges facing this mechanism. The article contains current information as of 17.10.2022.

1 Proposal for a Regulation of the European Parliament and of the Council establishing a carbon border adjustment mechanism, 14.7.2021, COM(2021) 564 final, available at the address: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52021PC0564; (Accessed on 21 September 2022). Hereinafter in this article referred to as "the legislative proposal" or "the proposal". Wherever in this text reference is made to "the draft" it is to be understood to mean the draft regulation put forward in this proposal.

2 As of 21 September 2022, the legislative process was at the stage of the first reading. The Council adopted the so-called general approach, in which it presented the text of the draft regulation in the wording proposed by the Council (document 7226/22) available at the address: https://data.consilium.europa.eu/doc/document/ST-7226-2022-INIT/pl/pdf (Accessed on 21 September 2022). In turn, on 22 June 2022, as part of the first reading, the Parliament adopted amendments to the draft regulation (document COM(2021)0564 – C9-0328/2021 – 2021/0214(COD)) available at the address: https://www.europarl.europa.eu/RegData/seance_pleniere/textes_adoptes/definitif/2022/06-22/0248/P9_TA(2022)0248_PL.pdf (Accessed on 21 September 2022). Whenever in this text reference is made to the position of the Council it is to be understood to mean its position adopted in the general approach, while whenever in this text reference is made to the position of the Parliament it is to be understood to mean its position adopted in the abovementioned document adopted as part of the first reading.

3 It should be emphasised that the legal regulations considered here are still undergoing of a legislative process; therefore, it is not certain whether and with what content they will finally come into effect.

Introduction

The effect of the carbon leakage from the EU to areas with lower ambitions in the scope of climate and environmental policies and the need to address this effect has long been debated in the European Union. Due to the high emission allowance prices in the EU ETS, it is profitable for enterprises to relocate part of their production outside the EU or to import materials and intermediate products from there. This undermines the effectiveness of EU climate policy, since, as a result of carbon leakage, greenhouse gas emissions grow outside the EU and this often translates into higher global emissions[4].

At present, the EU addresses the risk of carbon leakage by means of tools applied as part of the greenhouse gas allowance trading system (EU ETS); through the granting of free allowances to installations in the sectors at risk of carbon leakage and compensations for the increase in

4 As a result of generally lower environmental standards in the countries outside the EU, the emissions generated outside the EU in relation to the transfer of production will often be higher than they would be if the goods were manufactured in the EU.

electricity costs. However, the position of the European Commission is that this weakens the so-called price signal sent by the EU ETS, i.e. it weakens the incentives encouraging greenhouse gas reductions. On the other hand, as a result of the burdens imposed by EU climate policy, EU enterprises incur higher operating costs due to the obligation to pay for the CO_2 emissions they generate than enterprises outside the EU and this affects the competitiveness of EU producers. The introduction of a border carbon tax by the EU in the form of the so-called carbon border adjustment mechanism (CBAM) is expected to provide a remedy to these problems. A legislative proposal in this matter was submitted in mid-2021 as part of the legislative package called "Fit for 55" and now it still continues to be the subject matter of legislative work.

What, specifically, is the border tax?

The border tax is generally defined as a regulatory strategy to mitigate the risk of carbon leakage and loss of competitiveness associated with the unilateral adoption of carbon pricing policies[5]. As some Authors have already said in Go'2'50[6], there are different concepts of the border tax and it is also given different names: border adjustment tax, border adjustment mechanism or carbon border tax. The "carbon border adjustment mechanism" designed in the EU provides that a system similar to the EU ETS applicable to production in the EU will apply to goods imported into the EU.

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The CBAM provides that importers will account for so-called **"embedded emissions"** in specific products and electricity imported into the customs territory of the EU, i.e. emissions released during the production of these goods[7] in countries outside the EU[8]. Importers will submit to the competent authorities their declarations specifying the quantity of imported goods and verified embedded emissions and account for the declared emissions. They will be accounted for using purpose-designed emission units (called **"CBAM certificates"**) in a quantity corresponding to the quantity of embedded emissions (with some reductions). The submission of the declaration and the surrender of CBAM certificates will be part of the obligations to be fulfilled in the year following the year when the goods are imported into the EU territory. Initially, the CBAM is expected to apply to products in several sectors, to be then gradually expanded (this is described in detail in the further of the article).

The main objective of the CBAM is to prevent carbon leakage outside the UE and thereby to fight climate change[9]. In addition, the CBAM is to create incentives to encourage entrepreneurs outside the EU to reduce their greenhouse gas emissions. Moreover, the CBAM is to create a level playing field for the EU entrepreneurs in the sectors covered by the CBAM (which incur carbon costs) with regard to the entrepreneurs outside

5 A. Pirlot, Carbon Border Adjustment Measures: A Straightforward Multi-Purpose Climate Change Instrument?, Journal of Environmental Law 34/2022, p. 28.
6 M. Pyrka, I. Tobiasz, R. Jeszke, J. Boratyński, M. Sekuła, Options and conditions for the introduction of the Carbon Border Adjustment Mechanism (CBAM) in the EU, GO'2'50 Nr 1/2020, p. 34.
7 In accordance with the terms applied in the draft, "goods" means both the products listed in Annex I and electricity (cf. Article 3(1) of the draft and Annex I).
8 The scope of embedded emissions to be accounted for as part of the CBAM is an issue of contention in the trilogue. Detailed information on this subject is provided in the further part of this article.
9 Proposal, section 1, see also recital 12 of the preamble to the draft.

the EU[10] (which usually do not incur such costs). Finally, since the CBAM is to gradually replace the abovementioned instruments to prevent the risk of carbon leakage which operate as part of the EU ETS, its purpose is to strengthen the "price signal" within the EU too (in the EU ETS). The aim of all these assumed objectives is to make the CBAM "an essential element of the EU toolbox to meet the objective of a climate-neutral EU by 2050 in line with the Paris Agreement by addressing risks of carbon leakage as a result of the increased Union climate"[11].

Similarities and differences between the EU ETS and the CBAM

By assumption, the CBAM is to be a parallel system to the EU ETS and consistent with it. The draft indicates that the CBAM and the EU ETS have a common objective of pricing GHG emissions embedded in the same sectors and goods[12], except that the EU ETS applies to the production in the EU, while the CBAM covers production outside the EU. Just as in the EU ETS, the CBAM is to be based on the submission of declarations by the participants in the system (i.e. the importers of goods covered by the CBAM) specifying the emissions generated and the accounting for these emissions with purpose-designed emission units.

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It follows from the draft that the formal requirements and the mechanism of fulfilling these obligations will be similar. However, there will be quite significant differences between the CBAM and the EU ETS in a number of aspects, including, among others:

- **the subjective aspect,** since the CBAM mechanism applies to the imports of products into the EU customs territory (identified on the basis of their classification in the Consolidated nomenclature (CN)), whereas the EU ETS covers specific activities carried out at installations[13] operating within the EU; this difference generates both regulatory challenges related to the correct definition of the scope of the CBAM and is likely to generate risks related to attempts to circumvent the mechanism;
- **the subjective aspect,** since in EU ETS obligations are imposed on the installation operator, while in the CBAM the basic obligations will be imposed on the importer of goods;
- **the design aspect,** since the EU ETS is based on a "cap and trade" model. As part of this system, an absolute greenhouse gas emission cap has been set and the need to comply with it determines the number of emission allowances available to the participants in the system, whereas the number of CBAM certificates will not be limited. Somewhat in consequence of this, the number of certificates in the CBAM will not be determined through their sales at auctions, as is the case in the EU ETS. In order to make sure that the carbon cost in the CBAM corresponds to the cost in the EU ETS, the price of CBAM certificates is to be set with respect to the allowance prices in the EU ETS as paid at auctions;
- **regarding the issue of trade in CBAM certificates,** in contrast to emission allowances, CBAM certificates will not be a tradable financial instrument (it will only be possible to purchase them from the competent authority and, to a limited extent, to resell them to this authority).

10 Proposal, section 1.5.2 of the legislative financial statement.
11 Recital 9 of the preamble to the draft.
12 Thus recital 18 of the preamble to the draft, although at present the ultimate scope of sectors covered by the CBAM is an issue of contention. In accordance with the EC proposal, it could be understood that the CBAM was to cover products from selected sectors at risk of carbon leakage, whereas the Parliament proposes that the CBAM should cover all the products from the sectors covered by the EU ETS.
13 Aviation operations are omitted here, since they are not relevant to the subject matter of the article as not involving the production of goods.

To a large extent, these differences result from legal constraints. As already pointed out, the CBAM mechanism is to apply to goods produced outside the European Union. However (self-evidently), the EU is not competent to establish laws outside the EU; therefore, it could not directly regulate the environmental standards of such production. In contrast, the EU is competent to regulate the rules for the imports of goods into the EU customs territory, so it decided to use this competence indirectly to bring about emission reductions outside the EU by means of this type of solutions. Hence, the assumption of the CBAM mechanism is the imposition of obligations on the importers of goods into the EU in relation to imported goods. At the same time, the limitation of available CBAM certificates (modelled after the limited number of allowances in the ETS) was not possible, since it would mean the imposition of quantitative import limits, which could be considered incompatible with the WTO rules[14]. Therefore, it was decided that the prices of certificates would depend on the allowance prices in the EU ETS, thus also meeting another objective of the CBAM, i.e. ensuring that the producers outside the EU are subject to carbon costs equivalent to the ones borne under the EU ETS by EU producers (creating a level playing field).

The product and territorial coverage of the CBAM

The CBAM mechanism applies to imports of goods (identified on the basis of their classification in the Combined nomenclature) from specific sectors into the customs territory of the EU. The legislative proposal provides that the CBAM should initially cover goods from the sectors: of cement, fertilisers, iron and steel, aluminium and electricity[15]; and the Commission justified this choice by the need to apply a prudent approach[16]. In consequence, the CBAM would cover only the goods the imports of which represent only about 2% of the total imports into the EU[17]. As part of the trilogue, a discussion is underway about the addition, immediately when the CBAM mechanism comes into effect, of products from the chemical sector (including, among others, organic chemicals, hydrogen and ammonia) and polymers (plastics and articles made from plastics) to this list. Gradually, the CBAM will be expanded to include more sectors; however, the ultimate scope of the CBAM is still debated (this is described in detail in the further of the article). Moreover, the CBAM will also apply to products processed from goods covered by the CBAM as resulting from the inward processing procedure. CBAM will be applied to goods imported into the customs territory of the EU, with the exception of goods originating in countries and territories listed in the Annex to the Regulation, subject to derogations due to the fulfillment of the conditions set out in Art. 1 of the Regulation (currently, the derogation covers, among others, EFTA countries).

The situation of importers in relation to the CBAM

Basic obligations under the CBAM will be imposed on importers. Importers which will seek to import goods covered by the CBAM into the EU[18] will have to applied for an authorisation to import those goods and obtain the status of **"authorised declarant"**. It will be extremely important to be granted the status of authorised declarant, since the customs authorities will not allow the

14 This does not mean that no objections concerning the compatibility of the CBAM mechanism have been raised by other countries with respect to the now proposed CBAM design, either. Initial objections concerning the compatibility of the draft with WTO law have been raised by such countries as Russia, Brazil, China, India and RSA. The issue of the compatibility of the draft considered here with the WTO rules is beyond the scope of this article.

15 Annex I to the proposal for the Regulation.

16 Cf. recitals 28 - 37 of the preamble to the Regulation.

17 P. Chase, R. Pinkert, The EU's Triangular Dilemma on Climate and Trade, The German Marshall Fund of the United States, Policy Brief September 2021, p. 7.

18 Exceptions will include imports of goods from third countries and territories fully integrated into, or linked, to the EU ETS, listed in Annex II to the CBAM Regulation (at present, the EFTA countries are listed there).

imports into the EU market of any goods covered by the CBAM, unless they are imported by an authorised declarant[19]. Under the draft regulation, the status of an authorised declarant is granted, if the importer meets legally specified conditions (including among others, no previous criminal record, financial and operational capacity and a registered seat in a Member State; in certain cases, a guarantee will have to be provided)[20]. Such requirements are not new for importers; Article 39 of the Union Customs Code sets similar in type requirements (in the case where an entity seeks to be granted the status of authorised economic operator). It can be expected that the status of authorised declarant will be granted by authorities designated by the Member States, although during the legislative process it was also proposed that this task should be entrusted to the European Commission or a newly established EU authority.

Importers which have already been granted the status of authorised declarant will have to submit each year a **"CBAM declaration"**, containing information on the quantity of goods imported during the calendar year, the total emissions embedded in the goods and the number of CBAM certificates to be surrendered in order to account for their emissions[21]. When calculating the number of certificates which need to surrendered, the reductions may be made to account for the carbon price paid in a country of origin and the free allocation of allowances in the EU ETS. CBAM declarations will be verified by an independent verifier[22].

Importers covered by the CBAM (called "authorised declarants") will have to purchase and surrender CBAM certificates to account for their embedded emissions. They will also be obliged to keep earlier a specific number of CBAM certificates on their accounts[23].

What will be the nature of CBAM certificates?

A CBAM certificate will be a certificate in electronic format corresponding to one tonne of embedded emissions in goods[24]. Thus, in this respect, it will have a form resembling an emission allowance in the EU ETS. However, as already pointed out, in contrast to emission allowances as part of the EU ETS, CBAM certificates will not be financial instruments and it will not be possible either for participants in the CBAM system to trade in them, or for them to be purchased by financial institutions. In the case of the purchase of an excessive number of CBAM certificates, the only allowed form of their disposal will be to request their repurchase by the authority which has sold them, at the price corresponding to the purchase price and to a limited extent[25].

> **In contrast to emission allowances as part of the EU ETS, CBAM certificates will not be financial instruments.**

CBAM certificates will not be formally linked in any way to the allowances in the EU ETS, but their price will reflect the allowance prices reached at auctions; this is expected to ensure that the burdens of the carbon costs of goods imported into the EU customs territory are the same as those of goods pro-

19 Article 25(1) of the draft.
20 Article 17(1) of the draft.
21 Article 6(2) of the draft.
22 Art. 8(1) of the draft.
23 The authorised declarant will be obliged to ensure that at the end of each quarter on his/her account there is the number of CBAM certificates corresponding to at least 80% of the embedded emissions in all goods the declarant have imported since the beginning of the calendar year (Article 22(2) of the draft).
24 Article 3(18) of the draft.
25 Cf. Article 23(2)-(3) of the draft. The number of certificates subject to re-purchase shall be limited to one third of the total CBAM certificates purchased by the authorised declarant during the previous calendar year.

duced in the EU. The price of CBAM certificates will depend on the allowance price reached at auctions in a given week and will be published by the EC[26].

In recent years, the allowance price in the EU ETS has demonstrated a continued uptrend[27]. Since the price of CBAM certificates is expected to depend on the allowance price at auctions, in theory, it would be economically viable to purchase CBAM certificates earlier to use them in a later period when the price of the certificates is likely to be higher. This plan will be feasible in a limited timeframe, since a periodic cancellation of CBAM certificates is foreseen[28].

Obligations of producers from third countries

In the EU ETS, the obligation to report and account for emissions is imposed on the installation operator (i.e. the producer), whereas as part of the CBAM – as indicated above – the basic obligations rest with the importer (the authorised declarant). Formally, the producer of goods (the installation operator) in a third country has no obligations. But, in practice, the importer, too, will have to incur certain burdens, e.g. those resulting from the provision of the importer with specific documents and information needed to define the embedded emissions and those related to the verification processes[29]. Since it is assumed that data on actual emissions[30] will ultimately be reported, such information will have to be made available by the producer of goods. The producer will be able[31] to register itself and its installation in the central database managed by the European Commission. The registration will entail the obligations to determine the embedded emissions by type of goods produced at the installation, to ensure that this information is verified and to keep documents and information. Similarly, it is the producer of goods that will likely have to provide the importers with information and documents needed to reduce the number of certificates to be surrendered in order for the carbon price paid in the country of origin to be taken into account, although, in formal terms, this obligation will rest with the importer[32].

First, the transitional period

In accordance with the EC proposal, the transitional period of the CBAM was expected to begin already from 2023 and last until the end of 2025. It is most likely that it will have to begin later, since the current state of work indicates that it will be difficult to begin the transitional period at that time. In the transitional period, there will be no obligation to account for embedded emissions. In turn, reporting obligations are foreseen (probably simplified ones), to be imposed on declarants lodging a customs declaration for release for free circulation that import goods into the EU customs territory. Declarants will be obliged to submit, for each quarter of a calendar year, a report on goods imported in a given quarter of the year[33]. The report should contain information on the quantity

26 The price of CBAM certificates is to be calculated by the EC as the average price of the closing prices of EU ETS allowances on the common auction platform in accordance with the procedures laid down in Commission Regulation (EU) No 1031/2010 for each calendar week (Article 21(1) of the draft).

27 Cf. e.g. Chart 4. Daily closing prices for EAU transactions on the spot market in the period from 2008 to 2022 [in EUR], Raport z rynku CO_2 [Report on the carbon market – in Polish], Nr 124/2022 r., p. 23, which indicates a continued uptrend in emission allowance prices. The Report is available at the address: https://www.kobize.pl/pl/file/2022/id/179/raport-z-rynku-co$_2$-lipiec-2022 (Accessed on 30 September 2022).

28 By 30 June of each year, any CBAM certificates that were purchased during the year before the previous calendar year will be cancelled (Article 24 of the draft). Thus, if the authorised declarant purchased CBAM certificates in the year n, they will be subject to cancellation by 30 June of the year n+2; hence, they will be valid for about two years (±6 months, depending on the month of the year n in they were purchased).

29 C. Kardish, T. Wildgrube, Carbon Border Adjustment Mechanism. Administrative structure and implementation challenges, Climate change 21/2022, published at the address: https://www.umweltbundesamt.de/publikationen/carbon-border-adjustment-mechanism (Accessed on 18 August 2022), p. 13.

30 I.e. the emissions calculated based on primary data from the production processes of goods (Article 3(22) of the draft); cf. also section 2 of the proposal.

31 Cf. Article 10 of the draft.

32 Cf. Article 9(2) of the draft.

33 Article 35(1) of the draft.

of goods, specified per installation in the country of origin, the actual total embedded emissions, the actual total embedded indirect emissions and the carbon price due in a country of origin for the embedded emissions in the imported goods[34]. The purpose of the collection of this information is not only to prepare the entities covered by the CBAM to implement relevant reporting obligations, but also to enable such preparations on the part of the EU authorities and the Member States.

Issues of contention in the legislative process

At this stage of legislative work, quite many unknowns still remain regarding the operating model of the CBAM. The major issues of contention include the ultimate scope of the sectors covered by the CBAM, the time schedule for the phase out of free allowances in the EU ETS in the context of the implementation of the CBAM, the scope of emissions to be accounted for and the administration of the CBAM.

As pointed out above, the ultimate scope of the sectors covered by the CBAM was initially to be limited to several sectors and gradually expanded.

> **The ultimate objective scope of the CBAM has not been decided yet.**

The ultimate objective scope of the CBAM has not been decided yet. In particular, it is not clear whether it will be limited to sectors officially recognised in the EU ETS to be at risk of carbon leakage[35]. Although the Commission does not explicitly limit the CBAM to these sectors only, still it has treated the risk of carbon leakage as one of the major criteria determining the scope of the CBAM. Moreover, the CBAM is expected to provide an alternative to the instruments which address the risk of carbon leakage. In turn, the position of the Parliament was that the CBAM Regulation should already now provide that the mechanism would cover downstream products and all the products from the EU ETS sectors and that this should be completed by 01.01.2030 in accordance with the time schedule defined by the Commission. It is only pursuant to the guidelines which the Parliament formulated in its amendment that the Commission would prioritise goods related to the highest risk of carbon leakage and those most carbon-intensive.

The relation between the CBAM and the free allocation of allowances. The introduction of the CBAM is to be correlated with a gradual phaseout of free allowances allocated as part of the EU ETS. Therefore, this issue is strictly related to the CBAM, although, formally, it is not addressed by the draft CBAM Regulation, but by the legislative proposal for amendments to the EU ETS Directive[36]. In the course of the legislative work, the issues of contention included not only the pace at which the free allocation should be phased out in the EU ETS, but also whether it should start as soon as the CBAM would come into effect, or only after some time from its introduction following an impact assessment. Finally, all the institutions supported the phaseout of the free allocation of allowances immediately as the mechanism would come into effect, but they had different positions on the time schedule of the phaseout.

34 Article 35(2) of the draft.

35 Determined in Commission Delegated Decision (EU) 2019/708 of 15 February 2019 supplementing Directive 2003/87/EC of the European Parliament and of the Council concerning the determination of sectors and subsectors deemed at risk of carbon leakage for the period 2021 to 2030.

36 These issues are regulated in another legislative proposal submitted as part of the Fit for55 package, i.e. Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union, Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading scheme and Regulation (EU) 2015/757 (COM(2021) 551 final); https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0551 (Accessed on 1 September 2022).

The scope of emissions to be accounted for. Under the EC proposal, the CBAM was initially to cover the emissions generated during the production of goods covered by the CBAM[37]. In contrast, the emissions from the production of electricity, heating and cooling, which is consumed during the production processes[38] were possibly to be covered by the mechanism only after the completion of the transitional period and on the basis of a further assessment of the operation of the CBAM mechanism[39]. Thus, the obligation to account for emissions would be more limited than in the EU ETS. Both of the institutions participating in the legislative procedure supported an expansion of the scope of embedded emissions to be accounted for immediately as the mechanism would come into effect. The Council of the EU wants the CBAM to cover as well as emissions from the production of the heating and cooling used for the production process (irrespective of where they are produced) and emissions from the production of electricity, but only within the boundaries of the installation producing the goods[40]. Therefore, the Council wants the mechanism not to cover initially emissions from the production of electricity outside the boundaries of the installation producing the goods. It is important to point out that this approach leads to a different treatment of emissions from the production of electricity, depending on where it is produced. In turn, the European Parliament wants the CBAM to cover both emissions from the production of the heating and cooling and emissions from the production of electricity consumed in the production of goods[41]. It follows from the above that the Parliament wants the mechanism to cover a wider scope of emissions than the Council of the EU does immediately as the mechanism comes into effect and a much wider one that the European Commission has proposed.

The administration of the CBAM. In its legislative proposal, the EC proposed that the main duties related to the mechanism, including such duties as the granting and withdrawal of authorisations to importers, the verification of CBAM declarations and the sales and repurchase of CBAM certificates, should be carried out by the authorities of the Member States. The European Parliament took a completely different position, shifting the fulfilment of all these duties to an EU-wide CBAM authority specifically established for this purpose. However, it can be expected that, as a result of inter-institutional consultations, these duties will continue to be discharged by the authorities of the Member States, with the Commission playing an important role by providing (broadly understood) guidelines on their fulfilment and by managing a central platform, hosting transactions on CBAM certificates.

The effects of the CBAM. What can go wrong?

It should be pointed out that many analyses indicate the positive effects of the implementation of the CBAM in the EU Member States, among others, the report "The effects of the implementation of the border tax adjustment in the context of more stringent EU climate policy until 2030" by the Centre for Climate and Energy Analyses."[42]. This report indicated that the implementation of the border adjustment tax would contribute to reducing global emissions. Moreover, it can bring positive economic effects by strengthe-

37 Defined by the EC as direct emissions.
38 Defined by the EC as indirect emissions.
39 Recital 17 and recital 34 in fine of the preamble, and Article 3(16) of the EC proposal.
40 Article 3(15) of the draft adopted by the Council in the general approach.
41 Cf. Article 3(28) in conjunction with Article 3(15) and (16) of the draft adopted by the EP in the first reading.
42 Pyrka M., Boratyński J., Tobiasz I., Jeszke R., Sekuła M. (2020). The effects of the implementation of the border tax adjustment in the context of more stringent EU climate policy until 2030, Institute of Environmental Protection - National Research Institute / National Centre for Emissions Management (KOBiZE), Warsaw.

ning the position of the sectors which incur the highest costs of their participation in the EU ETS (energy-intensive and highly carbon-intensive industrial sectors). In addition, according to the cited report, the implementation of the CBAM will enhance the intensity of the trade among the Member States and increase the production for the internal markets, while at the same time reducing imports from the regions outside the EU. In consequence, this will strengthen the resilience of the EU economy to the impacts of global crises, particularly in the context of disruptions of the supply chain of goods to the EU, to be seen e.g. during the last crisis caused by the COVID-19 pandemic[43].

However, critical comments are also voiced, indicating the possible dysfunctions or shortcomings of the CBAM mechanisms. Several challenges facing this mechanism are presented below. They concern both the problems resulting from the limitations intrinsic to the operating rules of the CBAM and the expected difficulties in ensuring that the CBAM achieves some of the objectives which have been set for it.

Firstly, it is pointed out that the CBAM architecture does not fully correspond to the declared objectives which this mechanism is expected to achieve[44]. Given that the primary purpose of the CBAM is to prevent carbon leakage, the border price adjustments should also be applied to the exports of EU goods (rather than only to the imports of goods into the EU customs territory), consisting in compensating for the costs under the EU ETS so as to ensure that EU goods can compete on an equal basis on the non-EU markets, too[45]. In its proposal, the Commission did not include these adjustments, explaining it by environmental considerations; however, this is not considered to be fully understandable[46]. It should be borne in mind that the introduction of the CBAM is to be correlated with the phaseout of free allowances in the EU ETS. If the CBAM ensures worse protection against carbon leakage than the instruments now applied, then its main declared objective will not be achieved.

Introduction of the CBAM is to be correlated with the phaseout of free allowances in the EU ETS. If the CBAM ensures worse protection against carbon leakage than the instruments now applied, then its main declared objective will not be achieved.

Another source of the problems in preventing carbon leakage is related to processed products using a product covered by the CBAM (so-called downstream products). The legislative proposal indicates that the CBAM focuses on base materials and offers no incentives to reduce carbon leakage in the sectors of complex products using these materials[47]. This can generate the problem of carbon leakage in the sectors which use the materials covered by the CBAM in their production. Citing the example given by G. Kolev, e.g. the automotive sector can be referred to, as in its production this sector uses steel which is to be covered by the CBAM. Producers in the automotive sector outside the EU will be able to buy steel at much lower costs than EU producers. In light of this, EU producers will be in a worse competitive position. G. Kolev concludes that, in consequence,

43 Szczepański K., Pyrka M., Jeszke R.(2021). Podatek graniczny od emisji GHG jako narzędzie polityki klimatycznej UE i ochrony rynku wspólnotowego, Współczesne uwarunkowania i dylematy polityki gospodarczej (A GHG border tax as the EU climate policy tool and protection of the internal market [in:] Contemporary challenges and dilemmas of economic policy – in Polish), Toruń.

44 A. Pirlot, Carbon Border.... op. cit., pp. 47-48.

45 Ibidem, pp 43-44.

46 Ibidem, p. 44.

47 G. Kolev, Carbon Border Adjustment and Other Trade Policy Approaches for Climate Protection, Intereconomics 6/2021, p. 312.

in combination with the foreseen phaseout of free allowances, the CBAM will cause a tendency for carbon leakage to shift to the downstream sectors – specifically, on the part of those producers in the sectors not covered by the CBAM that purchase materials or intermediate products from the sectors covered by the CBAM. The European Parliament has proposed amendments intended to ensure a wider coverage of downstream products. The European Parliament wants the Commission to complement, by way of a delegated act, the products covered by the CBAM with downstream products containing a significant share of products covered by the CBAM in 3 years from the adoption of the draft Regulation.

An essential difficulty which can be expected during the operation of the mechanism is the difficulty in verifying data and documents presented by importers and producers. The draft CBAM Regulation provides that emissions embedded in goods other than electricity can be determined by taking into account actual emissions and that default values will be used only when data on the emissions cannot be appropriately provided by importers (authorised declarants which will have to receive these data from producers). Such a solution is expected to provide an incentive to reduce CO_2 emissions, as a producer using less carbon-intensive technologies will be able to demonstrate that the actual emissions are lower than their default values, thereby reducing the emissions to be accounted for in relation to the goods which the producer exports. However, already now opinions are voiced that this solution can be abused, particularly when one producer has several installations with different emission factors or in the countries with state-controlled enterprises (e.g. in China). Without access to transparent documentation on the production process, it will be difficult to assess the declared data[48]. An analogous problem may concern a reduction in the number of certificates to be surrendered due to the payment of a carbon price in the country of origin. Abuse can be related to both whether the price paid in the country of origin was really a carbon price and whether it was actually paid and not compensated for.

