POLITYKA ENERGETYCZNA – ENERGY POLICY JOURNAL

2024 ✦ Volume 27 ✦ Issue 2 ✦ 211–226

DOI: 10.33223/epj/189690

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Polish Energy Policy in the context of the global coal demand prospects

Abstract: The article presents the latest forecasts for global coal demand and supply in the short and long term. According to IEA analyzes, there was to be a peak in global coal production and consumption in 2023 (amounting to 8.7 and 8.5 billion tons, respectively), with a successive decline in the following three years. At the 2026 horizon, global coal production will be 8.5 billion tons, declining by 4% from 2023. Coal demand will fall by 2% to 8.3 billion tons. In the 2050 outlook, according to the State Policies Scenario, coal production compared to 2022 will decrease by 43% to 3.5 billion tce. By contrast, according to the Announced Pledges Scenario, the decline will be 75%, with production expected to fall to 1.5bn tce. Coal production and demand will decline due to the decarbonization of many global economies. The article also presents forecasts of global coal production and demand by region.

In Poland, coal is an important energy carrier based on indigenous production, supplemented by imports. Poland is one of the important producers and users of coal in Europe and the EU27. Between 2016 and 2022, Poland's coal production decreased from 36 to 28 million tce. Coal production in Poland accounts for 14–15% of coal production in Europe and 20–22% of production in the EU27. Poland's share is relatively small at 0.5–0.7% relative to global production. In terms of coal consumption, Poland's share is relatively stable (32–38 million tce in 2016–2022). It accounted for 8–10% of European consumption, 11–16% of EU27 consumption and 0.6–0.7% of global coal

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consumption. The latest Polish forecasting document, a draft update of the National Plan Energy and Climate Plan to 2030, assumes in the 2030 horizon, relative to 2020, a 32% decrease in coal production to 30 million tce, and a 23% decrease in coal consumption to 19 million tce. Similarly to global trends, Poland is also pursuing a decarbonization policy for many branches of the economy.

Keywords: Poland, world, coal, forecasts, supply, demand

Introduction

Coal has been an important energy carrier worldwide for decades. Between 2000 and 2014, a steady increase in coal consumption (reported in International Energy Agency (IEA) statistics including peat and oil shale) was observed at a rate of 1.2%/year. Overall, global coal consumption increased from 97 to 165.7 EJ (Fig. 1). As recently as 2000, coal consumption accounted for 23% of total global energy demand and remained at 29% between 2011 and 2014. Subsequent years saw variable dynamics in coal consumption. It has been influenced by the increasing decarbonization of many sectors of the world's economies and the growing share of renewable energy sources (RES). Between 2015 and 2021, the share of RES increased from 13 to 15%.

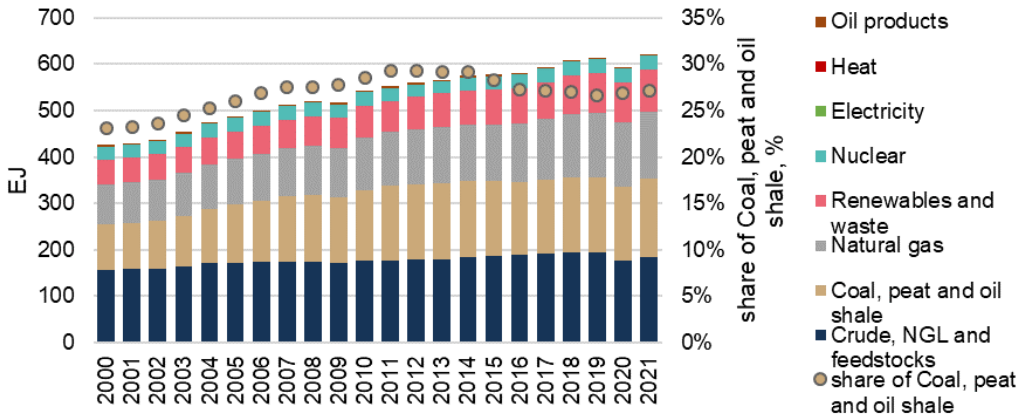


Fig. 1. World energy consumption by energy carriers, 2000–2021
Source: own study based on (IEA 2023a)

Rys. 1. Światowe zużycie energii według jej nośników, lata 2000–2021

Analyzing the main directions of coal consumption worldwide (Fig. 2), it can be noticed that it is primarily used by electricity, CHP, and heat plants. Between 2000 and 2021, this consumer group consumed 59–68% of global coal demand. The share of the steel and coke industry ac-

counts for a few percent (8% in 2019; Fig. 3). Residential coal consumption is also declining (Fig. 2). As recently as 2000, this sector consumed 3.2 EJ of coal (3%), falling to 2.2 EJ (1%) in 2021.