Preventing attempts to circumvent the CBAM mechanism will also be a challenge. The attempts can take various forms. It can be expected that attempts will be made to replace goods covered by the CBAM with slightly modified goods or to restructure the processes of production, sales or goods shipment in order to avoid or reduce the obligation to account for them.

Apart from those described above, other potential problematic areas have been indicated, including e.g. the problems with recognising the compatibility of this mechanism with WTO law[49] and the possible trade wars with other countries (initial objections regarding the compatibility of the CBAM with WTO law have been voiced, among others, by China, India, Russia, Brazil and RSA); or the economic effects in the form of changes in the structure of international trade and the related loss of part of revenues from this trade, particularly in the case of the least developed countries[50], which subsequently can translate

48 Ibidem, p. 313.

49 For more on this issue, cf. e.g. P. Chase, R. Pinkert, The EU's Triangular Dilemma… op.cit.; J. Bacchus, Legal Issues with the European Carbon Border Adjustment Mechanism, CATO Briefing Paper, No. 125/2021; https://www.cato.org/sites/cato.org/files/2021-08/briefing-paper-125.pdf (Accessed on 30 September 2022); C. Emerson, S. Moritsch, Making Carbon Border Adjustment proposals WTO-compliant; https://assets.kpmg/content/dam/kpmg/xx/pdf/2021/03/making-carbon-border-adjustment-proposals-wto-compliance.pdf; (Accessed on 30 September 2022).

50 It is pointed out that the exposure of non-EU countries to risks posed by the CBAM is uneven, since part of the countries (the countries of the Global South and the Eastern European countries which are outside the EU) are more vulnerable to these risks, among others, due to the scale of their exports to the EU or their difficulties in adjusting to the new conditions created by the CBAM by changing the trade structure or decarbonisation (L. Eicke, S. Weko, M. Apargi, A. Martin, Pulling up the carbon ladder? Decarbonization, dependence, and third-country risks from the European carbon border adjustment mechanism, Energy Research & Social Science 80 (2021)). Given that the least developed countries usually have less effective technologies in terms of CO_2 emission reductions, the CBAM is likely to cause a decline in the exports from the developing countries and their increase in the developed countries. Although this is consistent with the environmental objective (lower CO_2 emissions), it poses a threat to the economic growth of the least developed countries. Cf. e.g. G. Kolev, Carbon Border… op.cit., pp. 313-314, and the analyses cited there.

into difficulties in decarbonisation in these countries due to a shortage of financial resources.

Conclusion

The EU institutions have high hopes for the CBAM mechanism, considering it to be a remedy to the problems which have long accompanied EU climate policy. However, just as a large role is already now assigned to the CBAM in the implementation of the objectives of EU climate policy, so equally large challenges will be faced in the introduction and management of this mechanism – resulting from both the very nature of the obligations imposed by it (e.g. the difficulties in verifying data) and those external to the mechanism (mainly of a political nature). This causes a heated debate about the detailed shape of the mechanism, where the particular institutions participating in the legislative process still continue to take different positions on essential issues.

Without depreciating the importance of a correct design of the mechanism right from the start of its operation, we should be mindful of the planned expansion of the mechanism, in terms of both its objective scope and the emissions to be accounted for. It is important to watch the discussion underway as part, and on the occasion, of the legislative process, since it is likely that we are seeing the emergence of another climate policy pillar in addition to the EU ETS. Time will show if the CBAM mechanism fulfils the hopes vested in it.

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The role of public transport in Poland's efforts to achieve climate neutrality

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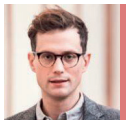

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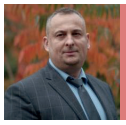

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Abstract:

The discussions on the achievement of ambitious climate objectives which the Member States of the European Union (EU27) have set out to achieve by 2050 address many economic aspects. One of the main challenges in their efforts to achieve climate neutrality is decarbonisation of both the passenger and freight transport sectors. The Fit for 55 package proposed by the European Commission includes, among others, a ban on the sale of internal combustion engine passenger cars from 2035. In Poland, in recent years the use of individual means of transport (passenger cars) has noticeably grown in contrast to public transport (buses and railways). This causes problems related to both air pollution and traffic congestion in cities. In response to these problems and challenges, this article presents the possible pathways for the development of passenger transport, with special attention paid to the role of public transport. It addresses the aspects related to changes in passenger activity and the development of the zero-emission bus fleet, as well as the related costs, energy demand and CO_2 emission reductions. The results of the simulations which have been carried out indicate that the promotion of public transport can result in a shift of about 20 billion passenger-kilometres of transport activity from individual transport to collective one. This will contribute to reducing CO_2 emissions in 2050 by additional 1.9 million tonnes. On the other hand, the electrification of passenger transport will cause an increase in electricity demand by as much as 34 TWh in 2050. The results presented here were obtained for two analytical scenarios which were designed for the purposes of the report by the CAKE/KOBIZE entitled "Polska net –zero 2050: Rola transportu publicznego w świetle pakietu „Fit for 55" i perspektywy roku 2050"[1] (Poland net-zero 2050. The role of public transport in the context of the "Fit for 55"package to 2050).

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Introduction

In March 2020, the European Commission adopted the package entitled the European Green Deal, which set the goal for the European Union to achieve climate neutrality by the middle of this century[2]. The Fit for 55 package is part of the Deal. It is expected to assist in achieving neutrality by laying down the reduction targets for the end of this decade and presenting the ways of reaching this goal. This package sets out much more ambitious reduction targets in the timeframe of the nearest decade. In accordance with the package, the European Union should reduce its emissions

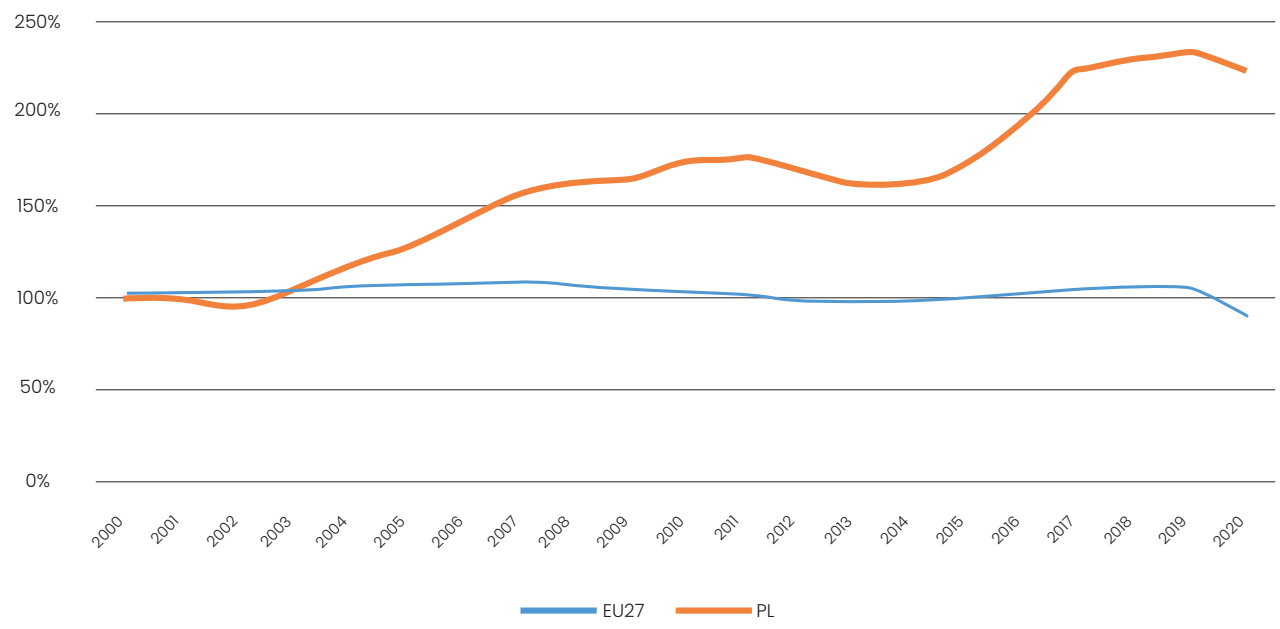
2 https://eur-lex.europa.eu/resource.html?uri=cellar:b828d165-1c22-11ea-8c1f-01aa75ed71a1.0002.02/DOC_1&format=PDF (Accessed on 31 August 2022).

by 55% compared with 1990, which represents a higher ambition by 15 pp than the one under the previous legislation laid down in the 2030 Climate and Energy Policy Framework adopted in 2014[3]. Such ambitious targets put the EU at the forefront of the fight against climate change.

The transport sector is problematic inasmuch as its emissions at the level of the European Union as a whole remain at practically the same level as in 2000, whereas in Poland these emissions have grown by almost 150%, as shown in Chart 1. In Poland, there has been quite a strong increase in passenger and freight transport activities, along with a moderate increase in their emission factors per unit of activity. In turn, at the level of the European Union as a whole, the increase in the activity has been offset by a decline in the emission factor. The actions taken to date have failed to decarbonise this sector, while it has proved possible to attain significant emissions reductions in the energy and buildings sectors or industry. Moreover, as projected by the European Commission, in the EU in the timeframe until 2050 passenger transport activity will rise by an additional 42% and freight activity will increase by 60%, while even higher increases are expected in Poland[4]. In light of this, transport is now one of the main obstacles on the pathway towards achieving climate neutrality.

The challenges facing the Polish transport sector are demonstrated by emissions which have grown since 1990. In recent years, a continued increase of the share of individual transport in passenger activity has been seen; this is enhanced by the fact that the offer of collective transport has not improved. Chart 2 shows that in recent

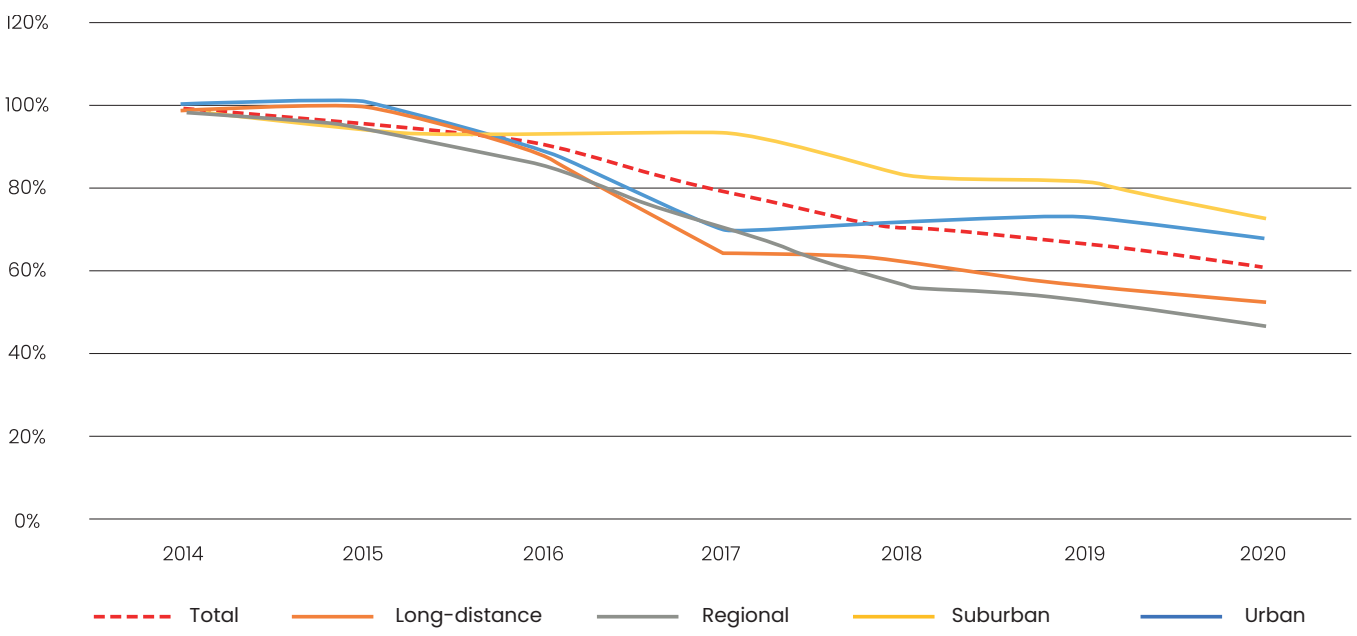
CHART 1. CO_2 EMISSIONS IN THE PASSENGER AND FREIGHT TRANSPORT SECTORS IN POLAND AND THE EUROPEAN UNION (2000 = 100%).



Source: Own calculations by CAKE/KOBiZE using the database env_air_gge, Eurostat. [Accessed on 05 September 2022]

3 https://data.consilium.europa.eu/doc/document/ST-169-2014-INIT/en/pdf.
4 https://publications.jrc.ec.europa.eu/repository/handle/JRC118353 (Accessed on 31 August 2022).

CHART 2. DOMESTIC LINES OF THE REGULAR BUS TRANSPORT IN POLAND IN KILOMETRES (2014 = 100%).



Source: Own calculations by CAKE/KOBiZE based on data from the Local Data Bank, GUS. Note: Urban lines do not include urban transport. [Accessed on 05 September 09.2022]

years the length of the regular bus transport lines, expressed in km, has decreased by almost 40% and a description of a deteriorating situation of the Polish railways can be found in Karol Trammer's book "Ostre cięcie" [A Sharp Cut – in Polish][5]. At present, individual transport (passenger cars) in Poland represents more than 75% of the whole transport activity, while the remaining part consists of railway and bus transport. Individual transport is much more emission intensive that the collective one and the roads in Poland are increasingly congested; traffic jams emerge when their design capacity is exceeded. This additionally contributes to a high level of air pollution and causes huge economic losses, which are estimated by the European Court of Auditors at EUR 270 billion[6] at the scale of the EU as a whole. One of the ways of reversing this trend is to adopt measures which promote public transport.

The European Commission proposes three priority areas where emission reductions can be achieved in the transport sector[7]. They include: (a) increasing the efficiency of the transport system by encouraging the shift to lower emission transport modes, (b) speeding up the deployment of low-emission energy sources and (c) moving towards zero-emission vehicles. It seems that, given the still high prices of low-emission vehicles relative to the average incomes in Poland, giving priority to wide support for public transport in Poland can be the right solution.

A number of additional arguments advocate for public transport. The popularisation of public transport, even without a shift to low-emission vehicles, does not translate directly (proportionally) into higher emissions. For example, at present the average trainload is 120 passengers per train; therefore, it is possible to improve the trans-

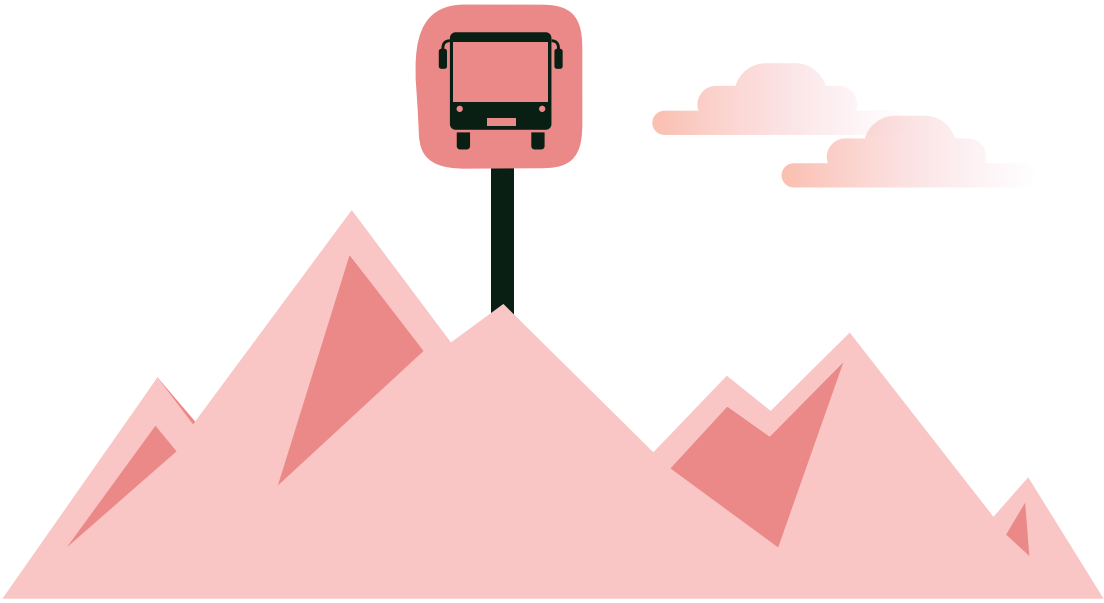
5 Trammer Karol, Ostre cięcie. Jak niszczono polską kolej [A Sharp CUT. How Polish Railways Have Been Destroyed – in Polish]. Krytyka Polityczna, Warsaw, 2019.
6 https://www.eca.europa.eu/Lists/ECADocuments/SR20_06/SR_Sustainable_Urban_Mobility_EN.pdf [Accessed on 31 August 2022]
7 https://ec.europa.eu/clima/eu-action/transport-emissions_en [Accessed on 31 August 2022]

port performance without significantly increasing emissions. CO_2 emissions are significantly reduced by increasing the number of persons travelling on this means of transport, since it has a low emission factor per passenger-kilometre (pkm).

Collective transport can play a significant role in achieving climate neutrality, particularly in the context of big cities and urban agglomerations. The transport emissions in cities should be reduced in a sustainable manner. Transport services should meet the inhabitants' expectations and be attractively priced, thus encouraging them to shift away from private means of transport in favour of urban transport.

In addition, the use of zero-emission technologies in collective transport will translate to a substantial extent into the improvement of air quality in cities. The achievement of these outcomes requires support for local governments and collective transport organisers for purchases of zero-emission (electric and hydrogen powered) vehicles and the expansion of infrastructure (charging stations, hydrogen refuelling stations) and the implementation of additional measures to promote public transport and to enhance the attractiveness of this mode of transport, among others, by reducing ticket prices or introducing free travels. Such solutions are increasingly often introduced in Europe[8].

In Poland, one of the responses to these challenges is the Green Public Transport Programme launched by the NFOŚiGW[9]. This Programme provides for co-financing for purchases of zero-emission buses and the construction of necessary infrastructure. In 2021, 2 calls for applications for co-financing were announced, while the foreseen budget of the Programme is about PLN 1.3 billion.



8 DW.com, Transport lokalny w Europie: wzrasta liczba darmowych biletów [Local transport in Europe: The number of free tickets is growing – in Polish]. https://www.dw.com/pl/transport-lokalny-w-europie-wzrasta-liczba-darmowych-biletów /a-62038927 [Accessed on 31 August 2022]

9 NFOŚiGW, Green Public Transport. https://www.gov.pl/web/nfosigw/zielony-transport-publiczny-faza-i-2021 [Accessed on 28 June 2022]

> The draft Polish Hydrogen Strategy provides that 500 hydrogen-powered buses are to be registered in Poland by 2025, while by 2030 their number is to grow to 2,000 vehicles with hydrogen fuel cells.

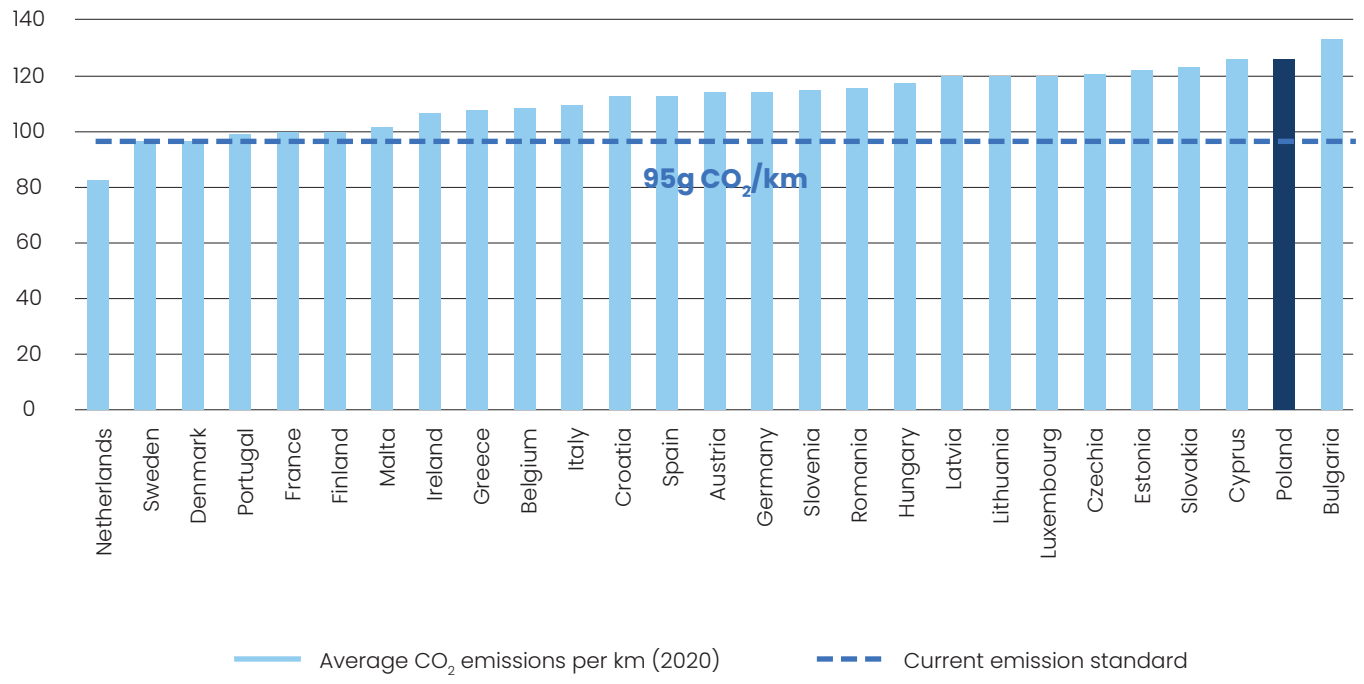
The draft Polish Hydrogen Strategy provides that 500 hydrogen-powered buses are to be registered in Poland by 2025, while by 2030 their number is to grow to 2,000 vehicles with hydrogen fuel cells[10]. In addition to electric buses, the use of hydrogen powered vehicles in public transport will contribute to achieving low-emission mobility targets set out in the Sustainable and Smart Mobility Strategy of the European Commission and the PEP2040[11]. From 2025, cities with more than 100,000 inhabitants will also be obliged to purchase only zero-emission vehicles so as ensure that by 2030 the public transport fleet is zero-emission.

Consequences of the Fit for 55 package

The strengthening of the standards for average CO_2 emissions from new passenger cars

The proposals put forward in the Fit for 55 package provide that the CO_2 emission standards will be reduced in 2030 compared with 2021 by 55% for new passenger cars and by 50% for new light commercial vehicles. It is assumed that in 2035 passenger cars and light commercial vehicles will have zero average emissions. This means that it will be possible to buy only electric and hydrogen powered vehicles. As of the end of 2020, only in three of the 27 EU Member States the average emissions from newly sold passenger cars met the existing standards (95g CO_2/km). In this ranking, Poland took the second to last place. This results from a low share of new zero-emission vehicles in the sales of passenger cars because of their purchase cost and the insufficiently develo-

CHART 3. AVERAGE CO_2 EMISSIONS PER KM FROM NEW PASSENGER CARS IN THE EU27 MEMBER STATES IN 2020



Source: Eurostat - http://appsso.eurostat.ec.europa.eu/nui/show.do [Accessed on 14 July 2022]

10 Ministry of Climate and Environment, The Polish Hydrogen Strategy until 2030 with an Outlook until 2040, Warsaw 2021.
11 Ministry of Climate and Environment, The Energy Policy of Poland until 2040 - PEP2040, Warsaw 2021.

ped infrastructure (recharging stations or hydrogen refuelling stations).

Extension of the emissions trading system to road transport and buildings – the BRT ETS system

The Fit for 55 package provides that a new emission allowance trading system will be established for the sectors of buildings and road transport (BRT ETS). Just as the EU ETS now in place, the aim of the new system is to ensure that a specified emission reduction target is achieved in the sectors it covers. Given a large number of small entities in the sectors of buildings and road transport in the new system, it will regulate the consumption of fuels used for combustion in these sectors, while the obligation to account for the emissions will be imposed on fuel distributors. In light of this, the new emission allowance trading system will cover fuels in the in the sectors of buildings and road transport, in particular:

•In road transport (excluding the use of agricultural vehicles on paved roads),

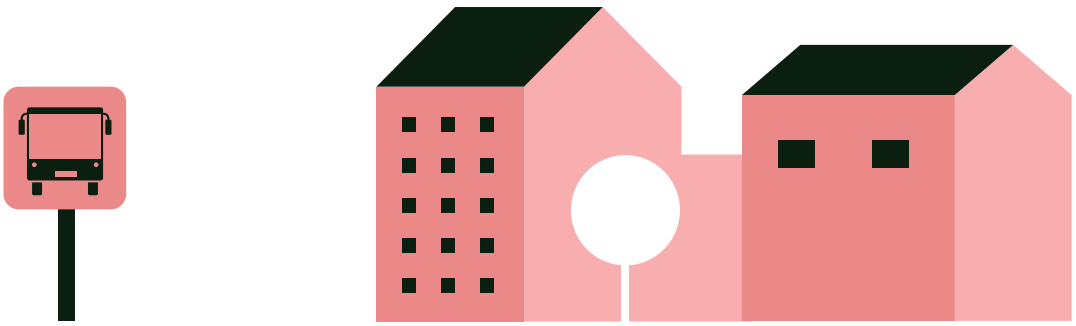
•emissions from combustion of fuels in commercial and institutional buildings,

•all the emissions from combustion of fuels in households, heat plants and combined heat and power plants (so far excluded from the EU ETS).

It can be difficult to achieve the targets set in the Fit for 55 package without adequate development of, and support for, public transport. A quick switch from internal combustion engine (ICE) vehicles to zero-emission vehicles (ZEVs) may turn out to be infeasible for many social groups in light of their high purchase costs or insufficient charging infrastructure and may lead to transport exclusion. Well-organised and cheap public transport can to a substantial extent contribute to changing consumers' preferences and shifting a considerable part of passenger activity from passenger cars to buses and railways (including the metro and tramways).

Climate neutrality scenarios taking into account the legislation in the Fit for 55 package

The report "Poland net-zero 2050. The role of public transport in the context of the "Fit for 55" package to 2050" published by the CAKE/KOBiZE presented analyses of the possible development pathways for passenger transport in Poland. In response to the challenges posed by the new legislation imposing a ban on the sales of internal combustion engine passenger cars from 2035, two analytical scenarios were compared:



•NEU_55 – assuming the achievement of the targets of the Fit for 55 package by 2030, the achievement of a 90% emission reduction in 2050 vs. 1990 in the long term and net-zero emissions including the land use, land-use change and forestry sector (LULUCF). The transport sector will be covered by the BRT ETS emissions trading system. In addition, a ban on the sales of internal combustion engine passenger cars will be imposed from 2035.

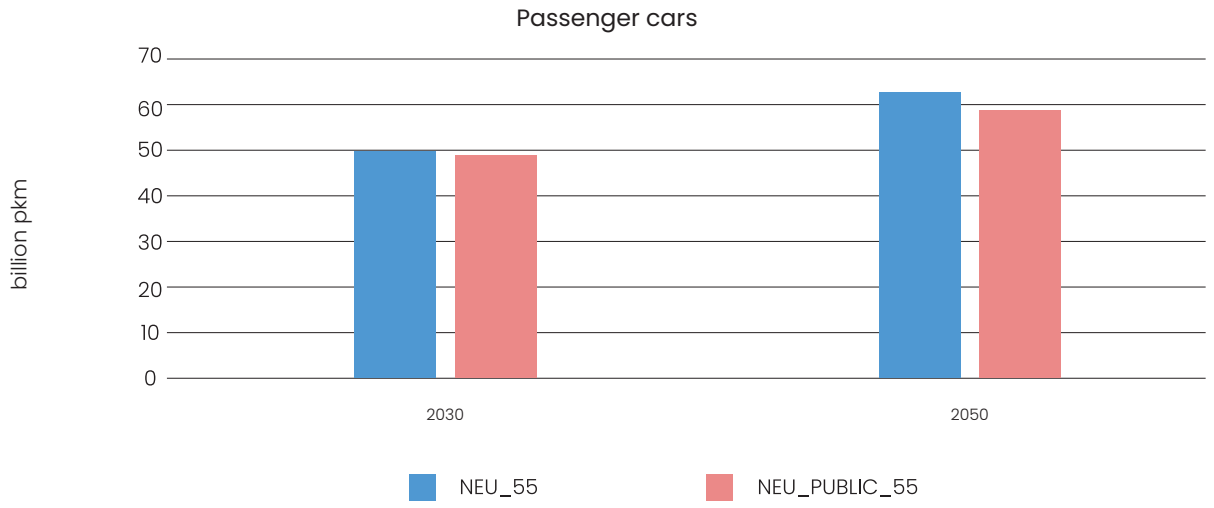
•NEU_PUBLIC_55 – a scenario including all the elements of the NEU_55 scenario and, in addition, the promotion and dynamic development of collective transport.

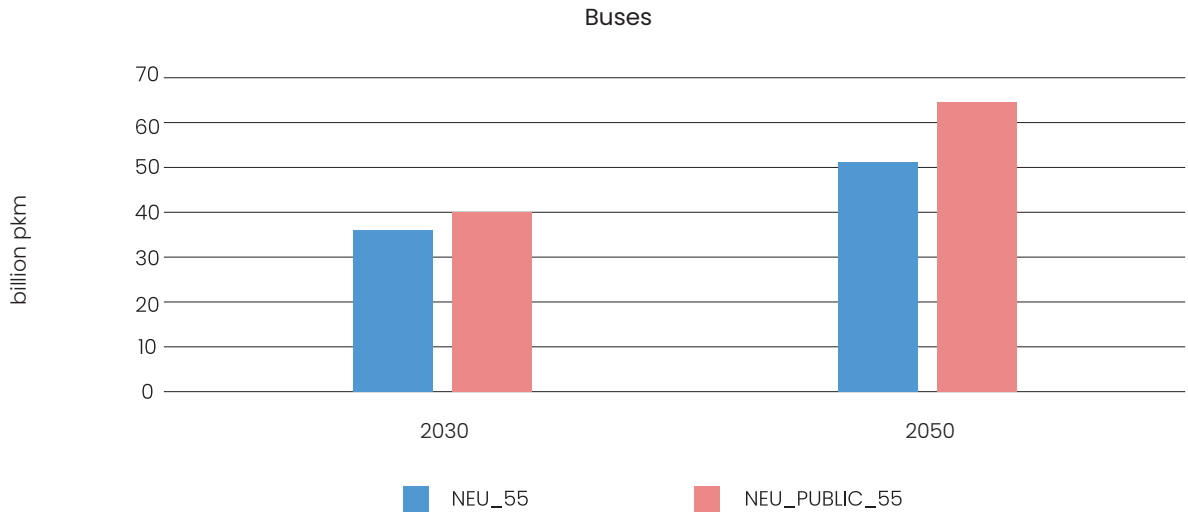
A comparison of the results obtained in the two scenarios indicates the role which public transport can play in Poland's efforts to achieve climate neutrality.

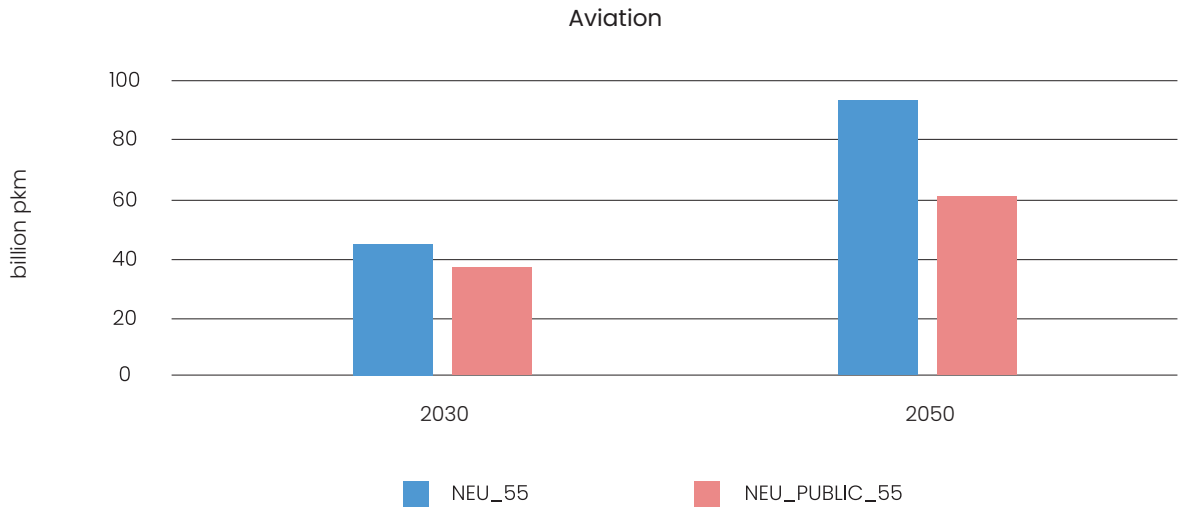
Activity changes in passenger transport

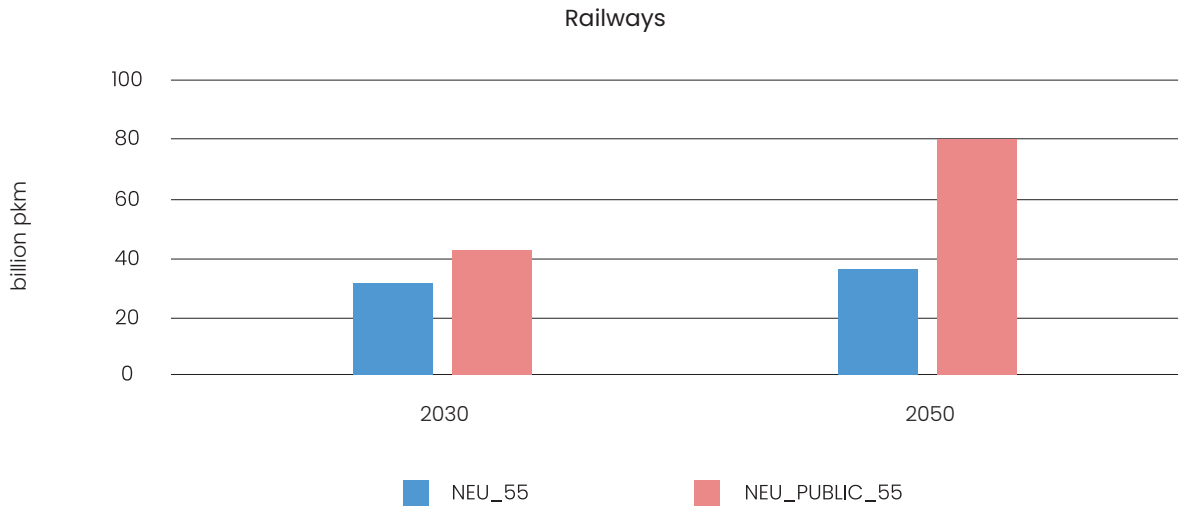
In Poland, passenger transport is dominated by individual means of transport, mainly passenger cars. This creates problems related to both CO_2 emissions, air pollution and high congestion in cities. The scenario including only the imposition of a ban on the sales of cars with ICE engines from 2035 shows no noticeable change in the consumers' preferences for the choice of the means of transport. Unless the offer of public transport is clearly improved, the situation can emerge where Poles will continue to mainly use individual transport, which will be more expensive than to date, in light of the shift to zero-emission (electric and hydrogen powered) cars, while part of society without sufficient income to buy these vehicles may be affected by transport exclusion.

CHART 4. TRANSPORT ACTIVITY IN POLAND IN 2030 AND 2050 (THE NEU_55 SCENARIO VS. THE NEU_PUBLIC_55 SCENARIO)









Source: Own elaboration by CAKE/KOBiZE

> The NEU_PUBLIC_55 scenario shows a growing role of public transport, particularly railways. The promotion of public transport will cause the shift of a substantial part (about 20 billion pkm) of passenger activity from individual transport (passenger cars) to public transport (buses and railways).

The NEU_PUBLIC_55 scenario shows a growing role of public transport, particularly railways. The promotion of public transport will cause the shift of a substantial part (about 20 billion pkm) of passenger activity from individual transport (passenger cars) to public transport (buses and railways). The promotion of public transport has the additional advantage as it contributes to the replacement of air travels (domestic flights and those within the EU) by railways.

The promotion of public transport and a ban on the sale of internal combustion engine passenger cars considered in the NEU_PUBLIC_55 scenario will have a positive effect on the adopted climate targets. An efficient and attractively priced public transport will contribute to changing the consumers' preferences. Higher operating costs of internal combustion engine passenger cars and current high costs of the purchases of electric and hydrogen powered vehicles should encourage the resignation from using private means of transport in favour of public transport. In addition to the expected emission reductions, it will also contribute to diminishing traffic intensity in cities.

CO_2 emission reductions

In the future, changes in passenger activity will translate into CO_2 emission reductions in transport. As a result of the simultaneous promotion of public transport and the imposition of a ban on the sales of internal combustion engine passenger cars from 2035, it will be possible to achieve a reduction of about 74% in the CO_2 emissions in 2050 compared with 2020 levels. The other emissions from passenger transport will remain at a level of about 8 Mt and their main sources will include internal combustion engine passenger cars in continued use and air transport.

> As a result of the simultaneous promotion of public transport and the imposition of a ban on the sales of internal combustion engine passenger cars from 2035, it will be possible to achieve a reduction of about 74% in the CO_2 emissions in 2050 compared with 2020 levels.

The implementation of the scenario including only a ban on the sales of internal combustion engine vehicles will lead to lower reductions by 2050, as a result of the diminished use of public transport (particularly railways). However, the absence of regulatory measures poses the risk that internal combustion engine vehicles will continue to dominate on the part of both consumers and producers. In light of this, it should be assumed that the optimum solution will consist of both the adoption of relevant legal constraints on the sales or manufacture of internal combustion engine vehicles and the promotion of public transport.

TABLE 1. EMISSION LEVELS AND CHANGES IN EMISSION LEVELS IN POLAND ACCORDING TO THE SCENARIOS ANALYSED IN 2030 AND 2050 COMPARED WITH 2020 LEVELS

		2030	2050
Emissions – passenger transport (Mt CO_2)	NEU_55	27,4	10,1
	NEU_PUBLIC_55	26,8	8,2
Change in CO_2 emission levels compared with 2020 levels – passenger transport	NEU_55	-11%	-67%
	NEU_PUBLIC_55	-13%	-74%

Source: Own elaboration by CAKE/KOBiZE

Development of collective road transport

The development of collective transport will entail an increase in the number of buses, particularly electric and hydrogen powered ones. In the scenario including the promotion of public transport, the share of zero-emission buses in the fleet will reach about 10% in 2030 and mainly occur in urban transport. This is consistent with the target set in the PEP2040 for the zero-emission bus fleet in urban transport by 2030.

As the zero-emission technologies develop, it will also be possible to use electric and hydrogen powered buses on longer distances, too. In 2040, their share will grow to about 40% and in 2050 to more than 70%. It will not be possible to completely move away from internal combustion engine buses by 2050 in light of the growing passenger activity and their wide use, particularly in inter-city or international travels.

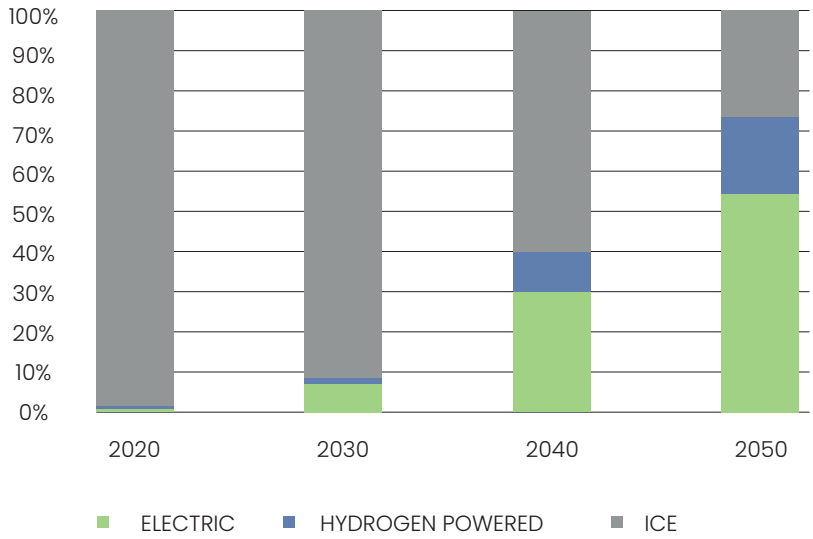
Demand for electricity and hydrogen

Both the wide use of zero-emission passenger cars and the development of public transport will generate additional demand for electricity and hydrogen. By 2030 the demand for electricity in passenger transport will grow to 7-8 TWh.

This will result from a higher number of passenger cars and increased activity in collective transport (railways and buses). In 2050, the electricity consumption in the passenger transport sector can reach about 34 TWh (about 10% of the electricity demand in Poland). More than 75% of electricity will be consumed by passenger cars. In turn, the electricity consumption by railways will grow triple in the period from 2020 to 2050.

> By 2030 the demand for electricity in passenger transport will grow to 7-8 TWh.

CHART 5. THE STRUCTURE OF THE BUS FLEET IN POLAND IN THE PERIOD FROM 2020 TO 2050 BY DRIVE TYPE IN THE NEU_PUBLIC_55 SCENARIO



Source: Own elaboration by CAKE/KOBiZE

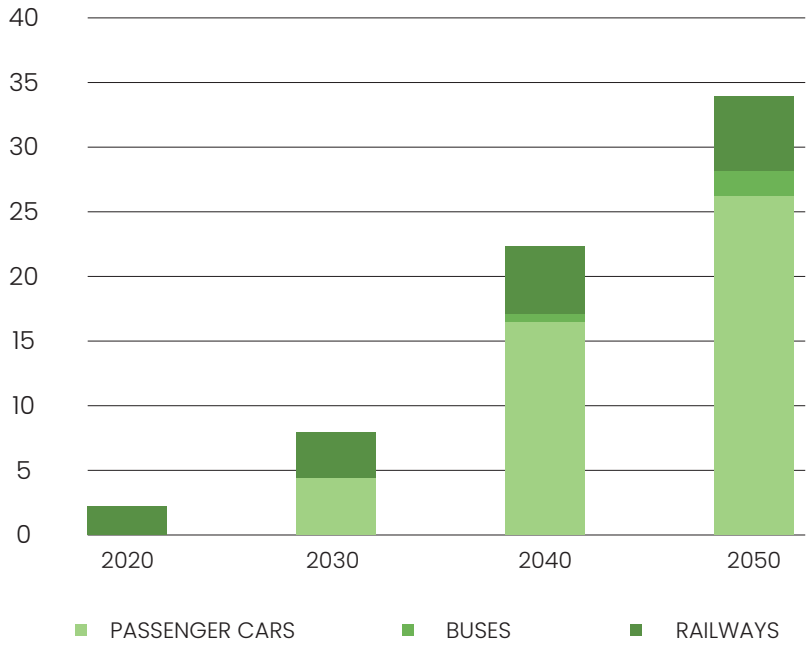
Initially, hydrogen powered vehicles will be mainly used in public transport (with about 2,000 buses in the fleet by 2030). In 2030, the hydrogen demand for their operation will be less than 2 kt. The major use of hydrogen technologies will come after 2035. Both hydrogen powered buses and passenger cars will be much more expensive than electric ones; therefore, their share will be much lower. In 2050, the hydrogen demand in passenger transport may exceed 50 kt and be generated in almost equal proportions by passenger cars and buses. The emerging concepts of using the hydrogen technology in railways may, in turn, increase this demand[12].

Development of public transport in Poland compared with EU27 – electrification of the bus fleet and the use of hydrogen in it

In 2020, the share of zero-emission buses either in Poland or in other Member States did not exceed 1%. The development of collective transport, particularly road transport, can speed up the process of decarbonisation. As the offer of collective transport is enhanced, the vehicle fleet will grow. Therefore, the deployment of new zero-emission vehicles will not generate excessive costs of the decommissioning of existing internal combustion engine vehicles. Moreover, introducing into service new electric and hydrogen powered buses will not pose a problem in urban transport, given the availability of technologies and programmes of support for their purchases. In the neutrality scenario expanded with the promotion of collective

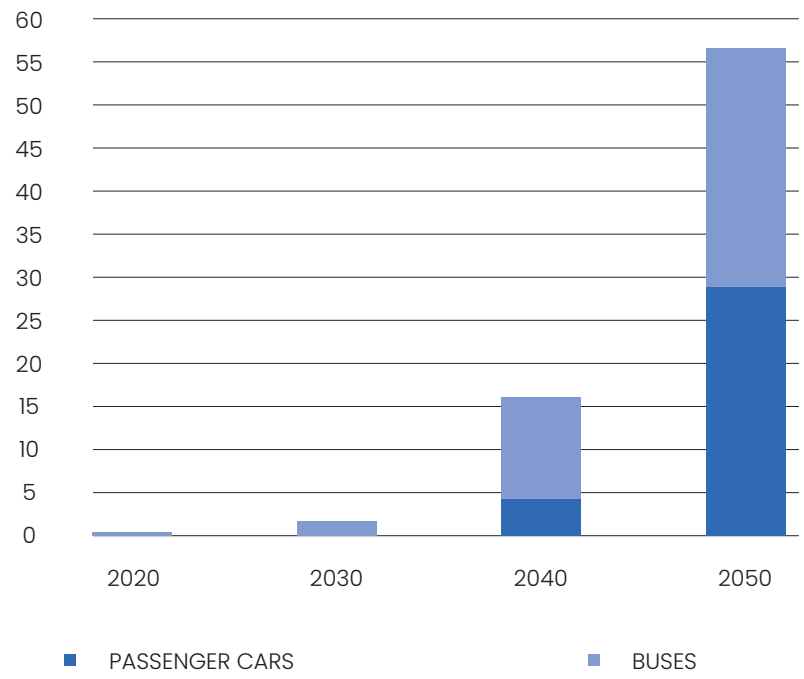
12 https://www.alstom.com/pl/press-releases-news/2022/5/pkn-orlen-i-alstom-ze-wspolpraca-na-rzecz-kolei-wodorowej [Accessed on 29 July 2022]

CHART 6. ELECTRICITY DEMAND IN THE PASSENGER TRANSPORT [IN TWh] IN POLAND IN THE NEU_PUBLIC_55 SCENARIO



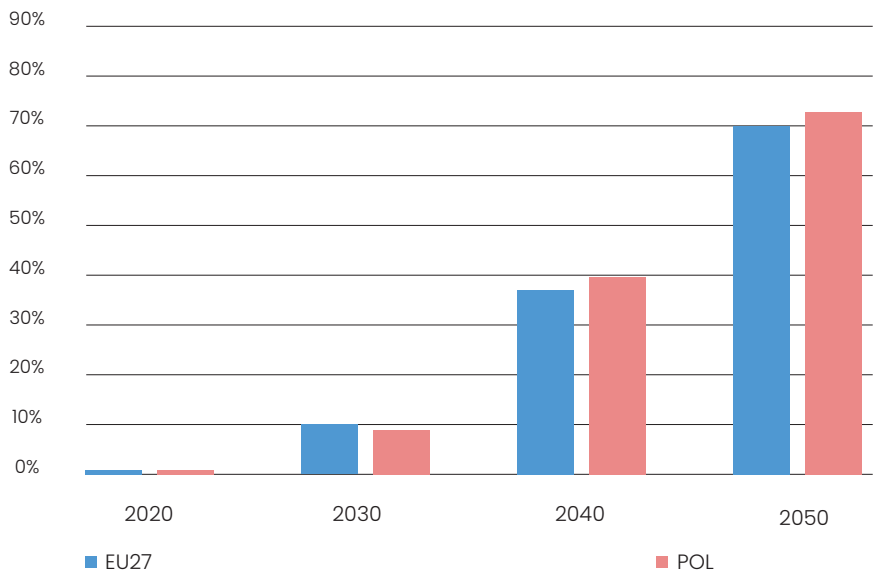
Source: Own elaboration by CAKE/KOBiZE

CHART 7. HYDROGEN DEMAND IN THE PASSENGER TRANSPORT [IN KT] IN POLAND IN THE NEU_PUBLIC_55 SCENARIO



Source: Own elaboration by CAKE/KOBiZE

CHART 8. SHARE OF ZERO-EMISSION BUSES IN THE FLEET IN POLAND COMPARED WITH EU-27 IN THE NEU_PUBLIC_55 SCENARIO



Source: Own elaboration by CAKE/KOBiZE

transport, in 2030 the share of zero-emission buses in Poland and EU27 may be less than 10% (in Poland, 1 pp below the EU27 average). After 2030 a major decarbonisation of the bus fleet in both Poland and EU27 is expected. In 2040, the share of zero-emission vehicle in the bus fleet will be almost 40% and about 70% in 2050. It is important to point out that in Poland the price stimulus for consumers may perhaps bring higher outcomes than the average for the EU27 Member States. In both 2040 and 2050, the share of zero-emission buses in Poland may be about 2.5 pp higher than the average for the EU27 Member States.

Costs of promoting public transport

The costs of promoting collective transport reflect the lower costs of its use and the transport performance which buses and trains need to carry out in order to satisfy the consumer demand. In the scenario including the promotion of public transport in response to a price stimulus, both the structure of travels and the total transport performance using a given means of transport will change.

The promotion of public transport will require additional outlays of about EUR 7 billion for railways and about EUR 40 billion for buses. These outlays will be used to reduce travel costs, thus directly affecting the ticket prices for passengers (with the consumer choice based on the relation of the cost to the baseline level rather than the level of the cost). In the case of urban (road) transport where the travel costs will be cut to a greater extent than in extra-urban transport, these costs will represent about 10% of the outlays on the promotion of bus transport.

In the period from 2025 to 2050, the mean annual outlays may be about EUR 0.3 billion for railways and EUR 1.6 billion for buses. The costs of promoting public transport will be incurred both to reduce travel fees and to implement the necessary investments related to the transition of the fleet/rolling stock towards zero emissions, as well as the maintenance and provision of an adequate transport offer.

TABLE 2. COSTS OF PROMOTING PUBLIC TRANSPORT IN POLAND IN THE PERIOD FROM 2025 TO 2050 IN THE NEU_PUBLIC_55 SCENARIO

	Cumulative costs (2025 – 2050) (EUR billion)	Mean annual costs (2025 – 2050) (EUR billion)
Railways	6,90	0,30
Buses (total)	39,60	1,60
Urban buses	4,40	0,20

Source: Own elaboration by CAKE/KOBiZE

Conclusion

The transition of the passenger transport sector should involve the dynamic development of road and railway public transport. An increase in passenger activity in public transport may reduce individual transport by about 7% and make it possible to significantly reduce aviation activity. In 2050, in Poland, in the scenario including the promotion of collective transport, the number of passenger-kilometres in aviation may be lower by about 30 billion passenger-kilometres than in the NEU_55 scenario (a decline of about 35%). This results from the fact that domestic and short-distance flights can be substituted by rail.

As a result of the transition of the collective road transport, the number of electric and hydrogen powered buses will grow. In the scenario including the promotion of public transport, the number of electric buses in Poland will reach about 6,000 in 2030 and about 70,000 in 2050 (about 53% of the fleet). Initially, the share of hydrogen powered buses will be relatively low – with about 3,000 buses in 2030. However, with progress in the hydrogen technology, their use will grow. The number of hydrogen powered buses in Poland in 2050 may reach about 25,000, representing about 20% of the fleet.

Until 2030, zero-emission buses will be mainly used in cities and for short-distance travels (about 10% of the fleet in 2030). However, the increasing use of zero-emission technologies will cause the growing demand for electricity and hydrogen. In the scenario including the promotion of public transport, the electricity demand in passenger transport (passenger cars, buses and railways) will be about 34 TWh in 2050, representing about 10% of the projected energy demand in Poland. Hydrogen demand in passenger transport will be mainly generated by hydrogen powered buses.

In 2030, it will be about 2 kt. In 2050, this quantity may substantially grow to more than 50 kt and will be generated by both hydrogen powered buses and passenger cars.

Public transport should play a significant role in the efforts to achieve climate neutrality. In addition, well-organised and attractively priced collective transport may help solve problems of a social character, i.e. transport exclusion. The currently available zero-emission technologies (using electricity and hydrogen) provide opportunities for the relatively quick replacement of the bus fleet, particularly in urban transport. Therefore, it is important to take measures to promote public transport, creating a real alternative to individual transport and thus contributing to achieving climate objectives.

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Equivalent measures to reduce emissions as the basis for the application of derogations to small installations in the EU ETS system

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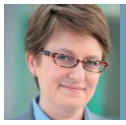
Equivalent measures to reduce emissions as the basis for the application of derogations to small installations in the EU ETS system[1]



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Abstract

The EU ETS system has been designed as a solution of a general character which covers specific categories of participants (installations and aircraft operators), incentivising them to reduce their greenhouse gas emissions by imposing on them the obligation to account for their emissions by means of a purpose-designed "currency" which emission allowances constitute. The value of this currency is determined by the market and its continuously decreasing supply is the object of regulatory mechanisms which have been carefully designed by the EU legislator.

However, this system provides for certain derogations which enable some categories of participants to achieve the reduction targets by using other solutions which are assumed to be more readily available and generate lesser administrative burdens and costs. In the EU ETS Directive, these solutions are called "equivalent measures". In their regulatory practice, different Member States have worked out quite a wide range of solutions deemed to be equivalent measures, i.e. measures expected to bring an equivalent reduction effect with respect to the one which results from the inclusion of a given entity in the EU ETS system. In this article, the Authors elucidate the institution of derogations for small installations as laid down in Article 27 of the EU ETS Directive and equivalent measures which are their elements. The Authors also review the equivalent measures applied in the regulatory practice of different Member States.

Introduction

In many areas of European Union (EU) law, there are provisions in effect which enable the Member States to use derogations from the application of certain requirements imposed by EU law. Derogations are most often used on the condition that decisions of this type are notified to the European Commission or on the condition that other requirements specified in EU legislation are met. Examples of this type of solutions can also be found in Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community and amending

1 This article is a continuation of the studies carried out as part of the project "The knowledge base on climate change and adapting to climate change effects, together with knowledge dissemination channels, to strengthen economic, environmental and societal resilience as well as to support management of extraordinary risks associated with climate change", co-financed from the EU resources as part of the POiIŚ Programme implemented at the IOŚ-PIB from 2017 to 2022.

Council Directive 96/61/EC[2] (hereinafter referred to as the EU ETS Directive) and in the non-legislative acts adopted pursuant to the Directive.

> The EU ETS Directive provides for certain solutions which enable the Member States to abolish the requirement for the fulfilment of some obligations related to the participation in the emission allowance trading system (hereinafter referred to as the EU ETS system), also including those that are the immanent features of the system, e.g. the obligation to account for greenhouse gas emissions.

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Exclusions are provided for in Articles 27 and 27a of the EU ETS Directive[3]. For specified groups of entities, they imply the abolition or a significant modification of most of the obligations related to the participation in the system. These solution have not a uniform character, as they can have the form of an unconditional abolition of these obligations or a conditional exclusion which entails the need to impose a different type of requirements expected to ensure a specific effect related to reductions in the emissions from the installations.

In 2009, an amendment to the EU ETS Directive (Article 27) introduced the exclusion of so-called small installations, which, on the one hand, was expected to enable these installations to take measures to reduce emissions, and, on the other hand, to ensure greater flexibility of the installations in choosing the appropriate manner of reducing their emissions, and, in consequence, also to ease the administrative burdens which the participation in the system implies.

> However, the application of this derogation pursuant to the Directive is not unconditional. The EU legislator assumed that the entities which use it ought to take reduction efforts just as the participants in the EU ETS system should. Therefore, derogations involved the need for the installations to meet additional conditions (to subject these installations to so-called equivalent measures).

2 Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC (OJ L 275, 25.10.2003, pp. 32–46, as amended).

3 At the outset, it is important to emphasise that these solutions are reserved for entities which operate on a smaller scale, as indicated, among others, by the application of the criterion of installed capacity and the criterion of the emission level generated from an installation in a year. The scale of the operations carried out at the installation understandably translates into the impact of a given entity on progression in the greenhouse effect; therefore, it can be concluded that these solutions have an additional dimension, which is to ensure greater flexibility of installations in achieving the reduction targets.

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It should also be emphasised that the criteria established in the Directive have a minimal status (represent minimum harmonisation) in the sense that in designing the exclusion system in their domestic law the Member States can apply more restrictive criteria or introduce additional criteria for the application of derogations which were not envisaged in the Directive.

The further part of this article will present the rules under which the EU ETS Directive allows for the possibility of derogations for small installations covered by the system and also examples of equivalent measures which some Member States have adopted as part of the authorisation envisaged in Article 27 of the EU ETS Directive.

The conditions for the exclusion of small installations under Article 27 of the EU ETS Directive

The decision to grant the derogations to small installations is taken individually by the particular Member States.

The EU ETS Directive provides that the exclusion may apply to a given unit after a consultation is held with the installation operator; therefore, it is the decision of the installation operator that will determine whether a specific installation will ultimately be granted the derogation or remain in the system.

Thus, the exclusions laid down in Article 27 of the Directive have a voluntary character. In the States which in the trading period from 2013 to 2020 decided to introduce the exclusions of small installations, following wide consultations, there was a relatively large group of installations declaring their willingness to be excluded. In addition, the exclusions are often used by installations in the sector of ceramic products, where, in most of the Member States, there is a large share of small and medium-sized enterprises[4].

In the current trading period, an important factor determining the decision on the exclusion of an installation is the price of the emission allowances which the installation operators need to purchase in order to fulfil the obligation to account for their emissions. A high allowance price and its projected further growth can increase the interest in this mechanism[5].

4 Thus e.g. J. Brock, E. Bonifazi, Ch. Thorpe, S. Morgan-Price, A.L. Kaar, Preparation for the implementation of the EU ETS provisions for small installations. Best Practice Guidance, Ricardo Energy & Environment 2019, Issue No. 3, p. 4.

5 Changes in emission allowance prices result from not only the reactions of the participants in the allowance market, but also the introduction of such mechanisms as the Market Stability Reserve. The aim of these mechanisms is to maintain an adequately high level of prices on the market in order to strengthen the reduction effect of the EU ETS system. For more on this issue, see M. Pyrka, S. Lizak, I. Tobiasz, J. Boratyński, R. Jeszke, P. Mzyk, Reform of the Market Stability Reserve (MSR) in the "Fit for 55" package, CAKE/KOBiZE, Warsaw, January 2022 (https://climatecake.ios.edu.pl/wp-content/uploads/2022/01/CAKE_MSR_Report_31-01-2022.pdf; (Accessed on 09 September 2022).

The introduction of the exclusion mechanism begins with the collection of applications from installation operators. An application submitted by an installation to be excluded is expected to provide to the state authorities the information that the installation meets specific exclusion conditions. First, it needs to demonstrate that the condition relating to the emission level is fulfilled.

The excluded installation needs to maintain its emissions at a level of less than 25,000 tonnes of CO_2 annually in each of the 3 last years before the date of submission of the application. In the case of a combustion installation, it must, in addition, meet the condition of a rated thermal input of less than 35 MW[6]. Installations operated by hospitals are an exception to these criteria.

The excluded installation needs to maintain its emissions at a level of less than 25,000 tonnes of CO_2 annually in each of the 3 last years before the date of submission of the application. In the case of a combustion installation, it must, in addition, meet the condition of a rated thermal input of less than 35 MW[7]. Installations operated by hospitals are an exception to these criteria. In their case, the criteria of installed capacity and emission levels do not apply; in light of this, installations operated by hospitals can be excluded without any additional conditions.

On the basis of applications and after the verification of the conditions for the exclusion, the Member State notifies the Commission of the applications concerning the installations to be covered by the exclusion mechanism. In this notification, the Member State provides to the EC the information on:

1) each excluded installation and equivalent measures, i.e. those applied to ensure an equivalent contribution to the emission reductions to which this installation will be subject;
2) confirms that this installation will be subject to the requirements for monitoring its emission levels to determine whether it meets the criterion of the annual level of the emissions from the installation (the emissions of less than 25,000 tonnes of CO_2, excluding emissions from biomass);
3) confirms that if this installation exceeds the specified threshold of its emissions (excluding emissions from biomass) in any calendar year or if the equivalent measures applying to this installation are no longer in place, the installation will be reintroduced into the system.

The State is obliged to publish the information presented in the notification for public comment.

The Commission may raise objections to the notification of the Member State and question the exclusion of specific installations. Its objections may concern all the elements of the notification, including the proposed equivalent measures to which the installation to be excluded would be subject.

6 The determination whether the installation meets the above criterion is made by applying, though with some exceptions, the rules followed in verifying the criteria for the coverage of the installation by the EU ETS system, including the so-called aggregation rule. In the case where the installation is included in the system on the basis of the threshold value referred to a rated thermal input, account is taken of the sum total of the rated thermal inputs of all the stationary technical units where combustion takes place. On the other hand, the de minimis rule does not apply here; under this rule, the calculations of the rated thermal input do not take into account the stationary technical units with a rated thermal input of less than 3 MW and the stationary technical units which only use biomass.

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The Commission may raise objections to the notification within 6 months of its date and if no objections are raised within that period, the notification of the exclusion of specific installations is deemed approved (Article 27(2) first sentence)[8].

The exclusion of an installation has not a definitive and irreversible character. In each case where the carbon dioxide emission level from the installation (excluding emissions from biomass combustion) exceeds 25,000 tonnes again or the excluded installation fails to carry out the equivalent measures applying to it (Article 27(1)(c), the installation should be fully reintroduced into the system and the installation operator should fulfil the obligations of the participants in the EU ETS systems on the same conditions as the other installations.

It should also be noted that the requirement for the reintroduction of installation into the EU ETS regime does not apply to the installations operated by hospitals[9]. In this case, the granting of the status of excluded installation has a permanent character and does not change as a result of changes in the emission level from the installation.

The installation which loses the status of excluded installation is granted emission allowances which are allocated on the principles set out in Article 10a. The installation may be granted the allowances starting with the year when it is fully reintroduced into the system[10]. Such an installation will remain in the system until the end of the trading period, which means that the status of the installation will not change if it reduces again its emission level (below 25,000 tonnes of CO_2).

The allocation of emission allowances after the reintroduction of an installation into the system should take into account relevant changes in activity levels (HALs) which occurred when the operated as a closed down installation.

In addition, it should be noted that the allowances allocated to the installations reintroduced into the system are granted from the pool of emission allowances which the Member State would otherwise sell at auctions (Article 27(3) second sentence). Therefore, it is important to note that the scheme of the exclusion of small installations is implemented at the risk of the Member State which implements it, since if the scheme does not bring the expected results and fails to reduce emissions from the installations subject to the derogations, the Member States will have to resign from part of the proceeds from the auctions of emission allowances and the allowances which were to be sold, funding the State budget, will be used to secure free allocation to the installations reintroduced into the EU ETS system.

The obligation to apply equivalent measures

The EU ETS Directive defines equivalent measures as "measures that will achieve an equivalent contribution to emission reductions" (Article 27(1).

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8 The version of Article 27(2) first sentence of the Directive in the Polish language incorrectly specifies the period in which the EC may consider the notification of a Member State. In light of the versions in other languages, including the English one, the period in which the EC may voice its objections to the notification relating to the exclusion of an installation is 6 months from the date of the notification. The notification should be preceded by a period of 3 months for public consultations on the notification (If, following a period of three months from the date of notification for public comment, the Commission does not object within a further period of six months, the exclusion shall be deemed approved).

9 J. Brock, E. Bonifazi, Ch. Thorpe, S. Morgan-Price, A.L. Kaar, Preparation ... op. cit., p. 11.

10 The emission allowances allocated to the installations included into the system come from the auction pool of the Member State (Article 10(3) of the EU ETS Directive).

However, the Directive does not specify the possible types of these measures, giving discretion to the Member States as to the character of this type of solutions.

Still, it follows from the language context of the Directive that the solutions to apply to installations are expected to bring an equivalent effect compared with the one which results from the coverage of a given installation by the EU ETS.

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Different types of studies have emphasised that the reduction effect achieved by applying equivalent measures can be higher than the one generated by the installations operating within the EU ETS, while it should not be lower than the latter level[11]. Therefore, the equivalency of a measure is not measured in economic terms and the scale of burdens related to the application of measures incentivising the excluded installations to reduce their emissions is not important, either. Equivalent measures may include solutions which generate in economic terms lesser burdens for installation operators than e.g. the accounting for emissions with allowances the market price of which, as is the case now, persists at a relatively high level.

What is important is the result which equivalent measures are expected to bring and its measure is the reduction of emissions from the excluded installation. This result should be equivalent to a certain model as set by the assumed emission reduction level which should be achieved at the installations subject to the EU ETS regime.

What is important is the result which equivalent measures are expected to bring and its measure is the reduction of emissions from the excluded installation. This result should be equivalent to a certain model as set by the assumed emission reduction level which should be achieved at the installations subject to the EU ETS regime. An emission reduction is the essential criterion for assessing the adequacy of a given solution as an equivalent measure[12].

Moreover, it is important to note that the assessment of the equivalency of an equivalent measure under the assumption that the installations remaining in the EU ETS system will achieve a certain result in the form of emission reductions involves an arbitrary assumption. The essence of the EU ETS system is that is encourages emission reductions by means of market-based solutions (the most important of them is the price of emissions which installations need to purchase in order to account for their emissions). In contrast, the EU ETS is not a mechanism which ensures the same effects in achieving emission reductions for each installation. The Directive gives discretion to the Member States as to the design of the system of equivalent measures. The measures can be uniform for all the excluded installations, but they can also form a package of different types of solutions.

11 J. Brock, E. Bonifazi, Ch. Thorpe, S. Morgan-Price, A.L. Kaar, Preparation ... op. cit., p. 5.

12 E.g. solutions which consist in the introduction of the obligation to diminish the emission factor of production, i.e. the quantity of CO_2 needed to manufacture the product, expressed in a specific unit, are given as an example of measures which are not adequate, since the application of such a solution does not ensure that the greenhouse gas emissions covered by the system will fall. In the case where the output grows, the reduction in the emission factor of production will not ensure absolute emission reductions.

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Types of equivalent measures applied in the EU Member States

Introducing the derogation mechanism on the conditions laid down in Article 27 of the EU ETS Directive, the EU Member States apply different solutions which are intended to play the role of equivalent measures as part of this mechanism.

Spain

Spain is one of the countries which introduced the derogations laid down in Article 27 of the EU ETS Directive.

In Spain, equivalent measures were introduced pursuant to the Act of 2005 Regulating the Emission Allowance Trading System and the later Royal Decree of 2011[13]. These solutions were introduced for the first time in the trading period from 2013 to 2020.

Until now, Spanish distinguished between two basic models of equivalent measures[14]. One of them consisted in establishing specific greenhouse gas emission reduction targets for installations which were intended to ensure emission reductions equivalent to the reduction targets set in aggregated form for the installations covered by the EU ETS system. In turn, the other model was based on the creation of incentives encouraging the launch of efforts comparable with the EU ETS system to reduce emissions (e.g. the obligation to account for emissions which exceeded a specific level).

In the current trading period (i.e. from 2021 to 2025), the issues related to the exclusion of installations and the equivalent measures applied as part of this mechanism are regulated by Royal Decree 317/2019 of 26 April 2019[15].

13 Ley 1/2005, de 9 de marzo, por la que se regula el régimen del comercio de derechos de emisión de gases de efecto invernadero (https://www.boe.es/eli/es/l/2005/03/09/1/con ; Accessed on 9 September 2022); Real Decreto 301/2011, de 4 de marzo, sobre medidas de mitigación equivalentes a la participación en el régimen de comercio de derechos de emisión a efectos de la exclusión de instalaciones de pequeño tamaño (https://www.boe.es/buscar/doc.php?id=BOE-A-2011-4118 ; Accessed on 9 September 2022).

14 Such solutions were introduced in the trading period from 2013 to 2020. In the next period starting in 2021, Spanish law provides for a uniform model of equivalent measures.

15 Real Decreto 317/2019, de 26 de abril, por el que se define la medida de mitigación equivalente a la participación en el régimen de comercio de derechos de emisión en el periodo 2021-2025 y se regulan determinados aspectos relacionados con la exclusión de instalaciones de bajas emisiones del régimen del comercio de derechos de emisión de gases de efecto invernadero, (https://www.boe.es/buscar/act.php?id=BOE-A-2019-6351 ; Accessed on 9 September 2022).

This Decree introduces changes in the system of equivalent measures and, instead of several types of measures, establishes a uniform mechanism which applies to all the excluded installations[16]. Exclusions are granted to the installations which meet the criteria laid down in Article 27 of the EU ETS Directive. These criteria refer to the emission threshold of less than 25,000 tonnes of CO_2 equivalent (excluding emissions from biomass) in each of the three years preceding the notification and a rated thermal input of less than 35 MW. Another condition for the exclusion of an installation is the commitment to implement equivalent measures intended to achieve a specific emission reducing level. Article 2 of Royal Decree 317/2019 stipulates that the solutions as a result of which an installation will reduce by 2025 its emissions by 32% compared with 2005 can be deemed to constitute equivalent measures. At the same time, the law sets out the pathway for achieving this target by gradually increasing the required reduction level (the emission reduction should be 23.2% in 2021; 25.4% in 2022; 27.6% in 2023; 29.8% in 2024; and 32.0% in 2025)[17].

If in any year in the period from 2021 to 2025 the emission levels from an installation are lower than those corresponding to the assumed target, the installation operator has the right to proportionately increase its emissions in the next year. This solution is patterned on the banking of allowances envisaged by the EU ETS system[18], except that the emissions may only grow between the years in the period from 2021 and 2025, and it is allowed to increase the emission levels after 2025, i.e. for the allocation period from 2026 to 2030.

In turn, if in any year in the period from 2021 to 2025 the emissions exceed their levels determined by the required reduction levels, the installation operator is obliged to transfer to the state the emission allowances for exceeding the emission limit. The emission allowances are returned by 30 April of the year following the year when the limit was exceeded. The transfer of emission allowances corresponds to the obligation to account for emissions imposed on the installations covered by the ETS ETS. In addition to the accounting for their emissions, the installation operators provide to the competent authority, i.e. the Climate Change Policy Coordination Commission, information on compliance with an equivalent measure. This information is forwarded by 31 May of the year following the reporting year.

The Spanish Government may use the emission allowances transferred by the installations excluded from the EU ETS to meet the obligations to reduce greenhouse gas emissions made under EU regulations as part of the non-ETS sectors.

The excluded installations must fulfil their emission monitoring and reporting obligations[19]. The

16 Royal Decree 317/2019 of 2019 also introduced the conditions for the exclusion from the system of the micro-installations referred to in Article 27a of Directive 2003/87/EC. The installations which reported in each of the years 2016-2018 to the competent authority emissions below 2,500 tonnes of CO_2, disregarding emissions from biomass combustion, are excluded from the emission allowance trading system in the period from 2011 to 2025. In addition, the installations which reported in none of the years of their participation in the EU ETS system emissions exceeding 500,000 tonnes of CO_2 may also be excluded. The installation operators do not need to submit applications for exclusion. Micro-installations are excluded by law pursuant to a resolution of the authority of an autonomous community on the exclusion of a micro-installation and the means of monitoring, verification and reporting greenhouse gas emissions to be applied for it.

17 Spanish law also allows for the possibility of establishing more restrictive emission reduction levels if such requirements are introduced by the autonomous community in whose territory the excluded installation is located.

18 Banking of emission allowances involves the possibility of transferring allowances (as a matter of fact, their surplus which has been secured) between the trading periods. The idea of banking of emission allowances is based on the assumption that the rights which emission units carry do not expire with the end of the trading period within which they were issued, but remain valid and can also be used after the end of that period. The holders of emission allowances can use them to account for their emissions or trade in them at any time. At this point, it should be noted that law can impose certain restrictions on the use of emission units; still, they do not essentially affect the validity of emission allowances.

19 The national authority, i.e. the Climate Change Policy Coordination Commission, has been authorised to adopt recommendations for emission monitoring, verification and reporting, including solutions enabling the application of simplified emission monitoring, verification and reporting methods. These recommendations may be prepared following the model of the solutions laid down in Commission Regulation (EU) 2018/2066 of 19 December 2018 which apply to the installations covered by the EU ETS system.

obligation to provide information on the emission levels is fulfilled by 31 for the previous year.

In the case where the installation operator fails to fulfil its obligations resulting from the application of equivalent measures to the installation, Spanish law provides for the imposition of penalties.

Moreover, Spanish law defines a sui generis gradation of infringements, which are divided into very serious, serious and minor ones[20]. Very serious infringements include failure to fulfil the obligation to return allowances to cover the emissions exceeding the preset emission reductions. A penalty imposed for such infringements is EUR 100 for each tonne of excess emissions. Information on the penalty imposed is made available to the public. The payment of a penalty does not exempt the installation operator from the obligation to surrender emission allowances when submitting the data for the calendar year when the infringement took place[21]. The provisions also provide for penalties for failure to fulfil the emission monitoring and reporting obligations.

Italy

Italy has also introduced a system of equivalent measures related to the exclusion of small installations. The legislative decree of 9 June 2020 on the implementation of Directive (EU) 2018/410 of the European Parliament and of the Council[22] provides that combustion installations with a rated thermal input of less than 35 MW and installations which emitted less than 25,000 tonnes of CO_2 equivalent in each of the three years preceding the notification of such an installation, excluding emissions from biomass combustion, may be excluded from the EU ETS system. The excluded installations are subject to measures intended to ensure an equivalent contribution to emission reductions. The operators of the installations meeting the criteria for exclusion submit a relevant application to the National Committee for the Management and Implementation of Directive 2003/87/EC and Support for the Management of Kyoto Protocol Projects (hereinafter referred to as the EU ETS Committee).

The system of equivalent measures was introduced in Italy for the first time in 2013. Pursuant to Resolution 16/2013 of the EU ETS Committee, the so-called National System for Small Emitters was established[23]. This System is based on the so-called National Registry of Small Emitters (Registro Nazionale dei Piccoli Emettitori - RENAPE), which registers authorised and actual emissions for all installations and other important data on the installations. The main assumptions for the National System for Small Emitters are based on:
1) the determination of the CO_2 emission limit for each excluded installation, which includes the obligation to reduce the emissions from the installation to a specific level;
2) the obligation to report emissions by 30 April of the year following the reporting year;
3) the obligation to pay a fee for each CO_2 tonne emitted in excess of the emission limit. Moreover,

20 E.g. failure to comply with the conditions for emission monitoring set out in the monitoring plan, where it does not cause a change in the data on emissions, is considered a minor infringement.

21 See Article 30(3) of the Act of 2005 Regulating the Emission Allowance Trading System.

22 Decreto legislativo 9 giugno 2020, n. 47 Attuazione della direttiva (UE) 2018/410 del Parlamento europeo e del Consiglio del 14 marzo 2018, che modifica la direttiva 2003/87/CE per sostenere una riduzione delle emissioni piu' efficace sotto il profilo dei costi e promuovere investimenti a favore di basse emissioni di carbonio, nonche' adeguamento della normativa nazionale alle disposizioni del regolamento (UE) 2017/2392 relativo alle attivita' di trasporto aereo e alla decisione (UE) 2015/1814 del Parlamento europeo e del Consiglio del 6 ottobre 2015 relativa all'istituzione e al funzionamento di una riserva stabilizzatrice del mercato, (https://www.normattiva.it/uri-res/N2Ls?urn:nir:stato:decreto.legislativo:2020-06-09;47!vig; Accessed on 9 September 2022).

23 Deliberazione del Comitato ETS n. 16 /2013 del 25 luglio 2013 „Disciplina gli impianti di dimensioni ridotte esclusi dal sistema comunitario per lo scambio delle quote di emissione di gas ad effetto serra al sensi dall'articolo 38 Decreto legislativo 13 marco 2013, n. 30". (https://www.mise.gov.it/images/stories/normativa/deliberazione_25_07_2013n16.pdf; Accessed on 9 September 2022).

the value of this fee is equivalent to the average emission allowance price for the previous year. Higher emissions from an excluded installation can also be compensated for by the surrender of emission allowances[24].

In the current trading period (2021-2030), the basis for the exclusion of installations from the EU ETS system was established by Resolution 119/2019 of the EU ETS Committee[25]. Each excluded installation is obliged to comply with its emission limit. The emission limit is determined on the scale of a year on the basis of one of the two methods chosen by the installation operator.

The first method refers to the methodology for the allocation of allowances as applied in the EU ETS system for the period from 2021 to 2030, where the emission limit determines the allocation which an excluded installation would be granted if it remained in the EU ETS system, but disregarding the adjustment of this allocation using the correction factor.

The second method for the determination of the emission limit is based on the calculation of the emission reduction level which would annually fall linearly so that the emissions from a given installation in 2030 do not exceed 43% below the 2005 emissions.

When submitting an application for exclusion, each operator indicates the method which it wants to apply in order to determine the emission limit.

It should be noted that both methods for the determination of the emission limit are consistent with the emission reduction targets for 2030; therefore, the efforts taken by the excluded installations to reduce their emissions will be consistent with the reduction efforts which the installations covered by the EU ETS system should take on an integrated basis in the period from 2021 to 2030.

The EU ETS Committee issues to each installation covered by the National System for Small Emitters a permit containing a number of elements of the permit issued to the installations covered by the EU ETS system as defined by Article 6 of Directive 2003/87/EC. Each excluded installation may each year, without incurring additional burdens, emit CO_2 at a level equal to its emission limit. The installation operator shall pay a fee to the State Treasury for each tonne of CO_2 emitted in excess of this limit, corresponding to the average emission allowance price from the previous year. The average allowance price on the basis of which the fee is determined is officially specified by the Italian Regulatory Authority for Energy, Networks and Environment (ARERA - L'Autorità di Regolazione per Energia Reti e Ambiente). Italian law also allows for the "accounting" for a higher emissions (in excess of their limit) through the surrender of emission allowances which are valid in a given reporting year. The fee is paid or the emission allowances are surrendered for exceeding the emission limit annually.

Italian law provides for different solutions ensuring certain flexibility in achieving compliance with the emission limit. They include the banking of emissions and the borrowing of them from the subsequent year. When the annual emissions from an excluded installation are lower than the emission limit, the installation operator can use the arising difference to achieve compliance in the subsequent year (by banking emissions). In turn, when the annual emissions from an excluded installation exceed the emission limit set out for a given year, the installation operator can use part

24 The obligation to pay a fee or to surrender emission allowances in the event of exceeding the emission limit was fulfilled every 2 years by 30 June of a given year for the 2 preceding years (e.g. 2015 the emissions in 2013-2014 were accounted for; in 2017 those in 2015-2016; in 2019 those in 2017-18; and in 2021 those in 2019-20).

25 Deliberazione del Comitato ETS nr 119/2019 dell' 8 agosto 2019 „Modalità per l'applicazione degli articoli 27 e 27 BIS della direttiva 2003/87/CE, per il periodo 2021-2030" (https://www.mise.gov.it/images/stories/normativa/deliberazione_119_2019pubblicata.pdf; Accessed on 9 September 2022).

of the emission allocation to be available next year (by borrowing emissions). The maximum increase in emissions by using the allocation for the subsequent year is 30% of this allocation. In turn, as a result of the borrowing of the emissions from the subsequent year, the emission limit in the subsequent year will be reduced.

An excluded installation prepares a report on its emission level. This report is verified by an accredited verifier. Moreover, this verification has the character of off-site verification. However, every year reports from a random sample representing 5% of the excluded installations undergo an additional on-site verification by an accredited verifier.

Italian legislation provides for penalties for failure to fulfil certain obligations imposed on small excluded installations. The operator of a small installation is liable to the penalty of a fine of EUR 1,000 to EUR 5,000 in the situation where the operator:
1) fails to submit its plan for monitoring the emission level to the EU ETS Committee;
2) fails to submit by the set deadline its updated monitoring plan to the EU ETS Committee if the installation operator changes, the level of the activity carried out in the installation is enhanced or reduced, in the case where the change in this level exceeds 20%, and in the event of a change in the character and operation of the installation or the introduction of significant changes in the monitoring method;
3) fails to submit to the EU ETS Committee its report on the greenhouse gas emission level by 30 April of each year[26].
In addition, the installations excluded under Article 27 of Directive 2003/87/EC are liable to the same penalties as those that apply to the operators of the installations covered by the EU ETS system, except that the value of unit penalty rates is reduced by 50% in the case of the excluded installations[27].

Germany

The solutions enabling the introduction of derogations for small installations, patterned on Article 27 of the EU ETS Directive, were laid down in the German Regulation Implementing the Act on Greenhouse Gas Emission Allowance Trading of 29 April 2019 (hereinafter referred to as the Emission Allowance Trading Regulation 2030[28]). Article 16(1) of this Regulation stipulates that the competent authority exempts the installation operator from the obligation to surrender the quantity of allowances corresponding to the emissions generated by its operations in the previous year provided that:
1) the installation emitted less than 15,000 tonnes of CO_2 equivalent in each of the three years of the reference period for a given five-year period for which the emission allowances are allocated[29],
2) the installation operator undertakes to implement an equivalent measure in the relevant five-year period[30].
Installations designed to carry out operations to generate electricity, steam, hot water and pro-

26 See Article 4(22) of the legislative decree of 9 June 2020 on the implementation of Directive (EU) 2018/410 of the European Parliament and of the Council.
27 See Chapter 7 of Resolution 119/2019 of the National Committee for the Management and Implementation of Directive 2003/87/EC and Support for the Management of Kyoto Protocol Projects.
28 Verordnung zur Durchführung des Treibhausgas-Emissionshandelsgesetzes in der Handelsperiode 2021 bis 2030 vom 29 April 2019 (http://www.gesetze-im-internet.de/ehv_2030/BJNR053800019.html ; Accessed on 9 September 2022).
29 The years 2016 to 2018 are the reference period for the five-year period for which the emission allowances are allocated (2021-2025), whereas the years 2021-2023 will be reference period for the period from 2026 to 2030.
30 The German legislation has adopted more restrictive criteria for the exclusion of small installations than those laid down in Directive 2003/87/EC. The Directive applies a higher threshold for the emissions generated by the installation to be excluded. Article 27 of the Directive sets this threshold at 25,000 tonnes of CO_2. Nevertheless the decision of the German legislator falls within the margin of the regulatory freedom enjoyed by the Member States in implementing EU law.

cess heat or to burn flue gases by using different types of fuels[31] are not eligible for exclusion if their rated thermal input is 35 MW or more. This criterion applies accordingly to the total rated thermal inputs of all the combustion facilities in all the technical units making up the installation where the fuels are burned.
In the period when the installation is excluded, the installation operator is subject to one of two equivalent measures which German law envisages. They consist in:
1) paying a compensation to account for the saved costs of emission allowance purchases;
2) a voluntary commitment to reduce the emissions generated by the installation.

The compensation to account for the saved costs of emission allowance purchases refers to the exemption of the installation from the obligation to account for its emission levels. The compensation is the product of:
1) the number of emission allowances which the installation operator would have to additionally purchase in order to account for the emissions in a given reporting year; and
2) the weighted average price of emission allowances quoted at auctions in the reporting year or in the calendar year preceding the reporting year, whichever price is lower.

The public is informed about the weighted average price of emission allowances for a given reporting year by 31 March of the calendar year following the reporting year.
In turn, the number of the allowances which determines the value of the due compensation corresponds to the difference in the emission level from the installation in the reporting year and the number of the allowances which would be allocated to the installation operator under the provisions of the German Act on Greenhouse Gas Emission Allowance Trading[32] if the installation fully remained in the EU ETS system.

If the emissions from the installation in a given reporting year are lower than the number of allowances which would be allocated to the installation operator, the compensation does not need to

31 The activity types are listed in points 2-6 of Part 2 of Annex 1 to the German Act on the Greenhouse Gas Emission Allowance Trading.
32 Gesetz über den Handel mit Berechtigungen zur Emission von Treibhausgasen vom 21 Juli 2011 (http://www.gesetze-im-internet.de/tehg_2011/BJNR147510011.html; Accessed on 9 September 2022).

be paid for this reporting year and the installation operator can use the arising emission surplus in calculating the compensation for the subsequent year or years. If in the subsequent year the emission level is also lower than the forecasted allocation of emission allowances, the same rules will apply.

The compensation for each reporting year is paid to the competent authority by 30 April of the calendar year following the reporting year.
If the compensation is not paid by the deadline, the competent authority calculates the compensatory fee using for the calculation of the outstanding compensation the higher of the weighted average prices of emission allowances which were quoted at auctions in the reporting year or in the calendar year preceding the reporting year.

The other type of equivalent measures adopted in German law is a voluntary commitment to reduce emissions.

The objective of a voluntary commitment to gradually reduce, starting from 2021, the total CO_2 emissions from the installation by 2.2% annually compared with the specified reference level.

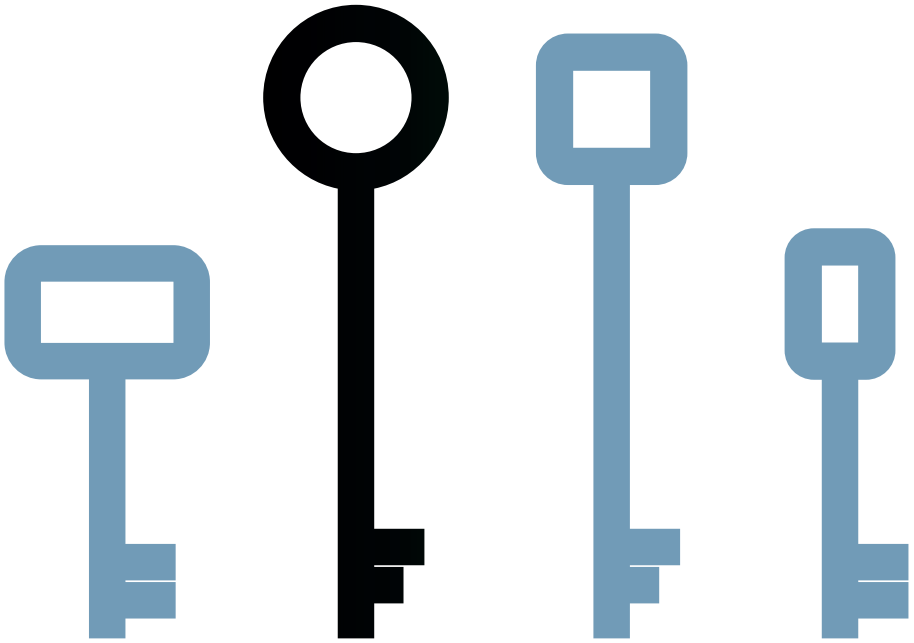
The reference level is the weighted average emission level from the installation in the period from 2014 to 2018 when the installation was covered by the EU ETS system, reduced by the percentage corresponding to the reduction in the number of allowances in the Community as a whole from the middle of the period of the calendar years 2014-2018 to the end of the trading period from 2013 to 2020.

If the installation operator fails to fulfil the commitment to reduce emissions, it is obliged to pay a charge for the emissions exceeding the preset limit. The amount of the charge to be paid is the product of the difference between the actual emission level from the installation in the reporting year and the target value for this reporting year, as set out by the required emission reduction level, and the weighted average emission allowance price quoted at auctions in the reporting year or in the calendar year preceding the reporting year, whichever price is lower.

The charge for each reporting year is paid to the competent authority by 30 April of the calendar year following the reporting year. Just as in the case of compensations, if the installation operator fails to pay the charge by the deadline, the competent authority calculates the compensatory fee using the higher of the weighted average prices of emission allowances which were quoted at auctions in the reporting year or in the calendar year preceding the reporting year.

The installation subject to equivalent measures is obliged to monitor and report its emissions. The obligation to verify the report on the emission levels is simplified to some extent, as this obligation only applies to the third year of a given trading period (Article 23(1) first sentence of the Emission Allowance Trading Regulation 2030).

Pursuant to the German Act on Greenhouse Gas Emission Allowance Trading, a breach of the provision of the Emission Allowance Trading Regulation 2030 on the reporting on the emission level and the verification of the reports on the emission level is an administrative office which may be liable to the penalty of a fine of up to EU 50,000 (Article 32).



Slovenia

In the Slovenian legislation, equivalent measures which provide the basis for the exclusion of installations on the conditions laid down in Article 27 of the EU ETS Directive were introduced in the regulations imposing the tax on air pollution by CO_2 emission (hereinafter referred to as the CO_2 emission tax[33]).

Slovenian law establishes a general obligation to pay a tax on the carbon dioxide emissions generated during the combustion of fuels. The tax is imposed on a unit of emissions amounting to 1 tonne of CO_2.
Slovenian law provides for a number of exclusions, the most important of which is the exemption established in favour of the installations covered by the EU ETS system and small installations excluded on the conditions laid down in Article 27 of the EU ETS Directive.

For small installations the legislator provides for a relief consisting in a reduction in the tax base by the emissions corresponding to the allocation of emission allowances which the installation would be granted if the installation fully remained in the EU ETS system.

If an excluded installation emits CO_2 in excess of the preset allocation of emission allowances, the installation operator pays a tax on each unit of CO_2 released into the air. The unit rate of the CO_2 emission tax is EUR 17.3 per tonne of CO_2. The obligation to pay can also be fulfilled by transferring an appropriate quantity of emission allowances to the national holding account kept for the Republic of Slovenia in the Union Registry. The emission allowances deposited in the Registry in fulfilling this obligation are cancelled.

The operator of a small installation can defer the payment of the CO_2 emission tax to the subsequent year, if the total difference between the green-

33 Uredba o okoljski dajatvi za onesnaževanje zraka z emisijo ogljikovega dioksida dne 11 julija 2018 (http://www.pisrs.si/Pis.web/pregledPredpisa?id=URED7380 ; Accessed on 9 September 2022).

house gas emissions specified on the basis of the report on its greenhouse gas emissions and the number of the allowances which the installation would be granted as part of free allocation starting in 2021 does not exceed 20%.

The tax rate applied in the payment of the CO_2 emission tax has a dynamic character and is correlated with the average emission allowance price. The average emission allowance price is calculated as the product of the amount of the proceeds from the auctioning of emission allowances going to the state budget as achieved in the preceding year from the sales of emission allowances and the quantity of emission allowances auctioned by the Government of Slovenia[34].

In light of this, if the average emission allowance price exceeds the tax rate (EUR 17.3 per tonne of CO_2) by more than 30%, the operator of an excluded installation pays the tax applying a tax rate corresponding to the average emission allowance price. The information on average allowance price is published on the website of the Ministry of the Environment by 28 February of each year.

As noted above, the installation operator has the right to a relief consisting in a reduction in the value of the tax liability corresponding to the emission level for which it would be allocated free emission allowances. This relief is granted on an application for the award of the exemption submitted to the Ministry of the Environment. In response to the application, an exemption decision is issued.

The operator of an excluded installation prepares a declaration specifying the amount of the tax due. The emissions are determined on the basis of the report on the emission level, prepared by applying the monitoring method laid down in the plan for monitoring the emission level[35].

In Slovenian law, failure to fulfil the derogation conditions for small installations is subject to penalties. This law provides, among others, for the imposition of a fine on the installation operator which fails to pay the CO_2 emission tax on time or presents untrue information in it (a fine of EUR 4,000 to 40,000).

A fine may also be imposed on a natural person who acting on behalf or in the interest of the installation operator has caused it to commit an offence (a fine of EUR 1,200 to 4,100).

Conclusion

The equivalent measures applied in the Member States create a very diverse category. They include solutions of a market-based character, such as e.g. taxes, and also solutions consisting in setting out the emission reduction standards compliance with which is controlled by relevant authorities. Moreover, the reference point for the emission reduction limit may be the emission level from an installation in a given period or the allocation of emission allowances which the installation would be allocated if it remained in the EU ETS system.

Some Member States adopt different solutions enabling the flexible enforcement of emission reduction standards in effect. This is important in the situation where the achievement of the set target sometimes requires expensive investments the implementation of which may need a slightly longer time.

34 Zakon o varstvu okolja dne 31 marca 2004 (http://www.pisrs.si/Pis.web/pregledPredpisa?id=ZAKO1545; Accessed on 9 September 2022).
35 Uredba o vrstah naprav, dejavnostih in toplogrednih plinih dne 23 decembra 2020 (http://www.pisrs.si/Pis.web/pregledPredpisa?id=URED8201; Accessed on 9 September 2022).

The Polish legislator has not implemented this type of solutions, although in light of the growing emission allowance prices to be seen in recent years and the large likelihood that these prices will grow in the future, among others, as a result of the strengthening of EU climate policy, the system of equivalent measures may gain in importance in the future as a solution supporting the achievement of the climate policy targets. Equivalent measures replacing the obligation to account for emission levels as part of the EU ETS system can be an interesting alternative in the case of sectors which are sensitive to risks posed by growing emission allowance prices, e.g. the heating sector. However, it should be emphasised that under the regulations now in effect equivalent measures can only be used by small installations complying with the threshold-based criteria laid down in EU law. At the same time, it is exactly small installations that are vulnerable to the greatest extent to the impacts of growing emission allowance prices; therefore, in the case of this category of entities, equivalent measures can be a tool for the effective achievement of the climate policy targets.

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Transaction strategies applied by the participants in the EU ETS carbon market

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Keywords: investment fund, financial intermediaries, EU ETS operators, EUA, speculation, carbon market, futures contracts

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Abstract

An integral part of the EU ETS system is its market part, i.e. the carbon market which is dominated by compliance entities which are obliged to account for their emissions within the EU ETS system and other, non-compliance entities which are not subject to this obligation. The former include the operators of EU ETS installations, i.e. enterprises in the industry sector and electricity producers. The latter include institutions intermediating in transactions among EU ETS operators, e.g. banks and the other financial institutions, such as investment and hedge funds seeking to achieve an appropriate rate of return on investments. And it was the increased activity of financial institutions in the EU ETS market that could be seen in recent years, among others, as a result a higher level of EU climate ambition or the energy crisis.

This article analyses the most important transaction strategies for the purchase/sales of allowances as applied by participants in the carbon market, the main motivations for the application of these strategies and the participation of particular groups of participants in the long-position futures market. The dominant trading strategy applied by the entities operating in the EU ETS system is co-called "hedging", i.e. the purchase of allowances even several years in advance to secure energy prices by its producers. Another popular strategy is "carry trade", i.e. the purchase of allowances in the primary market (auctions) and their resale in the secondary market. In turn, the industry sector prefers to collect allowances in its accounts, thus protecting itself against their rises in the future as part of so-called "hoarding". In order to account for its emissions in the previous year, the industry sector does not need to buy allowances in the market. Instead, it can apply so-called "borrowing", i.e. borrow the allocations allocated in a given year. In order to ensure liquidity in the market, financial intermediaries most often purchase allowances in the primary market (auctions)

List of useful abbreviations:

COT	Commitment of Traders
ESMA	European Securities and Markets Authority
ICE	Intercontinental Exchange
EEX	European Energy Exchange
EU ETS	European Union Emission Trading System
EUA	European Union Allowance
EUAA	European Union Aviation Allowance
ETF	Exchange Traded Fund
OTC	Over The Counter

and resell them in the secondary market, e.g. to the entities operating in the EU ETS system. In turn, other financial institutions which operate in the market to gain a long-term profit most often apply the "buy and hold" type strategies. The largest quantities of allowances are purchased in the derivatives market by means of futures contracts by energy producers and the industry sector (altogether about 80%). Financial institutions account for the remainder, with investment funds representing only 3.5% (CoT data).

This article also presents products available in the carbon market which its participants can use. The overwhelming majority of transactions are concluded by means of derivatives contracts on trading venues in the futures market. The spot market and the primary market (auctions) are much smaller in this much respect.

Types of participants in the EU ETS market

The EU ETS system operates in conjunction with the carbon market, where its participants such as EU ETS operators (industry and electricity producers), financial and credit institutions (banks), investment and hedge funds (i.e. so-called speculators) or other non-financial institutions conclude transactions to purchase or sell allowances. They can also purchase them though the secondary market, concluding immediate transactions (spot contracts) or derivatives transactions (futures contracts) on an trading venue or outside it.

Electricity producers account for about 50% of emissions in the EU ETS system; therefore, they are the largest source of the demand for allowances in the market. As the only sector in the EU ETS, the energy sector is obliged to buy all its allowances in the market, unlike the **industry sector**, which is allocated a specific quantity of free allowances and does not need to engage so much in the carbon market as the energy sector does. **Financial and credit institutions** are the entities which are responsible for supplying allowances to the sectors mentioned above. Characteristically, they are not obliged to account for their emissions in the EU ETS system. Instead, they are often members of different trading venues, carrying out the function of intermediaries or brokers operating within the EU ETS system. It is hard to overestimate their role, since financial institutions ensure appropriate liquidity in the market, enabling the buyers and sellers to conclude transactions. In the market, there are also other financial entities available which are not obliged to account for their emissions and do not operate as financial intermediaries. Most often, these are **investment funds, hedge funds or ETF type funds.** The aim of these entities is frequently to gain profits from transactions in the market in the short term (within one day) or in the long term (within several or a dozen or so years).

Products available within the carbon market

The participants in the EU ETS system have access to emission allowances through the primary market where they can receive allowances free of charge or purchase them at auctions. They can also purchase them through the secondary market, concluding immediate transactions (spot contracts, so this is the so-called spot market) or derivatives transactions (futures and forward contracts). Transactions between the participants in the carbon market are often concluded in the regulated markets which trading venues constitute. By assumption, they are expected to ensure gre-

ater protection of their participants than transactions outside trading venues in terms of a correct settlement of transactions and the prevention of market abuse and manipulation and money laundering attempts. On the trading venues, immediate (spot) transactions or derivatives (futures) transactions are concluded. Transactions may also be concluded outside trading venues, e.g. via a broker in the so-called OTC market, most often by means of non standardised forward contracts or by means of bilateral agreements between the participants in the EU ETS[1].

At present, in Europe emission allowances can be purchased at three trading venues (Table 1 shows the types of emission allowance-related products which can be purchased at them):

- **ICE Endex with its registered seat in the Netherlands;**
- **Energy Exchange (EEX) with its registered seat in Germany;**
- **Nasdaq Oslo with its registered seat in Norway.**

The dominant form of trading in the allowance market are derivatives contracts as part of the futures market with a share of about 89%. This means that the share of immediate contracts as part of the spot market and the trading in the primary market as part of auctions is only 11%[2]. ICE Endex is the largest trading venue in Europe in terms of the traded volumes of emission allowances, as indicated by the large number of transactions concluded in the form of derivatives contracts on this trading venue.

In turn, as regards the entities which can conclude transactions in the carbon market, there are really no restrictions in place. Allowances in the market can be purchased by any entity, even individual investors, e.g. through the purchase of an ETF fund (at present, the largest one is KraneShares[3] in the USA) or a derivatives contract on allowances through brokerage offices (in Poland, this type of services is offered e.g. by XTB). Most transactions in this market are concluded by such entities as: financial intermediaries (financial and credit institutions), EU ETS installation operators (energy and industrial companies) and short--term and long-term investors (which are often called speculators).

The dominant form of trading in the allowance market are derivatives contracts as part of the futures market with a share of about 89%. This means that the share of immediate contracts as part of the spot market and the trading in the primary market as part of auctions is only 11%.

Purchasing strategies applied by the participants in the EU ETS[4]

Energy producers

Energy companies are the largest group of the participants in the EU ETS system in terms of the need to purchase and account for their emissions, since they generate about 50% of emissions in the EU ETS system. As the only sector in the EU ETS, the energy sector is not allocated free allowances and needs to cover 100% of its emissions with allowances purchased in the market. In order to secure the future sales of electricity and the associated carbon emissions, energy producers can buy allowances even for 4 years in advance, hedging their needs. In practice, energy producers take long positions in futures contracts, with a long maturity period (e.g. in 2025 or 2024), to minimise the costs

1 ISDA, Role of Derivatives in Carbon Markets, September 2021.

2 German Emissions Trading Authority (DEHSt) at the German Environment Agency, Auctioning (EU ETS) German Auctioning of Emission Allowances Annual Report 2021, February 2022.

3 https://kraneshares.com/carbon-suite/ (Accessed on 25 November 2022).

4 Prepared on the basis of M. Pahle and S. Quemin, Financials threaten to undermine the functioning of emissions markets, 2022.

TABLE 1. EUAs (PRODUCTS) AVAILABLE ON THE TRADING VENUES IN EUROPE.

Trading venue	Products available in the primary market	Products available in the secondary market
EEX	EUA/EUAA auctions in the form of 2 spot contracts	EUA/EUAA spot contracts, EUA/EUAA futures contracts (e.g. DEC22, MAR23), EUA futures option contracts
ICE Endex	No primary market	EUA spot contracts, EUA/EUAA futures contracts, EUA futures option contracts
Nasdaq Oslo	No primary market	EUA spot contracts, EUA futures contracts,

Source: Own elaboration by KOBiZE on the basis of data from the websites of the EEX, ICE and Nasdaq trading venues.

and risks related to possession of EUAs. An advantage of this strategy is that there is no need to provide the entire financial resources for allowance purchases in a later period, except for a small part of them to cover the so-called security deposit for a contract. Another advantage is the guaranteed price as set in the contract at its expiration date. Thus, the company benefits from such a solution, e.g. in case of a drastic surge in allowance prices in the future. Large enterprises participate in allowance trading, mainly via their departments or specialised trading units which have emerged as a result of their long-term experience in operations in commodity markets before the introduction of the EU ETS. Therefore, they have direct access to the carbon market through many channels, such as auctions (the primary market), trading venues and the OTC market outside trading venues (the secondary market). For this purpose, in addition to securing the allowance prices as part of hedging, they can apply the "carry trade" strategy, which consists e.g. in the purchase of allowances in the primary market (at auctions) and their resale in the secondary market. This strategy is applied e.g. by such companies as Vattenfall, EDF or Engie. There are also energy producers such as CEZ or Statkraft which are closer to financials, since they act almost entirely as intermediaries applying the "carry trade" type strategy[5].

Unfortunately, there are no relevant data which would specify the exact share of energy producers in the carbon market. In the classification applied by the ESMA supervisory authority for reporting EUA transactions, energy producers are classified in the category "Commercial Undertakings". According to the data published in reports on transactions (the so-called Commitment of Traders – COT), their share in the market of long positions in EUAs is now about 59%, half of which (as estimated by the ESMA) can be electricity producers. The others are commercial undertakings trading in EUAs.

5 German Environment Agency, Trading activities and strategies in the European carbon market. Final report, April 2022.

> Energy companies are the largest group of the participants in the EU ETS system in terms of the need to purchase and account for their emissions, since they generate about 50% of emissions in the EU ETS system. As the only sector in the EU ETS, the energy sector is not allocated free allowances and needs to cover 100% of its emissions with allowances purchased in the market. In order to secure the future sales of electricity and the associated carbon emissions, energy producers can buy allowances even for 4 years in advance, hedging their needs

Industry sector

Given its free allocation of allowances, the industry sector needs to become engaged in the carbon market to a much lesser extent than the energy sector does. Historically, most enterprises could even use the allowances saved from previous years (if they had a surplus). In turn, at present, the standard practice is to borrow allowances allocated in a given year in order to account for the emissions in the previous year (so-called borrowing). Due to such a possibility, depending on the needs, many industrial enterprises do not need now to purchase allowances in the market. It should be emphasized, however, that this can change in the future, given the strengthening of the reduction targets. As a matter of fact, certain companies can even have in their accounts now the allowances which they have saved from the previous years. In such a case, they can sell them to improve their financial liquidity or collect them in their accounts, thus protecting themselves against their rises in the future (so-called hoarding). The allowances can also be used as collateral for loans to reduce the costs of financing, If, in contrast, industrial enterprises have not enough allowances, they most often use the services of specialised intermediaries, i.e. brokers or banks.

In the classification of entities applied by the ESMA, the industry sector is assigned to the category "EU ETS operators". According to the COT data, the share of industry in the market of long positions in EUAs is now no less than 17%, although a part of this share can also be attributed to energy producers (e.g. because in their transaction reports to the ESMA they said that they belonged exactly to this category of entities).

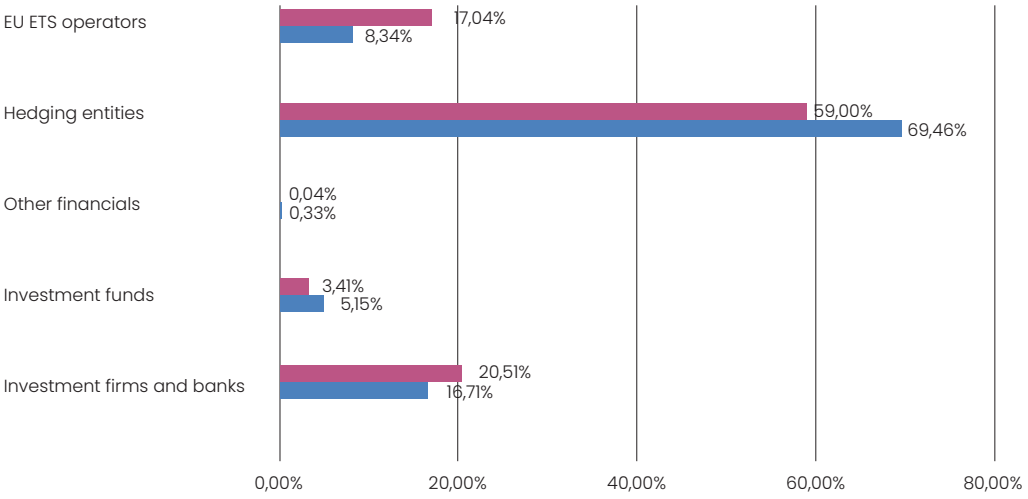
Purchasing strategies applied by financials

Financial intermediaries

The financials which are not obliged to account for their emissions as part of the EU ETS system can act as intermediaries between the entities operating in this system which want to purchase or sell allowances, ensuring liquidity in the market. Usually, the intermediaries secure their transactions by concluding a futures or forward contract giving them the right to sell allowances in the future at a predetermined price (the so-called short position). For this purpose they purchase allowances in the primary market (at auctions) or in the spot market. Financial intermediaries can also trade on their own account, gaining profits from their transactions. The role of intermediaries is also to level out any misfits between demand and supply by delivering allowances to the market, thus helping the installation operators within the EU ETS minimise their transaction costs. In the classification of entities applied by the ESMA, intermediaries are assigned to the category "Investment Firms or Credit Institutions".

According to the COT data, the share of intermediaries in the market of long positions in EUAs is now about 20%. In contrast, because of the role they play, the share of intermediaries in the market of short positions (the right to sell allowances) is much higher. It is now about 85%.

CHART 1. SHARES OF THE PARTICULAR CATEGORIES OF ENTITIES IN THE MARKET OF LONG POSITIONS IN EUAs, ACCORDING TO THE COT CLASSIFICATION.



	Investment firms and banks	Investment funds	Other financials	Hedging entities	EU ETS operators
11.11.2022	20,51%	3,41%	0,04%	59,00%	17,04%
14.01.2022	16,71%	5,15%	0,33%	69,46%	8,34%

Source: Own elaboration by KOBiZE on the basis of data from the ICE Future Europe trading venue.

> The financials which are not obliged to account for their emissions as part of the EU ETS system can act as intermediaries between the entities operating in this system which want to purchase or sell allowances, ensuring liquidity in the market. Usually, the intermediaries secure their transactions by concluding a futures or forward contract giving them the right to sell allowances in the future at a predetermined price (the so-called short position). For this purpose they purchase allowances in the primary market (at auctions) or in the spot market.

Investors (speculators)

In the market, there are also entities which are not obliged to account for their emissions or do not play the role of financial intermediaries. Their goal is to make money in the short or long term. Therefore, the entities of this type can be divided into short-term or long-term speculators (investors). Certainly, their activity also involves the risk of a possible loss. It should be pointed out that speculators are present in almost all the financial markets with any prospects for profits. Short-term speculators seek to gain profits in daily, monthly or yearly timeframes. They take advantage of short-term price variations and thus they can increase price variability. In turn, long-term investors operate in the timeframes of several or a dozen or so years (e.g. pension funds, which invest in the timeframe of 10-15 years), applying the "buy and hold" type strategy or, in other words, "a one-way bet". It is exactly their activity that poses the highest risk of destabilising the EU ETS system, since, in theory, in such a relatively small market as the carbon market (e.g. compared with the fuel or coal markets), they can buy up most of volumes, thus drastically reducing their supply, and keep them in their accounts for a very long time.

TABLE 2. GROWING NUMBERS OF ENTITIES ENGAGED IN TRANSACTIONS IN THE CARBON MARKET IN THE PERIOD FROM 2018 TO 2022 (DATA FROM THE ICE ORAZ EEX TRADING VENUES).

ICE	Compliance Entities and Other Non-Financials	Funds and Other Financials	Investment Firms	Total
2018	140	206	38	384
2019	154	248	41	443
2020	162	278	42	482
2021	301	368	100	769
2022*	301	374	116	791

** Data until 4 March 2022*

EEX	Compliance Entities and Other Non-Financials	Funds and Other Financials	Investment Firms	Total
2018	38	0	10	48
2019	44	0	16	60
2020	56	0	16	72
2021	68	1	24	93
2022*	63	0	33	96

** Data until 4 March 2022*

Source: ESMA

This is particularly important for operators functioning in the EU ETS which are obliged to account for their emissions.

The ETF funds, which have increasingly been gaining in popularity, can also be assigned to the group of long-term speculators. The funds of this type can e.g. purchase allowances on behalf of individual investors, treating them almost as a 100% safe capital investment. An increase in access to the ETF funds investing in physical allowances or their contracts can turn into the so-called "buying mania" and lead to the formation of a price bubble which most often bursts with the participation of individual investors.

In the classification of entities applied by the ESMA, intermediaries are assigned to the two categories: "Investment Funds" and "Other Financial Institutions". According to the COT data, the share of intermediaries in the market of long positions in EUAs is now more than 3%.

> Speculators activity poses, in general, a large risk of destabilising the EU ETS system, since, in theory, in such a relatively small market as the carbon market (e.g. compared with the fuel or coal markets), they can buy up most of volumes, thus drastically reducing their supply, and keep them in their accounts for a very long time. This is particularly important for operators functioning in the EU ETS which, willy-nilly, need to account for their emissions

Summary and conclusions

2021 and 2022 saw an increasing market activity of entities purchasing allowances for profit (intermediaries and investment funds). From their point of view, the carbon market became a promising investment opportunity, among others, in light of the strengthening of EU climate policy (i.e. raised reduction targets in the EU ETS and increased demand for allowances in the future, the energy crisis, involving higher prices of energy raw materials and energy), the absence of any restrictions on the participation in this market, or the absence of "a safety valve" enabling the EC to intervene in this market in case prices grow too fast. This is reflected in numbers. According to the data from the European Securities and Markets Authority (ESMA), since 2018 the numbers of investment funds and investment firms intermediaries have grown, respectively, by about 82% and 210%. Moreover, the growth rate of these increases clearly sped up in 2021. In the same time, the involvement of EU ETS operators and non-financials in the market grew very strongly – by almost 105%. The increase in the number of the participants in the EU ETS market coincided in time with increases in traded volumes. According to the data from Refinitiv, in the period from 2019 to 2021, the trade in emission allowances (excluding options) grew by about 40%.

TABLE 3. NUMBER OF ENTITIES, BROKEN DOWN INTO THOSE PARTICIPATING IN THE EU ETS SYSTEM AND THE OTHER ENTITIES (DATA FROM THE EEX AND ICE TRADING VENUES).

Year/ Category	EU ETS operators + non-financials (including those applying hedging)	Increase in % vs. 2018	Investment funds	Increase in % vs. 2018	Investment firms	Increase in % vs. 2018
2018	178	x	206	x	48	x
2019	198	11,23%	248	20,39%	57	18,75%
2020	218	22,47%	278	34,95%	58	20,83%
2021	369	107,30%	369	79,12%	124	158,33%
2022	364	104,49%	374	81,55%	149	210,47%

Source: ESMA data.

Given the recently greater interest in the EU ETS, it can be expected that in the subsequent years the investment funds and other entities seeking to gain profits from growing allowance prices will increase further their share in this market. Most probably, the market will become more attractive for natural persons who will also want to make money on the future boom in emission allowances. They can do it e.g. via the ETF type funds which are increasingly gaining in popularity and are easily available in Europe. There is no doubt that in the longer term the allowance prices in this market will grow. This is suggested by predictions published by analytical centres which expect e.g. that in 2030 the prices will exceed EUR 140, or by the fundamental factors which indicate that the quantities of allowances available for purchases in the market will fall from year to year in the current trading period (among others, due to the Fit for 55 package or the strengthening of the operation of the MSR reserve).

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New European Bauhaus: the EU support to cities and citizens for local initiatives focused on sustainable development and green transformation

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New European Bauhaus: the EU support to cities and citizens for local initiatives focused on sustainable development and green transformation

Key words: New European Bauhaus, European Green Deal, energy, climate, the European Union, sustainable development, green transformation, social participation, architecture, design

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Summary

New European Bauhaus (NEB) is an example of a very interesting EU initiative which demonstrates how modern, environmentally friendly, bottom-up and inclusive activities in the fields of architecture and industrial design can respond to the challenges and risks of modern civilization while at the same time supporting the development of local communities. Through such interdisciplinary projects it is possible to draw the public's attention to important issues, which are undoubtedly climate protection, attitude of responsibility of the younger generation and care for the local environment.

NEB can be a creative tool to support the process of long-term improvement of energy efficiency in buildings, reduction of CO_2 emissions and improvement of air quality. The integration of multiple disciplines in efforts to improve the quality of space and community life also involves processes of knowledge communication beyond professional circles. This article presents the idea and main principles of NEB, on its example discussing the role of popularisation and facilitation of local community initiatives aimed at shaping and implementing patterns focused on sustainability and green transformation.

New European Bauhaus, NEB is an environmental, economic and cultural initiative for Europe, launched by the President of the European Commission, Ursula von der Leyen, in her State of the Union Address 2020[1]. A year later she expressed her conviction that if the European Green Deal has a soul, then it is the New European Bauhaus that will lead to an explosion of creativity across the EU[2].

> If the European Green Deal has a soul, then it is the New European Bauhaus that will lead to an explosion of creativity across the EU.

1 State of the Union Address 2020, 16 September2020. (https://ec.europa.eu/commission/presscorner/detail/en/SPEECH_20_1655; access 08.07.2022)
2 State of the Union Address 2021, 15 September 2021. (https://ec.europa.eu/commission/presscorner/detail/ov/SPEECH_21_4701; access 08.07.2022)

The aim of this article is to present the role of popularisation and facilitation of local social initiatives aimed at shaping and implementing patterns focused on sustainable development and green transformation, using the NEB project as an example. The following text is a contribution to introduce the readers to the genesis of NEB, its assumptions and challenges, sources of funding, implementation timetable, as well as specific examples of activities that make up the implementation of this project, including in the local (and national) context with the participation of local communities.

Sample Bauhaus buildings in Dessau-Roßlau: entrance to Bauhaus art school building (1926)
Source: J. Żabicka

The initiative was inspired by the famous Bauhaus school of design and architecture, founded in 1919 in Weimar by the architect Walter Gropius. In its pedagogy and conceptual thought, the original Bauhaus sought to give shape to a universal modernism. It was in modernism where aspects relating to housing, self-sufficiency and household management played an important role alongside those relating to society as a whole. In the Bauhaus style, it was form that followed function, not the other way around. Between 1919 and 1933, the Bauhaus provided important impulses for a revolution of thought and action in 20th century architecture and art[3].

Sample Bauhaus buildings in Dessau-Roßlau: one of the Masters' Houses designed by Walter Gropius (1925-26)
Source: J. Żabicka

The Bauhaus and its model buildings in Weimar and Dessau-Roßlau were put on the UNESCO World Heritage List in 1996. Looking at the following examples of the now iconic Bauhaus buildings (ref. Photograph 1 and Photograph 2), it is indeed hard to believe that they were all built as far back as 100 years ago. And, to tell the truth, from this perspective, it is impossible to deny them their testimony of vision and innovation. The same edifices are now also a good example of a successful revitalization of this type of historic buildings.

3 100 years of Bauhaus. Eight facts about Bauhaus that one needs to know. (https://www.goethe.de/ins/pl/pl/kul/mag/21356319.html; access 11.07.2022)

Nevertheless, it begs the question: what do a historic arts and crafts school, an architectural style and contemporary EU climate and energy policy have in common? Seemingly nothing, yet quite a lot.

In its contemporary version, the NEB is intended to be the driving force through which the transformation towards achieving EU climate neutrality by 2050, as envisaged under the European Green Deal (and in particular under Circular Economy Action Plan, CEAP), will be able to take place in a way based on aesthetics, functionality and state-of-the-art technology, and that is human-centred. Thus, it is intended that the common denominator of both initiatives is to put the human beings at the very heart, with an emphasis on aesthetics, functionality, innovation and multidisciplinarity.

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The task of the contemporary NEB is to create an intellectual space for the integration of science, technology, culture and the arts in a way that will empower scientists to find solutions to current problems identified by citizens and society at large.

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The task of the contemporary NEB is to create an intellectual space for the integration of science, technology, culture and the arts in a way that will empower scientists to find solutions to current problems identified by citizens and society at large. Thanks to this EU initiative, it will be possible to accelerate the transformation of various economic sectors, including construction, textiles or furniture industries, resulting in the provision of goods and services for consumers, while maintaining the principles of a circular economy and reducing CO_2 emissions. With sustainability and community engagement as its core values, the NEB will make investments that develop the aesthetics of green transformation in an attractive, innovative, man-made way, in line with the initiative's slogan: „beautiful – sustainable – together". The NEB is intended to be inclusive, expanding the opportunities available to its participants and encouraging dialogue in a broad sense.

Overall, EUR 85 million will be earmarked for NEB project funding in 2021-2022 under various EU programmes such as:

- HORIZON;
- LIFE 2021-2027;
- European Regional Development Fund, ERDF.

NEB is also included in a wide variety of EU programmes as a part of the context or as one of the priorities, without a pre-defined budget, including the following:

- Creative Europe 2021-2027, CREA;
- ERASMUS+;
- Single Market Programme, SMP;
- European Solidarity Corps, ESC;
- Digital Europe Programme, DEP.

The implementation of the NEB project has been divided into the following 3 phases (ref. Table 1), which partly have been, are and will be carried out in a parallel manner:

- **Design Phase** – 4th quarter 2020 – 3rd quarter 2021 (1 year) – the aim of this phase (already completed) was to create a framework with calls for proposals for at least five areas where it is possible to materialize the NEB concept, which will allow good ideas to be accelerated, fleshed out and turned into reality. The pilot programmes were distributed in various EU Member States;
- **Implementation Phase** – 4th quarter 2021 – 2023+ (over 2 years) – it has started with the creation of the NEB pilot programmes. Accompanying initiatives identified during the design phase as well as digital networks and platforms complement the pilot programmes to structure and diffuse the initiative. The NEB community, made up of all participants of the design phase, monitors the implementation of the programmes and all the partners involved in this initiative gain knowledge, experience and benefit from the first experiments in order to gain future impact capacity.
- **Dissemination Phase** – 1st quarter 2023 – 2024+ (over 2 years) – in this phase the NEB will focus on disseminating good ideas and concepts not only in Europe but also beyond. This will include networking as well as knowledge sharing between the practitioners – on the best available methods, solutions and prototypes. The aim of these activities will be to enable change leaders to replicate their experiences in local communities of cities and rural areas, as well as to inspire a new generation of architects and designers in this way.

In order to achieve the objectives of the NEB, the European Commission supports the movement of interested individuals and organizations. For this purpose, it organizes, among other things, an annual festival and awards the NEB awards. As part of the special calls announced by the European Commission, it is possible to obtain expert or financial support for the implementation of projects that fit into the NEB concept. The awards are given to the projects and ideas that contribute to creating beautiful, sustainable and inclusive places in four categories:

- Return to nature;
- Regaining the sense of belonging;
- Giving priority to people and places who need it the most;
- Shaping a circular industrial ecosystem and supporting lifecycle thinking.

In each of the above categories, there are two parallel competition themes: „New European Bauhaus Awards" – for the existing projects completed in the last two years, and „New European Rising Stars of Bauhaus" – for concepts or ideas submitted by young creators under 30 years of age. Entrepreneurs, local governments and scientists can be involved in the implementation of projects. Among the finalists in both categories we already had some representatives of Poland:

- Modular shutter gardens that allow everyone to have a garden by their window, especially those living in high-rise buildings without balconies[4];
- project of adaptation of rural grannaries in accordance with the FOLK concept[5];
- Rokietnica project – transformation of a dilapidated country estate into a local community centre and regional innovation centre[6].

4 https://prizes.new-european-bauhaus.eu/node/304046 ;(access 11.07.2022)
5 https://prizes.new-european-bauhaus.eu/node/304209 ;(access 11.07.2022)
6 https://prizes.new-european-bauhaus.eu/node/292415 ;(access 11.07.2022)

Additionally, at the beginning of April 2022 the European Commission launched the NEB Lab[7] in the form of an analytical and design centre, where the prototypes will be jointly developed, the tools will be tested as well as the policies' solutions and recommendations will be prepared. The launch of the NEB Lab was initiated by the invitation to the supporters of the initiative in question for a more direct engagement of enterprises and public entities (regions, town and villages) in this project. Its aim is to further develop this community, currently comprising of over 450 official partners, high-level round table members, national focal points as well as winners and finalists of the NEB awards.

In developing the infrastructure (including the digital platform) of the NEB Lab[8], the European Commission invited the NEB community to collaborate in the following fields:

- **„Labelling strategy"** – the project that has invited experts, academics and professionals in the fields of sustainable development, social inclusion and aesthetics to contribute to the creation of guidelines and evaluate frameworks that will help ensure that projects are well aligned with the NEB core values;
- **„Analysis and experimental research of regulatory solutions"** – work aimed at exploring how regulatory frameworks in place at all levels can support the development of projects under the NEB;
- **„Innovative financial instruments"** – two separate projects that will allow testing innovative solutions under the NEB in the field of project funding with the active involvement of stakeholders in the areas of crowdfunding and public funding as well as co-funding in the context charity activities.

The issues listed above complete the current initiatives aiming to promote the transformation of places of learning as well as the applications for support for the citizens of cities, towns and rural areas to propagate the NEB project in their local communities under Cohesion Policy, by calling the proposals under:

- **„Civic participation"** – the project aims to encourage citizens to identify challenges relevant to their local communities from a NEB perspective and to work together to develop solutions. The projects are designed to help them develop more sustainable habits, create new products, services or solutions as well as to become the instigators of change;
- **„Collective creation of public space"** – the project aims to support the innovative solutions in the NEB-related fields by encouraging local entities to develop inspiring, beautiful and sustainable ideas for redesigning public spaces in cities, urban and rural areas, while creating new solutions in the field of transformation;
- **„Support for local initiatives in the NEB field"** – the project aims to provide technical support to small and medium-sized municipalities that do not have the capacity or extensive expertise needed to implement their NEB initiatives. Under this call, there are to be selected 20 site-specific project concepts that will benefit from tailor-made support on the ground provided by a group of interdisciplinary experts in order to shape these concepts in line with the NEB and the objectives of the European Green Deal.

The EU Cohesion Policy support in the above-mentioned thematic areas should contribute to a targeted approach to NEB initiatives on both the regional and local levels, as well as to involve the public authorities in the Member States in launching more NEB projects also at the national level. NEB will also provide a space for the implementation of bottom-up, regional initiatives related to our coexistence in Europe, such as:

- **„New European Bauhaus: direction South"** – the project bringing together six schools of architecture from Southern European countries (Portugal, Spain, France, Italy, Croatia and Greece),

7 More information on NEB Lab on website: https://europa.eu/new-european-bauhaus/about/neb-lab_en; (access 12.07.2022)
8 https://europa.eu/new-european-bauhaus/about/neb-lab_en; (access 12.07.2022 r.)

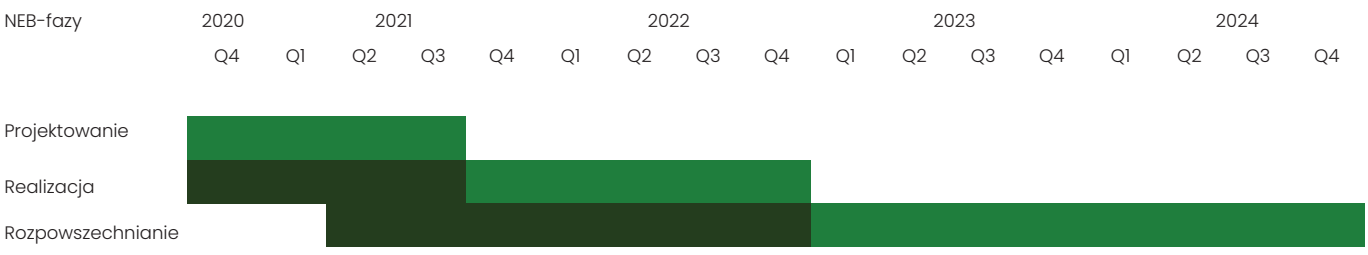
which will jointly reflect on education and its improvement through architecture;

- **„Nordic Bauhaus CO_2 emission-neutral"** – the project that focuses on sharing experiences on how architecture, design and art can contribute to creating a CO_2-neutral built and living environment in an inclusive way;
- **„New European Bauhaus in the mountains"** – the project that aims to improve the quality of built environment as well as quality of life for citizens in rural and mountainous areas.

At this point it is worth noticing Poland's experience with the NEB programme. From January 2022 the Łukasiewicz Research Network has been designated as the National Focal Point (NFP). It incorporates 4,500 academics and engineers working for business, who support it in solving technological problems, conducting research and development projects, modernising the equipment, creating new products and striving to make the technologies work better, be cheaper and more effective. Within the NEB, Łukasiewicz is working on their own projects, for example a project to renovate large-panel blocks of flats in the context of improving energy efficiency and aesthetic values of these buildings. In addition, in their role as NFP, Łukasiewicz brings together and coordinates a network of Partners and Friends of the NEB.

Any entity that is not profit-oriented or is not part of a public or local government administration can become a **NEB Partner**[9]. The role of NEB Partners is to assist in building and inspiring the NEB community. At the same time, they act as advocates for the initiative. In order to become a NEB Partner, one has to go through a four-step application procedure, the purpose of which is to verify whether and to what extent the mission, values, experience and goals of the organisation fit into the overall objectives of the NEB. The European Commission systematically reviews the applications received to check the scope, quality, scale and diversity of the proposed actions. The call for applications is ongoing, with a one-month summer break – the system for partnership applications was reopened in September 2022. Polish entities that have so far obtained the status of NEB Partner are: BWA Wrocław, Faculty of Architecture of the Wrocław University of Technology, Landscape Protection Foundation, Laboratory of Architecture 60+, Urban Sports Square Foundation, Laboratory for Urban Research and Education,

TABLE 1. NEB PROJECT IMPLEMENTATION SCHEDULE



Source: Own compilation based on the European Comission materials

9 More information on NEB Partner status and the related application procedure at: https://europa.eu/new-european-bauhaus/get-involved/call-partners_en; (access 12.07.2022)

Museum of Modern Art in Warsaw, Chamber of Polish Architects, PPNT Gdynia, Time Space Identity Association, Traffic Design Association, SWPS University, Warsaw University of Technology.

On the other hand, all other entities – profit-oriented institutions and public or local government administrations – can become a **Friend of the NEB**[10]. This form of cooperation is addressed to cities, towns, villages, regions and companies. Again, an appropriate application form must be completed and submitted. After successfully passing the four-stage application process, new Friends of the NEB can join the existing community of 450 entities we had mentioned earlier. Friends are a very valuable asset of the NEB community. They have access to a dedicated online platform, hosted and maintained by the European Commission. This platform supports networking, community building and knowledge sharing. Friends of the NEB by invitation can participate in projects run by the Commission or the NEB community. They can also recommend projects to Partners and support them in several ways, for example by implementing projects in their regions. They can also propose their catalogue of solutions to help in the implementation of the initiative. It is worth noting here that the NEB Friends are obliged to comply with strict rules of environmental and social responsibility. At present, the status of Friend of the NEB was granted to only one Polish entity – the Ostróda municipality. However, it must be remembered that this network is still being built and developed.

Summarising the above information, it should be stated that a very important element of the planned ecological transformation under the European Green Deal (EGD) are innovative management structures, aimed at effective cooperation for the creation of a sustainable living environment, taking into account social, economic, environmental, cultural aspects as well as quality planning processes (innovative and inspiring solutions). They require a systemic approach and holistic thinking due to the existing interconnections and dependencies. In this context, it seems particularly important for local authorities to be proactive in creating opportunities for cooperation and in harnessing the activity of residents and users of cities, towns and rural areas for the successful implementation of adaptation measures that will be a „tangible" and positive experience for them.

It seems particularly important for local authorities to be proactive in creating opportunities for cooperation and in harnessing the activity of residents and users of cities, towns and rural areas for the successful implementation of adaptation measures that will be a „tangible" and positive experience for them.

Referring to the issue of international collaboration of local communities and cities in the implementation of the EGD policies, it is worth noting the fact that on 29th September 2022, during the European Days of Research and Innovation, 60 European cities joined **CrAFt** (Creating Actionable Futures) **project**, implemented under the EU instrument – Europe Horizon. Inspired by the NEB, this project brings together cities, citizens, policy makers, arts and academia in order to co-shape the transition to climate neutrality by 2030. The CrAFt cities („Reference cities") which have joined first three pilot cities of the project („Sandbox cities") – Amsterdam, Bologna i Prague – are going to co-create and test models of joint management of urban transformation.

10 More information on NEB Friend status and the related application procedure at: https://europa.eu/new-european-bauhaus/get-involved/call-friends_en; (access 12.07.2022)

FIGURE 1. MAP OF EUROPEAN PARTNER CITIES PARTICIPATING IN THE CrAFt PROJECT

Source: https://craft-cities.eu/wp-content/uploads/2022/09/craft-map.pdf; (access: 06.10.2022)

They will receive implementation support and will become role models for other cities across Europe. The representative of Poland in this group is Łódź – a city that is one of the most important Polish industrial centres, also known as the „Polish Manchester" due to its once dominant textile industry, which is now being replaced by the development of new technologies.

> NEB is an example of a very interesting initiative that demonstrates how modern, environmentally friendly, bottom-up and inclusive activities in the fields of architecture and industrial design can respond to the civilizational challenges of the modern world and the related threats, while supporting the development of local communities. Through such specific initiatives, it is possible to draw public attention to such undoubtedly important issues as climate protection, the attitude of responsibility of the young generation, as well as care for the local environment.

Summing up, the NEB is an example of a very interesting initiative that demonstrates how modern, environmentally friendly, bottom-up and inclusive activities in the fields of architecture and industrial design can respond to the civilizational challenges of the modern world and the related threats, while supporting the development of local communities. Through such specific initiatives, it is possible to draw public attention to such undoubtedly important issues as climate protection, the attitude of responsibility of the young generation, as well as care for the local environment. By supporting the ecological transformation of the European Union, including the process of adaptation to climate change, these activities can contribute to improving the resilience of Member States to current and expected climate change. Therefore, the NEB, along with the "Renovation Wave" strategy and the "From Farm to Fork" strategy, as well as the development of taxonomy and sustainable finance sector, may be one of the European Commission's valuable initiatives – especially given its appeal to the young generation of Europeans – in order to ensure a multi-sectoral and comprehensive approach to the EU-level goal of achieving climate neutrality by 2050.

> In the context of the Energy crisis and price crises [...] resulting in high energy prices in Europe, the NEB takes on an additional – economic dimension.

On the other hand, now, in the context of the Energy crisis and price crises caused by, among others, Putin's war in Ukraine, which has been going on for over half a year now and the „energy war" between Russia and the West, resulting in high energy prices in Europe, the NEB takes on an additional – economic dimension. In her latest State of the Union address (SOTEU 2022), the President of the European Commission Ursula von der Leyen said: „This is a war on our energy, a war on our economy, a war on our values and a war on our future".

In this situation, the decarbonisation of the building stock may be dictated by the growing necessity to become independent from the supply of energy resources from the East, which are used by the Kremlin as a silent „weapon" and an instrument of political pressure. In today's market realities, we should rethink our buildings to save energy, reduce CO_2 emissions, while leading to sustainable improvements of local living conditions. In the current state of affairs, NEB can therefore be a creative tool to support the process of long-term improvement of energy efficiency in buildings, reduction of CO_2 emissions and improvement of air quality.

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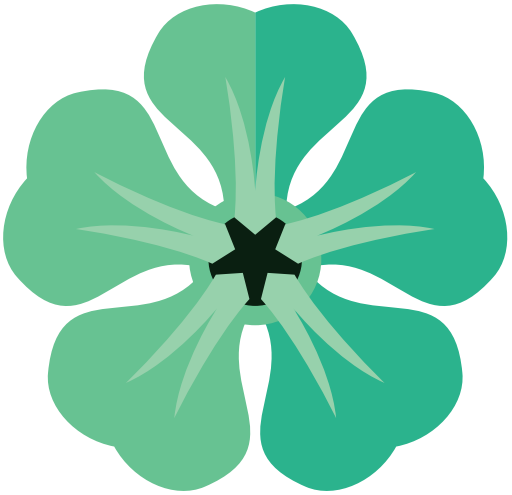
6. State of the Union Address 2020, 16 September 2020. (https://ec.europa.eu/commission/presscorner/detail/en/SPEECH_20_1655; access: 08.07.2022)
7. State of the Union Address 2021, 15 September 2021. (https://ec.europa.eu/commission/presscorner/detail/ov/SPEECH_21_4701; access: 08.07.2022)
8. State of the Union Address 2022, 14 September 2022. (https://state-of-the-union.ec.europa.eu/system/files/2022-09/SOTEU_2022_Address_original_version.pdf; access: 06.10.2022)
9. Website of the Łukasiewicz Research Network (https://lukasiewicz.gov.pl; access: 11.07.2022)



Global trends in the development of market-based mechanisms as measures to reduce emissions

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Abstract

The analysis presented in this article addresses the trends in the global carbon credit markets and the implementation of the market-based mechanisms under Article 6 of the Paris Agreement which are expected to give momentum to the development of the international market under this Agreement. The article shows the context in which the voluntary market operates. The market seeks to fill in the gap in the efforts to ensure that enterprises have offset units to account for the measures taken as part of corporate social responsibility (CSR) and now more and more often social and environmental corporate responsibility (SECR). It addresses the expectations of business and the Parties to the Paris Agreement for the voluntary and international markets to fill in the gap in the ambition of the actions of States in order to reduce emissions to the extent which would enable the achievement of the long-term goal of the Agreement, the potential scale of the use of carbon credits and the types of actions applied to generate offset units, with an indication of nature-based solutions (NBS) and an indication the popularity of forest projects, particularly REDD+. The article explains briefly the purposes of REDD+ projects and why some nongovernmental organisations are against offset projects to avoid deforestation in the developing countries. However, apart from the purely formal conditions related to the implementation of projects, the use of the potential of voluntary actions depends on their attractiveness to unit buyers; i.e. on their prices and additional benefits from the implementation of projects for the environment and local communities (issues of crucial importance for CSR). The question is whether the carbon offset market will fulfil the hopes placed in it.

Economists believe that climate change has been caused by a market failure on a global scale. One of the ways of tackling this problem is expected to be the dissemination of emission allowance trading systems or the mandatory cancellation of carbon credits. At least in theory, the establishment of a global market where the equivalent of one tonne of CO_2 captured and removed from the atmosphere would be the same commodity as other goods which are traded on exchanges, is expected to generally unlock the financing of measures to reduce greenhouse gas emissions. Over the recent decade, several mandatory emission trading systems have emerged. To date, the EU emission allowance trading system (EU ETS) has been the most important and effective of them in reducing emissions. As part of the global market-based approach, by buying up carbon credits private investors will finance additional actions and thus supplement the climate action resources from

public funds which are insufficient in relation to the identified needs. Carbon removals from the atmosphere are a more effective action than emission reductions alone. The achievement of zero emissions on a global scale requires carbon removals from the atmosphere on a massive scale, since the efforts pledged to date by the Parties to the Agreement are insufficient to achieve its goal. Moreover, even if most advanced new technologies are applied some quantity of emissions, defined as residual emissions, e.g. from technological processes, will still continue to be released. This is expected to be tackled by carbon capture and storage (CCS) or carbon capture, utilisation and storage (CCUS)[1]. Therefore, given the absence of other alternatives related to carbon capture, transport and storage on an industrial scale in the early development period of relevant technologies, projects in the sector called the Land Use, Land Use Change and Forestry (LULUCF) sector or the Forestry and Other Land Use (FOLU) sector by the Intergovernmental Panel on Climate Change[2] are highly popular with investors.

1 IEA, About CCUS. Playing an important and diverse role in meeting global energy and climate goals. Technology report, April 20201 ; About CCUS – Analysis - IEA; (Accessed on 22 September 2022).
2 For more on the IPCC, see the website of this UN body established to assess climate change-related scientific issues ; IPCC — Intergovernmental Panel on Climate Change; (Accessed on 17 September 2022).

By the end of August 2022 the value of the voluntary carbon credit market had exceeded USD 2 billion.

In 2021, the value of the voluntary carbon credit market exceeded USD 1 billion. Although this value had doubled by August 2022, McKinsey indicates that in order to achieve the reduction targets consistent with its potential by 2030, the value of the voluntary market would have to grow even 15 times[3]. If the projects to remove carbon in a natural way reached the potential of 7 $GtCO_2$ annually by 2030 and the price of one credit reached USD 20, the financial flows between the unit buyers and the countries of the South would exceed USD 100 billion[4].

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It follows from the calculations presented by the Ecosystem Marketplace experts[5] that 2021 was the year when the volume of trade in the voluntary carbon credit market broke every previous records. Therefore, it can be considered that

3 C. Blaufelder, C. Levy, P. Mannion, D. Pinner, A blueprint for scaling voluntary carbon markets to meet the climate challenge, 29 January 2021; A blueprint for scaling voluntary carbon markets | McKinsey; (Accessed on 21 September 2022).
4 WEF in collaboration with McKinsey & Company, Nature and Net Zero, May 2021, p.6; Report: Nature and Net Zero | World Economic Forum (weforum.org); (Accessed on 17 September 2022).
5 Ecosystem Marketplace.

the efforts of the UK presidency before COP26 in Glasgow, which were focused on arousing investors' interest in voluntary carbon credits and their making voluntary commitments to achieve zero emissions brought the expected outcomes, since this trend was continued in 2022[6]. The achievement of the greenhouse gas reduction level required for reducing emissions to zero by 2050 means that the offsetting mechanisms can and, as their proponents argue, should play a significant role in reaching climate neutrality[7]. However, to make this possible, both the governments and the public need to reach a consensus that the offsetting mechanisms are necessary and even indispensable for achieving the goals of the Paris Agreement, which will strengthen even to a greater extent the motivation of companies undertaking offsetting actions or buying carbon credits to use them in order to reduce the impacts of their emissions as part of their corporate social responsibility. In conclusion, this needs a political decision of states to support the offsetting and recognise their role, at both the national and international levels, and to ensure the integrity of the voluntary markets which are self-regulating mechanisms.

The voluntary character of these markets means that governments at the national level do not seek to regulate them[8] and their integrity depends on the good will of the market participants and their determination to only choose credits fulfilling specific conditions rather than be solely guided by the price criterion, as, indeed, the unit prices in the voluntary markets can vary by several to a dozen or so USD.

Types of mitigation projects which generate credits for the voluntary markets

Carbon units from projects carried out by both private and public entities are placed on the voluntary markets. The private entities include both those that identify themselves with the non-profit sector, e.g. foundations, and private companies which implement projects for profit, while public entities are supported by the governments of certain states, e.g. Norway, Japan and, for a certain period of time, Australia.

The mitigation projects which generate units for the voluntary markets can be divided into technological ones and those involving nature-based solutions (NBS). The former include the implementation of RES, a switch to less emission-intensive fuels, the limitation of energy consumption, waste treatment or the capture of emissions, whereas projects involving nature-based solutions include forest projects (carbon removals through avoided deforestation, reforestation, the prevention of forest degradation and the implementation of sound forest management), other projects related to land use (peatland restoration, the conservation or recovery of meadows, projects to remove or limit emissions from the cultivation of farmland, the limitation of emissions from animal farming etc.). The potential for the use of nature--based solutions in 2030 to generate offsets can vary between 65% and 85% of the total reduction potential of voluntary mitigation projects, which are estimated to be capable of generating 8 to 12 $GtCO_2$ of emission reductions annually[9]. The practical mitigation potential of nature-based solutions (NBS) is estimated at 6.7 $GtCO_2$. Forest projects have for many years been very popular

6 World Bank, State and trends of Carbon Pricing, Washington 2022; State and Trends of Carbon Pricing 2022 (worldbank.org); (Accessed on 21 September 2022).

7 At this point, it is important to recall again the McKinsey forecasts of January 2021 regarding a 15-fold increase in the demand for voluntary carbon credits by 2030 and the a 100-fold increase in the demand by 2050. A blueprint for scaling voluntary carbon markets | McKinsey; (Accessed on 21 September 2022).

8 Voluntary carbon credits are regulated at the state level by California. For more on this subject, see: Program Q&As - Climate Action Reserve : Climate Action Reserve; (Accessed on 20 September 2022).

9 McKinsey, op. cit.

with investors seeking to use the offsetting mechanisms. The units from these projects already now reach higher prices than units from other projects, including those implementing RES. Due to a drop in the prices of technologies, the latter have lost additionality, since it is simply profitable to implement both them and projects to improve energy efficiency and the revenues from their implementation are higher than their additional costs. A common term "carbon dioxide removal" is used to denote projects to remove carbon dioxide from the atmosphere. This term is expected to suggest that the purpose is not only to offset emissions, which would not change the balance of gases released into the atmosphere, but rather to take actions to permanently remove carbon dioxide from the atmosphere.

In order to receive units certifying emission reductions in the voluntary markets, a project needs to be registered in one of the existing certification systems, in accordance with a specific standards. There are many standards in place in these markets for the certification of units from projects. The main standards are primarily the Gold Standard (GS), the Verified Carbon Standard (VCS)[10] and the American Carbon Registry (ACR) programme, the oldest of them, as it has been applied since 1996. Units from voluntary projects are also accepted by the cap-and-trade system in California, which registers voluntary credits as part of the register of offsetting actions operated in addition to the California Compliance Offset Program and is called the Climate Action Reserve[11]. The California Voluntary Offset Program offers support to entities carrying out voluntary projects in the form of know-how from the registration of a project to the issuance of carbon credits and infrastructure in the form of the credit registry. All the certification systems operated in the voluntary markets have in common their commitment to demonstrating that the projects registered by them meet specific criteria and can be used without doubts by Western companies to offset their emissions.

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Unlike the flexibility mechanisms under the Kyoto Protocol, the initial success of which, related to the authorisation of the units generated by the Clean Development Mechanism (CDM) and the Joint Implementation Mechanism (JI) for use in the EU ETS , gave momentum to the quick development of the flexibility mechanisms, there was no similar driver to enhance the development of the voluntary markets. Indeed, insufficient supply and growing demand can mean high credit prices and discourage investors. The already repeatedly cited analysis by McKinsey shows that the potential availability of credits should grow to levels of 8 to 12 $GtCO_2$ annually[12]. Paradoxically, in the voluntary registers there are sizable quantities of unused credits, which are reasonably priced, too. However, these are units from projects which raise buyers' doubts. The companies which invest in offsets want to be sure that the projects which have generated them have not caused and do not cause adverse impacts on the environment or local communities, including indigenous populations, that they are additional and permanent (i.e. they are not reversed by deliberate

10 Also known as Verra (after the non-profit organisation which manages it). Voluntary Carbon Markets - Verra ; (Accessed on 10 October 2022).
11 About Us - Climate Action Reserve : Climate Action Reserve; (Accessed on 21 September 2022).
12 A blueprint for scaling voluntary carbon markets | McKinsey; (Accessed on 21 September 2022).

actions, e.g. logging in forests after the completion of a project or the drainage of peatland protected by the project).

The role of carbon credits from voluntary actions in raising global ambitions

Credits from voluntary actions are financial instruments and can be used to demonstrate actions to mitigate greenhouse gas emissions taken by private investors and organizations which in increasingly large numbers commit on their own initiative to reduce the emissions generated by their activities. Carbon offsetting is usually much cheaper and easier to be done that emission reductions at source. In the initial stage of the trade in carbon credits, offsetting became ill-famed due to the cases of abuse in the context of the implementation of projects as part of the Clean Development Mechanism (CDM[13]). Nevertheless, both offset project developers and financiers strongly support the expansion of the voluntary markets, considering that they offer opportunities for the dissemination of market-based approaches not only in the developed countries but also in the developing ones.

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In accordance with the narrative popularised in this context and intended to restore a good reputation to offsets, the development of the voluntary carbon credit markets is absolutely necessary to achieve the goals of the Paris Agreement and to close the emissions gap, i.e. the difference between the levels of emissions needed to achieve the goal of the Agreement and the levels of reductions which can be achieved by the pledged Nationally Determined Contributions (NDCs). Assuming that this dependence was of crucial importance for supporting the mitigation efforts, in the period preceding CO26 the UK Prime Minister appointed Mark Carney, a former Governor of the Bank of England and the UN Special Envoy for Climate Action, to the position of his Financial Advisor for COP26. Carney promoted greening of the financial system, i.e. considering the issues related to climate change mitigation and environmental protection in decisions taken by financial institutions. The Taskforce on Scaling Voluntary Carbon Markets (TSVCM[14]), established on Carney's initiative, presented its estimations[15] indicating that the application of carbon offsetting mechanisms by means of the voluntary carbon credit market offers the potential for completely filing in the emissions gap between the commitments of the Parties to the Paris Agreement and the global reduction effort necessary to achieve its goals.

This would mean the need to increase the funds for projects to reduce and capture emissions via the voluntary carbon markets in the range from between USD 5 and 30 billion annually in the more conservative scenario to more than USD 50 billion in the expansive scenario, on the assumption that the demand for these units will vary around

13 In recent years, a number of publications have been published on this issue. Here, reference is made to an example of such articles: The CDM: Rip-offsets or real reductions?, Thinkprogress, July 15, 2009. The CDM: Rip-offsets or real reductions? – ThinkProgress ; (Accessed on 20 September 2022).

14 The participants in this initiative include more than 50 representatives of entities taking an active part in trade in carbon credits. They are supported by the Consultative Group the members of which represent another 120 entities operating in the voluntary markets, The Operating Team is sponsored by the Institute of International Finance (IIF). More information can be found on the website of the Institute www.iif.com.

15 Included in the Final Report of the Team, published in January 2021; Taskforce on Scaling Voluntary Carbon Markets. Final Report, January 2021; (Accessed on 15 September 2022).

1-2 GtCO2e annually[16]. In order to achieve zero emissions on a global scale by 2050, the global greenhouse gas emissions need to be halved from their present levels by 2030. According to McKinsey, in the period from 2019 to 2030 net reductions should reach 23 GtCO2e[17]. Reductions of this order cannot be achieved without the involvement of private entities. To date, only the EU has imposed through the ETS significant emission reductions on its enterprises[18]. Other emission trading systems are substantially less ambitious and their allowance prices do not represent incentives comparable to those of the EU ETS in terms of encouraging emission reductions; which are, moreover, implemented at source. Apart from the need for G20 countries to raise their levels of ambition, voluntary actions could play an enormous role in reducing emissions[19].

Voluntary actions have the potential to play an enormous role in achieving the goals of the Paris Agreement

Apart from more or less daring attempts to valuate the emitted CO_2 as part of mandatory fiscal mechanisms or regulations, for several years now the governments of the developed countries have encouraged business to become involved on a voluntary basis in reduction actions on a greater scale, without indicating whether these should be its own reductions or those achieved elsewhere. Since 2021 European companies have not been able to use project-based units in accounting for their emissions in the EU ETS, while in the period from 2013 to 2020 the extent of their use was significantly limited, as the EU wants to achieve its reductions on its own, focusing on reductions at source. However, just as enterprises in other jurisdictions, European companies may make additionally voluntary commitments and use financial instruments in the form of carbon credits to meet them; however, they are not taken into account in the EU balance of reduction actions. One of the practices applied is to purchase, instead of credits from voluntary actions, CER units from CDM projects and then to cancel them on a voluntary basis. The UN even runs a special platform for the sole purpose of the cancellation of CERs to offset emissions[20].

The UN Climate Summits regularly convened by the Secretary General of this organisation and other global climate summits, such as the French summit of the leaders and heads of state held on the anniversary of the adoption of the Paris Agreement, serve not only to encourage governments to raise the ambition of their actions, but also to influence the public opinion, and the public would, in turn, influence investors and big business. On the sidelines of the negotiation process under the United Nations Framework Convention on Climate Change (UNFCCC), successive COP presidencies have appointed their representatives called climate action champions[21], who have organised meetings and conferences enabling company CEOs to promote their green image and announce ambitious climate goals. At the same time, their shareholders have increasingly high expectations that companies will respond to the wishes of their customers and take determined actions to mitigate climate change. As a result of this, big corporations and enterprises

16 Ibidem, p. 2. The Report cites the study by McKinsey for the World Economic Forum, published in May 2021. Cf. WEF in collaboration with McKinsey & Company, Nature and Net Zero, May 2021; WEF_Consultation_Nature_and_Net_Zero_2021.pdf (weforum.org); (Accessed on 19 September 2022).

17Ibidem, p. 4.

18 So did the UK and Switzerland whose ETS is linked to the EU ETS.

19 United Nations Carbon Offset Platform. (United Nations online platform for voluntary cancellation of certified emission reductions (CERs) (climateneutralnow.org); (Accessed on 30 September 2022).

20 United Nations Carbon Offset Platform. (United Nations online platform for voluntary cancellation of certified emission reductions (CERs) (climateneutralnow.org); (Accessed on 30 September 2022).

21 More information about the champions' activities can be found on the UNFCCC website; UN Climate Change High-Level Champions - Climate Champions (unfccc.int); (Accessed on 21 September 2022).

emulating them not only commit to reduce their emissions, but even adopt the target of achieving zero emissions by 2050. In the period preceding COP26, more than 2,000 companies with a global reach announced that they would reduce their emissions to zero by the middle of this century[22]. More pledges were voiced during the COP and it can be expected that this trend will continue. The carbon credits purchased on a voluntary basis by corporations are expected to help them to offset those greenhouse gas emissions that they are enable to eliminate for different reasons. The rationale which is most frequently presented for the use of offsets is the absence of technological solutions needed to reduce emissions from their own business activities, as these solutions will only emerge in the future, following technological progress.

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According to this narrative, the use of credits to offset emissions is expected to be transitional until appropriate technologies are implemented. Therefore, the companies which use offsetting proclaim their readiness to eliminate greenhouse gas emissions at source, but this is expected to happen in the future after it becomes possible to achieve reductions in a cost-effective manner.

Importantly, an increasingly large number of enterprises choose to offset not only Scope 1 and 2 emissions, i.e. those directly related to their activities, but also Scope 3 emissions, i.e. those generated by the broadly understood use of the products manufactured by these enterprises. An example of this can be the Danish company Velux which has implemented since 2020 its sustainability strategy 2030[23]. The target which it has adopted is to become a climate neutral company by 2041 with respect to all its lifetime. On the one hand, Velux wants to compensate for its historical carbon footprint through support for forest conservation, while, on the other hand, it intends to reduce its emissions to zero in the future, including the emissions which the suppliers and subcontractors of this company contribute to its footprint (Scope 3 emissions). To this end, it plans to take a number of measures, among others, to use only zero-emission raw materials (e.g. aluminium produced using renewable energy), to commit to implement the circular economy in the company and also to use carbon credits from voluntary actions, with an indication of projects to protect tropical forests.

Nongovernmental organisations are critical about the use of offsets by companies and some of them consider it a manifestation of neocolonialism.

Unlike the shareholders of big companies, climate activists are more or less critical about the use of offsets to demonstrate emission reductions. According to Greenpeace, the offsetting of emissions by companies will not halt climate change. Companies should reduce their own emissions at source, since the use of carbon credits to offset emissions from industry and services should be

22 Taskforce on Scaling Voluntary Carbon Markets, op. cit., p. 2, Business and industry leaders urged to accelerate climate action and seize opportunities of net zero - GOV.UK (www.gov.uk); (Accessed on 15 September 2022). During the COP the number of companies pledging zero emissions rose to more than 2,100.

23 "It's our nature" is the VELUX sustainability strategy from 2020. (Accessed on 12 October 2022).

considered last resort and used only to complement rather than substitute for their own actions[24]. Greenpeace believes that too many companies choose offsets rather than measures to reduce their own emissions and for this reason regards these actions as greenwashing. Moreover, it refers to the fact that removals are not considered by the scientists associated with the IPCC to be a measure capable of halting climate change and should only be applied to offsets emissions which are the most difficult to eliminate and the costliest to reduce[25].

In the opinion of the Taskforce (TSVCM) established by Carney, voluntary carbon markets should connect the demand and supply sides in a seamless, cost-effective and transparent way. They should also instil confidence and ensure credibility in transactions using carbon credits. Finally, they should be readily repeatable and scalable to meet the expected increase in demand in relation to the efforts to achieve the temperature target of the Paris Agreement[26]. The report by the WEF and McKinsey of May 2021 represented a continuation of the approach proposed by the TSVCM in its January 2021 report cited earlier, explicitly referring to the proposals put forward there for the construction of infrastructure and mechanisms stimulating investments in carbon removal projects belonging to the category of nature-based solutions (NBS)[27]. In the literature, it has also been pointed out that projects involving nature--based solutions are cheaper to implement than technological projects.

The development of a voluntary carbon emission allowance market can bring multiple effects which are not always positive. In addition to concerns that companies excessively rely on carbon credits enabling them to continue their operations without reducing their emissions at source, misgivings arise about the popularity of NBS projects, in respect of which climate activists worry that the soaring demand for offsets can cause the buyout of land in the developing countries to safeguard the carbon neutrality commitments of big corporations.

The opponents of NBS projects go as far as to call the trend to invest in carbon removals through projects carried out in the developing countries.

According to Oxfam, the plans to reduce their emissions by means of NBS projects as announced by big companies would require the use for this purpose of land five times the size of India. The opponents of NBS projects go as far as to call the trend to invest in carbon removals through projects carried out in the developing countries carbon colonialism[28]. These charges should be treated with a grain of salt, particularly given that massive land grabbing takes place primarily for the purposes of expanding the areas for extensive cultivation and plantations and that the progressive mass-scale deforestation in many countries of the global South still remains the main problems. The reservation of forest areas for NBS projects, most often of the REDD+ category[29], does not mean that the developer becomes the owner of the land, but only protects the forest areas

24 Is Mark Carney's proposed $100 billion-a-year voluntary carbon market the best the 'rock star central banker' can do on climate change? | Greenpeace UK. (Accessed on 12 October 2022).

25 Ibidem

26 Taskforce on Scaling Voluntary Carbon Markets, op. cit., p. 3.

27 What are Nature-Based Solutions (NBS)?; https://www.nature-basedsolutions.com/; (Accessed on 21 September 2022).

28 G. Monbiot, Carbon offsetting is not warding off environmental collapse – it's accelerating it, the Guardian, 26 January 2022, Carbon offsetting is not warding off environmental collapse – it's accelerating it | George Monbiot | The Guardian); (Accessed on 21 September 2022).

29 REDD+ ; https://redd.unfccc.int; (Accessed on 21 September 2022).

against logging, in cooperation with the national or local governments in a local area of the state which allow for or even vie for such projects so as to protect forests. Without active support or at least consent of the state it is impossible to protect forest areas in the countries of the South. Unfortunately, these actions are not always completely successful. The problem which entities carrying out REDD+ projects (so-called nested REDD+, as in principle REDD+ should cover the whole territory of a given country, but when the relevant conditions for REDD+ are not satisfied, the implementation of smaller projects is permitted) most often encounter is carbon leakage, i.e. the continuation of the previous trend of logging in tropical forests, but outside the area covered by the project. For this reason the VCS or TREES standards for NBS projects provide for numerous safeguards against carbon leakage as a result of illegal logging and the reservation of an appropriate buffer pool of credits generated by a project to cover the possible damage caused by illegal logging or fires. The entities implementing projects try to ensure alternative income sources and other benefits, e.g. schools or roads, for the local community. In this way, they contribute to implementing the Sustainable Development Goals (SDGs).

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REDD+ projects dominate voluntary actions in terms of the volumes of carbon credits generated

REDD (i.e. Reduced Emissions from Deforestation and Forest Degradation) projects are carried out on the principle that the governments and other forest owners in the global South should maintain forested areas in an intact state and resign from logging. An extended concept, called REDD+, includes, in addition, measures to enhance carbon stocks in the forested areas covered by the programme through appropriate forest management[30]. REDD+ projects are implemented in 54 countries of the South. The REDD+ programme which is supervised by the UNFCCC provides for results-based payments[31]. The countries participating in the programme report the forest reference levels for their forest resources, i.e. the baseline with respect to which the results of the actions which they take as part of REDD+ are determined. They are also obliged to prepare the national REDD+ strategy and to implement the national system for monitoring forest resources. On the basis of the reports on the programmes carried out to implement the REDD+ strategy which are presented in the technical annex to the Biennial Update Reports (BURs) to the UNFCCC, these countries can seek ex-post co-financing for their actions after they report the achieved reductions. REDD+ projects are also implemented by the World Bank and a number of developed countries, including Norway, which is particularly active in this area, Switzerland, Australia or the USA (via the USAID). Climate activists have accused Norway, which has been the largest promoter of REDD+ projects since 2007, of neocolonialism and greenwashing of emissions from oil and gas extraction. The history of the dispute between Indonesia and Norway about the payment of funds for the forest

30 More information can be found on the UNFCCC website ; REDD+ - Home (unfccc.int); (Accessed on 17 August 2022).

31 Angelsen A, Hermansen EAT, Rajão R and Hoff R van der. 2018. Results-based payment: Who should be paid, and for what? In Angelsen A, Martius C, De Sy V, Duchelle AE, Larson AM and Pham TT, eds. Transforming REDD+: Lessons and new directions, pp. 41–53. Bogor, Indonesia: CIFOR.

protection which resulted in avoided emissions of more than 11.2 million tCO2e demonstrates how dubious such projects can be. Irrespective of the doubts which can be raised by paying countries to stop deforestation of their own forests, it is very difficult to demonstrate the additionality of such actions, i.e. to prove that the expected outcome has not arisen spontaneously, and especially to ensure the sustainability of the changes achieved and to prevent carbon leakage effected through the transfer of logging to other tropical forest areas which are not covered by the projects. The countries implementing REDD+ projects are often unable to ensure effective protection of their forests, particularly in the absence of cooperation with local communities and the inconsistency of their economic policy, which provides, at the same time, for the award of licences to companies permitting them to carry out logging or set up plantations. On the other hand, the achieved reductions can be easily reversed. In the case of the reductions of emissions from forests in 2017 in Indonesia, the results did not account for peatland drainage and also the natural decrease in the rate of deforestation caused by a drop in palm oil prices, which involved the absence of the additionality of actions to avoid deforestation.

The countries implementing REDD+ projects are often unable to ensure effective protection of their forests, particularly in the absence of cooperation with local communities and the inconsistency of their economic policy, which provides, at the same time, for the award of licences to companies permitting them to carry out logging or set up plantations.

TABLE: CARBON CREDIT PRICES AS OF 21 SEPTEMBER 2022 (REAL-TIME VALUATION).[32]

CarbonCredits.com Unit prices	Previous price	Change	YTD
Compliance markets			
European Union	EUR 69,22	- 2,56%	-13,71%
California	USD 27,54	-0,33%	-13,99%
Australia	AUD 30,15	-	-40,88%
New Zealand	NZD 82.75	+ 0.30 %	+20,89%
South Korea	USD 16,64	- 3,3%	-29,05%
China	USD 8,23	-	+6,97%
Voluntary markets			
Aviation offset	USD 4,08	-	-49,00%
NBS offset	USD 9,22	+ 0,66%	-34,52%
Technological offset	USD 2.01	-	-60,43%

Źródło: Live Carbon Prices Today, Carbon Price Charts • Carbon Credits (dostęp: 21.09.2022 r.)

32 Norway's support for REDD: The new colonialism and the failure of democracy | REDD-Monitor (Accessed on 4 October 2022).

In spite of reservations and information about the frequently low effectiveness of actions taken as part of REDD+, especially avoided deforestation, which have appeared in the public space, the proponents of voluntary markets and the purchasers of carbon credits are quite optimistic about forest projects, mainly in light of the fact that the natural carbon removal by plants enables carbon dioxide to be captured and removed from the atmosphere. The determination of the permanence and irreversibility of this process poses a problem. Investors try to address this problem. Given the high risk of carbon leakage or periodic fires, a credit buffer pool is established to resolve problems of this type. Thus, a certain part of actually generated credits reaches the market. Apart from the assumption that carbon removal projects more effectively contribute to achieving the goals of the Paris Agreement than projects to reduce emissions from industrial processes or energy generation, which only diminish the emission growth rate but do not remove carbon dioxide from the atmosphere, their implementation cost is also a strong argument. Indeed, natural carbon removal is considered to be the most cost-effective mitigation measure. McKinsey estimates that the removal of 1 tonne by means of NCS costs between USD 10 and 40, depending, among others, on the location and type of the project[34].

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Moreover, if the revenues from REDD+ projects are reinvested by the developing countries in projects to reduce emissions, e.g. renewable energy sources, reductions of emissions from the combustion of fossil fuels, energy efficiency, or NBS projects, such afforestation, avoided deforestation, agroforestry or reductions of methane emissions from waste landfills or wastewater, REDD+ can play an important role in increasing the range of actions to reduce emissions in the countries of the global South and support the low-emission growth of the economies of these countries[35].

The impact of demand on carbon credit prices

In its annual report on the state and trends of carbon markets in 2022, the World Bank emphasised that in the previous year (2021) prices rose in both voluntary markets and compliance markets[36]. Intensive allowance price increases in the ETS market were related to the growing interest of investment funds and speculators in investments

33 Live Carbon Prices Today, Carbon Price Charts • Carbon Credits ; (Accessed on 21 September 2022).
34 Transforming REDD+, op. cit, p.4.
35 How the voluntary carbon market can help address climate change | McKinsey; (Accessed on 17 August 2022).
36 World Bank, State and Trends of Carbon Pricing 2022, Washington DC 2022, p. 10.

in allowances and derivatives. The EU policy providing that the EU will achieve zero emissions by 2050 was reflected in the climate law adopted by the EU and in effect since 9 July 2021, which sets out its reduction targets and the pathway for achieving them in a manner which gives certainty to investors as to the permanence of this direction of actions[37]. As early as mid-2021, the participants in the EU ETS market assumed, as indicated by the survey carried out by the International Emissions Trading Association (IETA), that the allowance prices would remain at a level of about EUR 47.25 on average in the period from 2021 to 2025 and grow to a level of about EUR 58.62 euro in the period from 2026 to 2030[38]. The conviction about the inevitability of the price growth was related to the adoption by the EU of a higher reduction target for 2030, which is now at least 55% compared with 1990 levels, but such drastic increases as those that soon followed were not expected. As early as January 2021, the EU price grew to about EUR 34 and, as a result of successive rises in the course of the year, the value of EUR 90 was exceeded in early December 2021 and, although in July 2022 the price fell below EUR 80 euro per unit, it is projected that the uptrend will continue and the level of EUR 100 will be exceeded in 2025 at the latest, as assumed in the prices in EUA futures transactions. Perhaps, it may happen much earlier, among others, because of the energy crisis in the EU[39].

The allowance prices in the EU ETS continue to be much higher than those in other emissions trading systems. This is the best evidence to the lack of ambition of these systems and, in consequence of this, their doubtful effectiveness in addressing the problem of the continuous growth of global greenhouse gas emissions. A number of exchanges and financial institutions report the quotations, updated every few minutes, of allowance prices in the compliance markets and those of allowances in voluntary markets. As an example, the prices of allowances and offsets as of 21 September 2022 are given below.

It is important to emphasise that the markets respond with falling or growing carbon credit prices to information that the targets have been raised or that countries, particularly those that are large emitters, have made commitments.

The markets respond with falling or growing carbon credit prices to information that the targets have been raised or that countries, particularly those that are large emitters, have made commitments.

Both the election of Joe Biden as US President and the earlier election of Barrack Obama had a positive effect on the moods in carbon credit markets, although the rises were temporary. Similarly, a sudden surge in credit prices was caused by the Paris COP, where, as expected, the Parties to the UNFCCC adopted the Paris Agreement. The last price increase in voluntary markets which was related to negotiations came in relation to the adoption of the framework for the implementation of the mechanisms under Article 6 of the Paris Agreement during COP26 in Glasgow. In accordance with the Platts assessments of changes in carbon credit prices, during the COP the prices of CORSIA-eligible credits grew by 20% compared with the prices as of 31 October 2021, to USD 17.55.

37 Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 (European Climate Law).(EUR-Lex - 32021R1119 - EN - EUR-Lex (europa.eu); (Accessed on 16 September 2022).

38 Europe carbon prices expected to rise to 2030-industry survey | Reuters ; (Accessed on 16 September 2022).

39 KOBiZE carbon market reports provide monthly summaries of EUA prices for both spot and futures transactions. Raport z rynku CO_2 (kobize.pl); [Report on the carbon market – in Polish] (Accessed on 16 September 2022).

In the same period, the prices of credits generated by NBS projects grew by as much as 45%, from USD 9.65 to USD 13.95[40].

In conclusion, it can be said that the prices of carbon credits from voluntary carbon reduction or removal projects, which over the last dozen years or so were a cheap alternative to certified emission reductions (CERs) generated by the Clean Development Mechanism projects, also grow, following the price increases in the compliance markets, such as the EU ETS. This should be attributed to the conviction of investors and capital markets about the inevitability of decarbonisation, which will primarily affect the developed countries and corporations operating in them.

Natural Climate Solutions offer the potential for implementing about one third of the emission reductions necessary to achieve the 1.5°C target

According to the assessment presented in the cited 2021 analysis by McKinsey and the World Economic Forum, Natural Climate Solutions (NCSs) offer the potential for implementing about one third of the emission reductions necessary to achieve the goal of limiting the global average temperature increase to 1.5°C.[41]

The main challenge which the TSVCM tried to tackle and which the WEF and McKinsey attempted to assess was the level of investors' demand for offsets which was too low to achieve the required scale of reductions. Indeed, the reduction potential seems to be sufficient to possibly close the reduction gap by offsetting emissions. According to McKinsey, the potential offered by Natural Climate Solutions alone is 10.2 GtCO2e annually, where the practical potential is closer to 7 $GtCO_2$, under the assumption that as the implementation of projects progresses it becomes more difficult to use the whole potential of Natural Climate Solutions. The main types of projects concern avoided deforestation, reforestation, peatland restoration and cover cropping. McKinsey assumes optimistically that by 2030 the potential supply of carbon credits can grow year on year to 8-12 $GtCO_2$. MCKinsey also assumes that carbon credits will mainly come from avoided nature loss, including avoided deforestation, avoided or reduced methane emissions from waste landfills and carbon removal from the atmosphere based on new technological solutions[42]. Investors who monitor market trends follow such recommendations when they choose units for offsetting or undertake their own projects in the developing countries.

Will voluntary offset unit markets fulfill the hopes placed in them?

One of the potential obstacles to the further development of voluntary markets is a corresponding adjustment. This is the rule laid down in Article 6 of the Paris Agreement to prevent the double counting of reductions from the implementation of projects. Only one party to a project, the investor or the host, can book the achieved reductions towards its NDC. If the same unit were taken into account in the NDC of the investor country, this would mean double counting of emission reductions.

In Glasgow, the negotiators who decided on the design of the market mechanisms laid down in Article 6 of the Agreement agreed that a corresponding adjustment would apply to projects authorised by host countries as projects imple-

40 After COP26, new questions arise over carbon trading as markets gain new prominence, S&P Global Understanding Voluntary Carbon Markets | S&P Global (spglobal.com); (Accessed on 21 September 2022).

41 WEF and McKinsey & Company, Nature and Net Zero, op. cit. p. 4. The theses of the report are also discussed by P. Manion, It's time to scale up natural climate solutions – here's how, 4 June 2021; It's time to scale up natural climate solutions--here's how | McKinsey & Company; pp. 11-12 ; (Accessed on 20 September 2022).

42 A blueprint for scaling voluntary carbon markets | McKinsey ; (Accessed on 21 September 2022).

mented pursuant to Article 6 of the Agreement. This means that projects unauthorised as those carried out under the Agreement (Articles 6.2 and 6.4) are not subject to a corresponding adjustment of the balances of the budgets of the host countries with those of the receiving countries. This is exactly the case with voluntary projects. An exception is the Gold Standard, which proposes that, on the basis of a voluntary decision of the Parties, a corresponding adjustment should be implemented in the case of the flow between the countries.

It will be possible to use emission reductions from projects authorised by the host country as projects implemented pursuant to Article 6.4 or actions carried out under Article 6.2 which lead to internationally transferred mitigation outcomes (ITMOs) and actions implemented in conformity to certain voluntary standards (those that adopt solutions close to the mechanisms under Article 6) to account for the NDC reduction targets or to account for emissions for international mitigation purposes under CORSIA and, in the future, emissions from maritime shipping. These actions will have to be subjected to a corresponding adjustment between the NDC of the host country and the NDC of the country where carbon credits are used[43].

It will be possible to use unauthorised voluntary units to account for the NDC of the host country in the carbon market of the host county or as a financial input to the implementation of the NDC.

However, since one of the main problems discerned in relation to the use of carbon credits to offset emissions in the developed countries is their detachment from the implementation of the NDC of the country where offset users operate, many stakeholders, mainly nongovernmental organisations and organisations which manage the standards of voluntary markets, raised in a public debate the issue of the regulation of the status of projects and that of the accounting for emission reductions between the budgets of the host countries and the budgets of the countries of origin of investors.

One of the main problems discerned in relation to the use of carbon credits to offset emissions in the developed countries is their detachment from the implementation of the NDC of the country where offset users operate.

One of the measures which may contribute to resolving these issues is the introduction of the obligation to report the use of offsets as part of social and environmental corporate responsibility (SECR). The UK is one of the countries which have imposed such an obligation. The UK government adopted the guidelines for reporting environmental impacts which imposed such an obligation on both stock exchange-listed and private companies from 1 April 2019[44]. Companies which qualify to be included in the group of large enterprises are obliged to submit their energy and carbon reports[45]. The report also covers the use of offsets.

Banks in many developed countries also require information on the actions taken to reduce and offset emissions. Therefore, it can be assumed that the boundary between voluntary carbon offsetting and the obligation to demonstrate activity in this area will gradually fade away. The obliga-

43 A. Marcu, Article 6 rule book. A post COP26 assessment. ECRST, Brussels 2021, p. 5.

44 The new energy & carbon reporting requirements | RSM UK; (Accessed on 11 October 2022).

45 The Companies (Directors' Report) and Limited Liability Partnerships (Energy and Carbon Report) Regulations 2018 (legislation.gov.uk); (Accessed on 11 October 2022).

tion to use carbon credits would give the voluntary markets the momentum which as the TSVCM and the WEF expected would ensure the quick development of these markets. However, they will no longer be voluntary markets.

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The social impacts of the EU transition to a climate neutral economy and selected instruments to mitigate them as part of Just Transition

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The social impacts of the EU transition to a climate neutral economy and selected instruments to mitigate them as part of Just Transition

Keywords: Just Transition, climate policy, EU Funds, structural economic changes, worker wages

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Abstract

The article presents the results of an analysis of the impact of the transition towards climate neutrality on workers against the EU's support instruments in the context of the costs of these changes. It describes the assumptions and method for the analysis carried out using models built at the Centre for Climate and Energy Analyses (CAKE) and presents the mechanisms and scale of instruments supporting the transition effort, including the Just Transition Fund, the InvestEU Programme and the Loan Facility. The article demonstrates that although the Community's support instruments match to a significant extent the scale of the indispensable effort in the timeframe of less than a decade, it will be necessary to maintain the present or similar mechanisms in the subsequent decades, as the analysis clearly shows that the transition costs will be incurred in the longer term.

Introduction

A deep reduction in greenhouse gas emissions which is the goal of the Paris Agreement involves both benefits and costs. The readers certainly know well the most important benefits; they primarily include the limitation of adverse impacts in agriculture and the satisfaction of food needs, the avoided health costs related to higher temperatures, the avoided damage associated with natural disasters, the limitation of air pollution and less dependence on fossil fuels (translating into higher energy security of many countries).

In the last IPCC report (the Sixth Assessment Report[1]), the most important cost measures include macroeconomic variables: a drop in consumption growth or a decline in the growth rate of the Gross Domestic Product. The report indicates that the achievement of the ambitious goals of limiting climate change does not require a reduction of consumption from its present level, as consumption growth will continue even in

1 IPCC, 2022: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [P.R. Shukla, J. Skea, et al. (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA.

the most ambitious scenarios, although it will be slightly slower than in the scenarios of less ambitious climate policy. E.g. the growth of the global economy in the scenario of limiting climate change to about 1.5°C means that the economic growth will slow down by about 0.04 percentage point. Certainly, these calculations apply to the average global economic growth. The burden of climate policy is distributed unevenly among countries and citizens.

Another natural question which is increasingly often asked in both the scientific literature and the public debate is about the burden which particular social groups will incur and how they will incur it. The integrated assessment models, which are the most important tool applied in the analyses described in the IPCC report, approach costs and burdens in a very abstract way: as changes in the growth rate of consumption or GDP. The structure of these models is not developed well enough to show in which parts of the everyday household budget the changes caused by climate policy will be seen.

From the citizens' perspective, costs will occur in two forms: (i) an increase in the prices of consumer goods and (ii) the loss of financially beneficial employment for part of workers. The price increase will primarily include an increase in the costs of the purchase and use of energy carriers, in particular electricity and heat, an increase in transport costs and, probably, an increase in the costs of certain food products, especially meat. The costs for workers will be more pronounced in emission-intensive sectors, such as mining. A deep carbon reduction requires the phaseout of mining over twenty to thirty years. For persons who are employed in this sector this means the need to look for an alternative job, which in most cases will be less financially beneficial than work in mining.

Putting forward the concept of the European Green Deal, including its goal of climate neutrality in 2050, the European Union discerns this disproportion in the distribution of the costs of such an ambitious climate policy. The Just Transition Mechanism is the leading instrument expected to mitigate the impacts on the regions and groups which are most strongly affected by the social and economic effects of these actions. It is assumed to provide targeted financial support in the period from 2021 to 2027 and, as pledged, to bring about investments with a value of about EUR 55 million in the most affected regions. This mechanism has three pillars, among which the Just Transition Fund is the leading one, while the other two pillars consist of solutions which are part of the InvestEU Programme and a new loan facility from the EU budget, which is described in greater detail in a further part of the article. Components supporting Just Transition can also be found in the other mechanisms to support EU climate policy.

In this context, it seems well-advised to examine to what extent the resources allocated to Just Transition make it possible to compensate for the total costs of climate policy from workers' perspective. The presence of these costs is not self-evident. On the one hand, some workers will lose jobs and incomes, while, on the other hand, the transition of the economy will contribute to creating many new jobs. In this context, many questions arise and in the nearest years we will all look for answers to them; specifically, whether we can find that the new jobs will be less profitable than the old ones or whether we can estimate the differences in incomes and determine the scale of costs for workers; what the scale of these costs is against the instruments prepared by the European Union to mitigate the adverse social impact of low-carbon transition; whether the scale of these funds is adequate and sufficient; and, finally, how the available resources should be used to compensate most effectively for losses incurred by workers, their families and their regions.

Why the transition is costly for workers

The basic rationale for the introduction of the funds listed above, in particular the Just Transition Fund, is the compensation for losses incurred by those social groups for which the low-carbon transition poses a risk. At this point, it is important to stop and ask a slightly provocative question whether the transition may pose a risk. There is no doubt that it involves not only the phaseout of certain sectors, but also the creation of many new jobs in setting up renewable energy sources, manufacturing electric vehicles or thermally modernising buildings. Persons who leave such sectors as mining will, therefore, have opportunities to take a job at a new workplace. Moreover, it can be noted that after all the work in mining is particularly difficult and often poses the risk of a loss of health or life. In light of this, by changing their job miners can enjoy non-monetary benefits.

However, there is a strong economic argument indicating that the benefits from the transition for workers forced to change the employment sector will be lower than the costs, incomes and satisfaction at their new workplaces than those that they enjoy now. Firstly, if workers in the mining sector have remained in this sector for many years, then this sector offers them incomes and/or satisfaction that is higher than any other sector. Otherwise the workers would already have changed their employment sector on a voluntary basis to one where they would have enjoyed greater benefits. Secondly, when workers in the mining sector lose their job in the sector they lose their ability to use their specific human capital. Reason tells them to choose the second best option of the other sectors. However, their productivity in the second best option will always be lower than their productivity in the first best option which their work

in the mining sector was. The difference between these two options determines the loss of miners' earnings.

The starting point for building the argument put forth above entails two premises: about the diversity and rationality of workers. Diversity means that each worker has specific human capital: specific experience, education and innate abilities. There are two consequences of the specificity of human capital: (i) a single worker can be more productive in one sector than in other sectors; and (ii) the potential productivity of one worker in a given sector can be different from the potential productivity of another worker in the same sector. The other premise is the rationality of workers: each worker chooses the sector where he/she is the most productive. The first premise is not controversial, as it is clear that each job needs specific skills and abilities. It cannot be expected that an average worker in the mining sector will be equally productive in the construction sector as a bricklayer with a long period of service.

The second premise – about the rationality of workers – may seem less self-evident. Workers may not be fully aware of the possible earnings in other sectors of the economy. In theory, one can imagine the situation where wages in other sectors are higher, but a miner does not want to change his/her job, because he/she simply does not know it. However, this is hardly likely. Almost everyone has access to diverse offers of a job with full information about its conditions. Most persons also have contacts with workers from other sectors who can share information on the hardness of working conditions and benefits of their jobs. In addition, it is even more difficult to defend an alternative assumption that workers do not know their earning opportunities, while experts know them. Workers know better their skills, abilities and satisfaction with the implementation of a given job than experts with their data tables do.

At this point, it is important to mention a yet another mechanism which has not been addressed so far, namely the fact that climate policy will change not only the employment structure but also worker wages in different sectors. It can be expected that the wages in "green", low-carbon sectors will be higher than now, encouraging the persons now employed in mining to seek a job exactly in these sectors. Certainly, this effect needs to be taken into account when calculating the total costs/benefits caused by climate policy for workers. However, the simulations using the economic models described below demonstrate that the strength of this positive effect is relatively

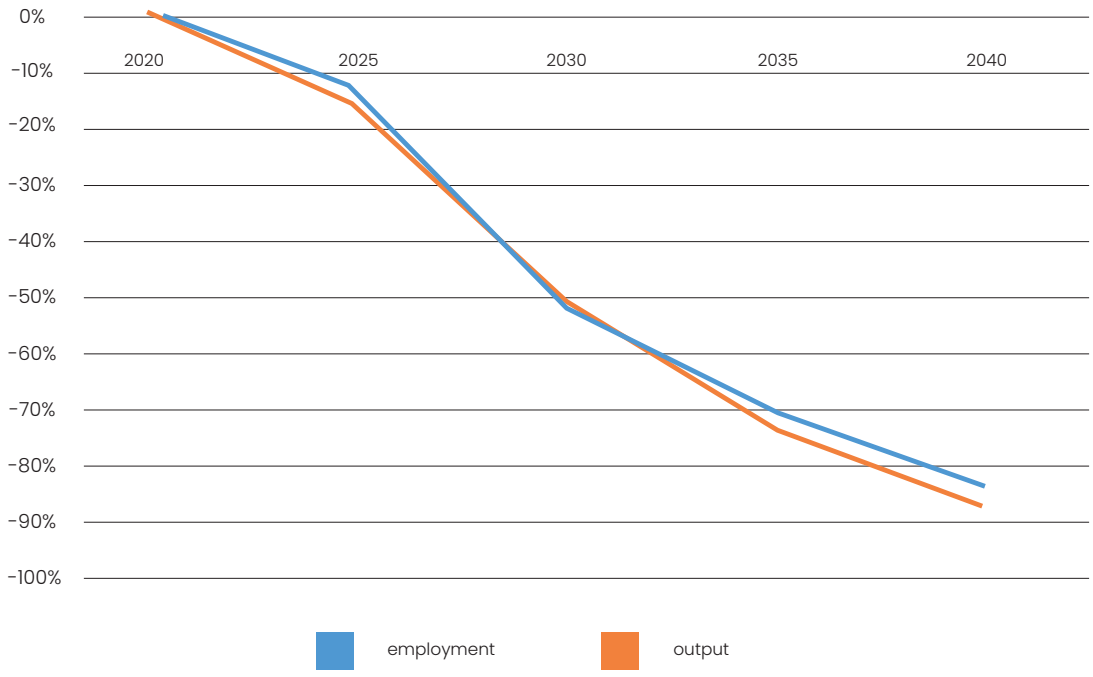
low and does not make it possible to compensate for the costs for workers caused by a change of the employment sector. It should also be emphasised that increased wages in green professions are a double-edged tool, as, on the one hand, it reduces the transition costs for workers, while, on the other, it raises the costs of using green technologies and the transition costs for consumers.

The impact of the transition on the employment sector

In light of this, there is the challenge of finding an answer to the following question: How – taking into account all the mechanisms referred to above – can the scale of the costs for workers related to the low-carbon transition be determined? The Centre for Climate and Energy Analyses (CAKE) operating at KOBiZE attempted to find an answer to this question by using its own modelling tools which it had developed. The starting point for the analysis is the model of the global economy which makes it possible to describe the structural changes related to the pursuit of climate policy. Using this model, it is possible to take into account the diversity of workers, changes in their productivity caused by a shift between sectors and wage changes in different sectors of the economy.

The model used in the analysis applies novel solutions which enable more realistic predictions about changes in the labour market than the standard macroeconomic models do. The standard models assume that a minor reduction in wages in one sector causes an immediate and completely cost-free outflow of workers from this sector to other sectors. This assumption implicitly provides for the perfect homogeneity of workers and the absence of any costs related to a shift between sectors; as we argued in the previous

CHART 1. PROJECTED DECLINE IN THE EMPLOYMENT AND OUTPUT IN THE MINING SECTOR.



Source: Own elaboration based on a simulation using the d-PLACE model.

section, is hardly realistic. In our model, we introduced solutions which made it possible to correct this assumption and take into account the diversity of workers and the costs of a shift between sectors. This model provides that a decline in wages in one sector will cause part of – not all – workers to leave this sector. In the study "How to compute the cost for workers within the "Just transition" to a low-carbon future?" (CAKE Working Paper, April 2022[2]), we described detailed mathematical derivations which explained how this model made it possible to consider the costs for workers.

The parameters of the model which described the transition costs for workers were calibrated to the values estimated in studies in the scientific literature. The studies on which the calibration was based had analysed how large the changes in the wages of persons employed in companies controlling a significant part of the labour market (the so-called monopsony) needed to be in order for workers to decide to change their jobs. On the basis of this information, the value of the present job for workers can be inferred with respect to the value of the second best job option. A detailed description of the calibration strategy can be found in the study cited above.

In the model, the differences in wages among sectors for workers of the same education group are attributed to the difference in the hardness of work in these sectors. If, instead, we assumed that the hardness of work in all the sectors was the same, the transition costs for miners would be higher.

The model does not take into account demographic effects and the fact that part of the now employed workers will retire by 2050, which me-

CHART 2. TRANSITION COSTS FOR WORKERS AS A PERCENTAGE OF WAGES IN THE WHOLE ECONOMY AND THE GDP LOSS CAUSED BY WORKER FLOWS AMONG SECTORS.

Source: Own elaboration based on a simulation using the d-PLACE model

2 https://climatecake.ios.edu.pl/wp-content/uploads/2022/05/CAKE_JustTransition_working-paper_April-2022-1.pdf; (Accessed on 10 November 2022).

ans that they will not have to look for a job. If this effect were considered in the model, the estimated transition costs for miners would be lower. In an alternative simulation, it could be assumed that the costs are only incurred by those miners who are forced to choose a new job before they reach the retirement age. It should be noted, however, that under this assumption the costs for young workers would not be taken into account. For part of them, a reduction in the employment in mining means the loss of a potentially financially beneficial job.

The results of the model show that in the scenario providing for the achievement of the climate neutrality goal by 2050 the employment in mining in Poland will fall by 51% in the period from 2020 to 2030 and by 83% in the period from 2020 to 2040.

The results of the model show that in the scenario providing for the achievement of the climate neutrality goal by 2050 the employment in mining in Poland will fall by 51% in the period from 2020 to 2030 and by 83% in the period from 2020 to 2040.

The model predicts that miners will find jobs in other sectors, but their productivity in new sectors will be lower than in mining. In 2030, the total loss for all the workers who are now employed in mining will be about EUR 0.3 billion annually. In 2040, this loss will grow to EUR 0.6 billion annually.

Certainly, miners are not the only group of workers who may incur the costs related to the low-carbon transition. Losses will also be suffered by workers in the other sectors, particularly those where the production costs depend on the level of the emission cost incurred. The simulations using the model enable the calculation of the total loss suffered by workers in the whole economy. In 2030, this loss will represent 0.4% of average worker wages, which translates into EUR 0.7 billion annually at the national level. In 2040, this loss will already reach a level of 0.5% of average worker wages, which means a loss of EUR 1 billion annually.

In 2030, this loss will represent 0.4% of average worker wages, which translates into EUR 0.7 billion annually at the national level. In 2040, this loss will already reach a level of 0.5% of average worker wages, which means a loss of EUR 1 billion annually.

The lost worker incomes will translate into GDP loss. The model simulations demonstrate that in 2030 the forced worker flows among sectors will cause a loss of 0.1% annually. In 2040, this loss will reach as much as 0.3% of GDP annually. This value does not reflect the total costs of the low-carbon transition, but only the decline in GDP resulting from the consideration of the limited ability of workers to change sectors under the model.

Just Transition Mechanism

It follows from our calculations that for certain groups the effort and costs of achieving climate neutrality may be significant. Bearing this in mind, the pathway for greenhouse gas emission reductions is accompanied by the Just Transition Mechanism with the basic purpose of supporting the regions which are most affected by the impacts of the transition, including the costs of necessary changes. It consists of three basic pillars:

- The Just Transition Fund (JTF).
- A dedicated scheme under the InvestEU Programme.
- The Public Sector Loan Facility, combining the resources of the EU budget and the European Investment Bank.

Certainly, the most important instrument of the Just Transition Mechanism is the first one of those listed above, which was established under Regulation (EU) 2021/1056 of the European Parliament and of the Council of 24 June 2021[3]. The Just Transition Fund is a completely new instrument established under the financial perspective 2021-2027 and legally enshrined in broadly conceived EU cohesion policy, i.e. one of the most important policies, including measures to reduce disparities among European regions and support structural changes in them.

The Regulation clearly provides that the JTF is expected to achieve the single objective defined as "enabling regions and people to address the social, employment, economic and environmental impacts of the transition towards the Union's 2030 targets for energy and climate and a climate-neutral economy of the Union by 2050, based on the Paris Agreement". These measures are carried out as part of the wider Investment for jobs and growth goal of cohesion policy[4]. An important feature of this mechanism is a clear indication of its geographical coverage and the scope of support in the regions of particular EU Member States.

> **Poland is the largest JTF beneficiary with its 20% share representing EU 3.5 billion in 2018 constant prices (followed by Germany with its share of 12.88% and Romania with 11.12%).**

The resources available from the Just Transition Fund will amount to EUR 17.5 billon (in 2018 constant prices), including EUR 10 billion from the resources under the Recovery and Resilience Facility[5] and EUR 7.5 billion under the Multiannual Financial Framework for cohesion policy as part of the Investment for jobs and growth goal mentioned above. Poland is the largest JTF beneficiary with its 20% share representing EU 3.5 billion in 2018 constant prices (followed by Germany with its share of 12.88% and Romania with 11.12%[6]). Thus, the scale of the Just Transition Fund is close to that of the total transition costs for workers which, according to the estimates presented above, will amount up to PLN 0.7 annually; moreover, it should be clearly emphasised that the model results cover a much longer timeframe, while the EU support instruments apply to the period until 2027 and at present it is uncertain whether they will be continued with a similar design.

As required, the Member States eligible for support prepare territorial just transition plans indicating measures to be supported from the JTF, where eligible measures are clearly defined and mainly include specific investments contributing to achieving the objective of the JFT and also measures to upskill and reskill, to support jobseekers or to prevent exclusion from the labour market. In Poland's case, on 5 December 2022, the European Commission approved five Polish Operational Plans with territorial just transition plans to be financed from the Fund[7]. Their value is EUR 3.85 billion (equivalent to EUR 3.5 billion in 2018 constant prices) and they are intended to support areas in Silesia and Western Małopolska (EUR 2.4 billion), Wielkopolska (EUR 415 million), Lower Silesia (EUR 581.5 million) and Łódzkie Voivodeship (EUR 369.5 million).

3 Regulation (EU) 2021/1056 of the European Parliament and of the Council of 24 June 2021 establishing the Just Transition Fund.
4 See Article 5(2) of Regulation (EU) 2021/1060 of the European Parliament and of the Council of 24 June 2021.
5 Regulation (EU) 2021/241 of the European Parliament and of the Council of 12 February 2021 establishing the Recovery and Resilience Facility.
6 Irrespective of the dispute with the European Commission, at this point we assume that Poland will receive the foreseen resources, including their part under the Recovery and Resilience Facility.
7 See the press release: EU Cohesion Policy: €3.85 billion for a just transition toward climate neutral economy in five Polish regions.

The second important pillar of financial support for the Just Transition Mechanism is a dedicated scheme under the InvestEU Programme – another component of the Recovery and Resilience Facility. This Programme has been designed to support EU policies in recovery from a deep economic and social crisis, among others, providing long--term funding for enterprises, while at the same time complying with the long-term EU priorities, i.e. the European Green Deal. The InvestEU Programme can support investments implemented under territorial just transition plans, but in a slightly wider scope than the one set out by the JTF Regulation (e.g. projects for energy and transport infrastructure, including gas infrastructure and district heating, but also decarbonisation projects, economic diversification and social infrastructure).

The InvestEU Fund aims to mobilise more than EUR 372 billion of public and private resources through an EU budget guarantee of EUR 26.2 billion EUR. This guarantee is expected to back the funding from other sources which is acquired by entities carrying out projects in the areas undergoing Just Transition (with an approved territorial just transition plan). Still, projects which are not located in these regions can also benefit from the scheme provided that they contribute to meeting the development needs associated with the transition of these regions and are specified in relevant approved territorial just transition plans. It is important to add that the use of the resources of the InvestEU Fund is correlated with the European Green Deal Investment Plan[8]. The InvestEU Advisory Hub aims to support projects which also correspond with this Investment Plan and ensure the strengthening of the capacity of the implementing entities or financial intermediaries.

8 See the Communication from the Commission. Sustainable Europe Investment Plan. European Green Deal Investment Plan. COM(2020) 21 final.

The third financial pillar of the Just Transition Mechanism is the Public Sector Loan Facility, which combines the resources of the EU budget and the European Investment Bank and is designed to support public sector investments in the regions undergoing the transition. As part of this support, the public sector may be granted preferential loans for the actions undertaken by public entities, including investments in energy and transport infrastructure, district heating networks, energy efficiency measures, renovation of buildings and social infrastructure. Support to investments related to fossil fuels is excluded.

Just Transition is also supported from the Modernisation Fund established under the EU ETS Directive. Although this instrument is primarily intended for investments to modernise the energy sector in order to improve its efficiency and move away from technologies based on fossil fuels, the eligible measures which can be funded from this source also include Just Transition in coal-dependent regions, including a change of the workplace and the acquisition of new competences by workers, as well as support for education and initiatives to create jobs. The resources of the Modernisation Fund come from the sale of the pool of allowances separated within the EU ETS. It is foreseen that the in the period from 2021 to 2030 it will represent 2% of the total pool of emission allowances and the beneficiaries are ten Member States selected on the basis of the GDP per capita criterion. Poland is the largest beneficiary of the Modernisation Fund, with its 43.4% share of the pool of emission allowances intended for sale. Still, in this case, too, it should be recalled that the transition costs estimated in the model analysis occur in a longer period than the one covered by the support instruments described here; therefore, efforts to maintain them or adopt new ones seem inevitable.

Conclusions and recommendations

Our analysis indicates that the low-carbon transition will cause income losses for certain groups of workers, particularly those who are now employed in emission-intensive sectors. Simulations using a macroeconomic model indicate that in Poland the costs may even reach EUR 0.7 billion annually at the end of this decade. These costs are expected to be compensated for by the European Union funds, such as those from the Just Transition Fund. Our cost analysis indicates that the funds can compensate for a significant part of the costs for workers provided that they operate not only in the nearest years, but also in the longer term. An open question is how the resources from European Funds can be used to ensure that they bring as large benefits as possible.

The loss caused by the transfer can be reduced by dedicated investments to create jobs aligned with the abilities and competences of workers who are now employed in mining. Industrial processing and construction are two branches of the economy which potentially could take over workers who leave mining. Consideration can be given to measures encouraging companies employing miners to start emission neutral activities and supporting them. This would make it possible to shift groups of workers to a new productive activity within one enterprise. This would minimise the costs related to uncertainty and a search for a new job. In addition, such a solution would reduce the risk that workers' competences may not meet the requirements at a new workplace, since the current employer is best informed about workers' competences. Although the costs of the forced transfer grow only in a distant timeframe, actions to reduce them should be taken already now. In particular, this is the case with investments as their preparation and implementation need time.

> **Consideration can be given to measures encouraging companies employing miners to start emission neutral activities and supporting them. This would make it possible to shift groups of workers to a new productive activity within one enterprise.**

An important conclusion drawn from a comparison of the results of the model-based analysis with the Community's support instruments is that the transition costs for workers can be compensated for by using not only the Just Transition Fund, but also by making effective use of the other two pillars, i.e. the InvestEU Programme and the Loan Facility. Moreover, the transition costs will be incurred in a longer period than the one when the present ones are in place; therefore, it seems necessary to carry on the discussion and work on the continuation of the current support instruments or the development of new ones in the subsequent decades.

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