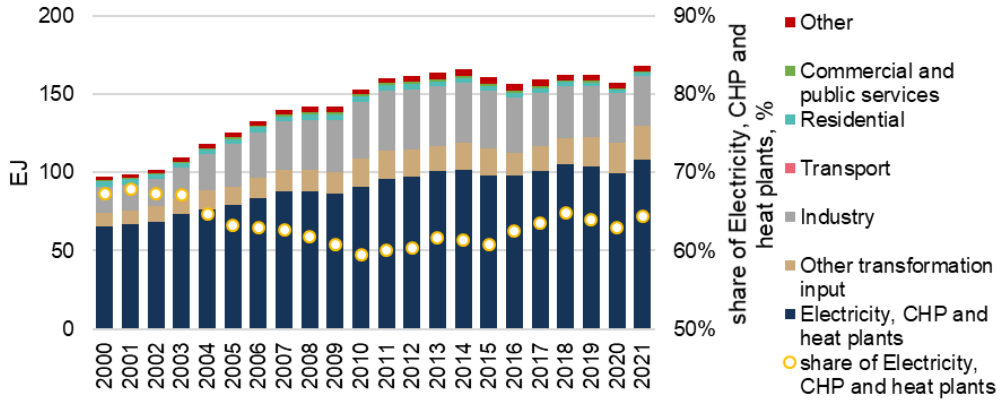


Fig. 2. Major coal users in the world, 2000–2021
Source: own study based on (IEA 2023a)

Rys. 2. Główni użytkownicy węgla na świecie, lata 2000–2021

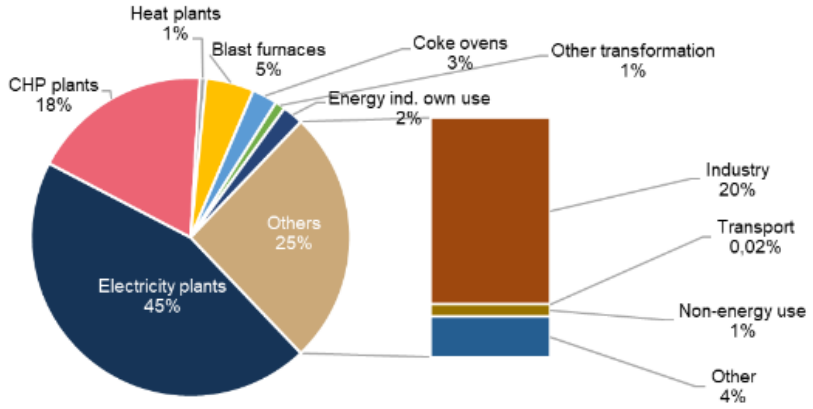


Fig. 3. Structure of global coal users in 2019
Źródło: own study based on (IEA 2021)

Rys. 3. Struktura użytkowników węgla na świecie w 2019 r.

In Poland, coal is an important energy carrier. Its base is indigenous production, supplemented by imports (mainly from Russia until 2022). There was a particular threat to the security of its supply in 2022 when Poland had to look for alternative suppliers. As a result of Russia's aggression against Ukraine, imports from Russia were placed under a total embargo.

Analyzing the data (IEA 2023a), it can be calculated that between 2000 and 2015, coal covered more than half of the total energy supply (51–63%). The increase in the use of other energy carriers, especially those based on renewable sources in subsequent years, decreased this fuel's share to 42% in 2021. Admittedly, in 2020, the share of coal in the total energy supply in Poland was 40%. Still, this year is unrepresentative, as it is associated with the outbreak of the Covid-19 pandemic (slowing down many economies worldwide, including Poland). Due to such a significant share of coal in the Polish economy, the article aims to analyze global demand forecasts and contrast them with demand prospects in Poland.

1. World coal production and consumption

When analyzing global coal production and consumption (combined: thermal coal, coking coal and lignite), it can be seen that an upward trend has prevailed since 2000 (Fig. 4). Of course, during these more than two decades, there have been declines in production and consumption, due to, among other things: the global financial crisis and its aftermath (2008–2009), the decline

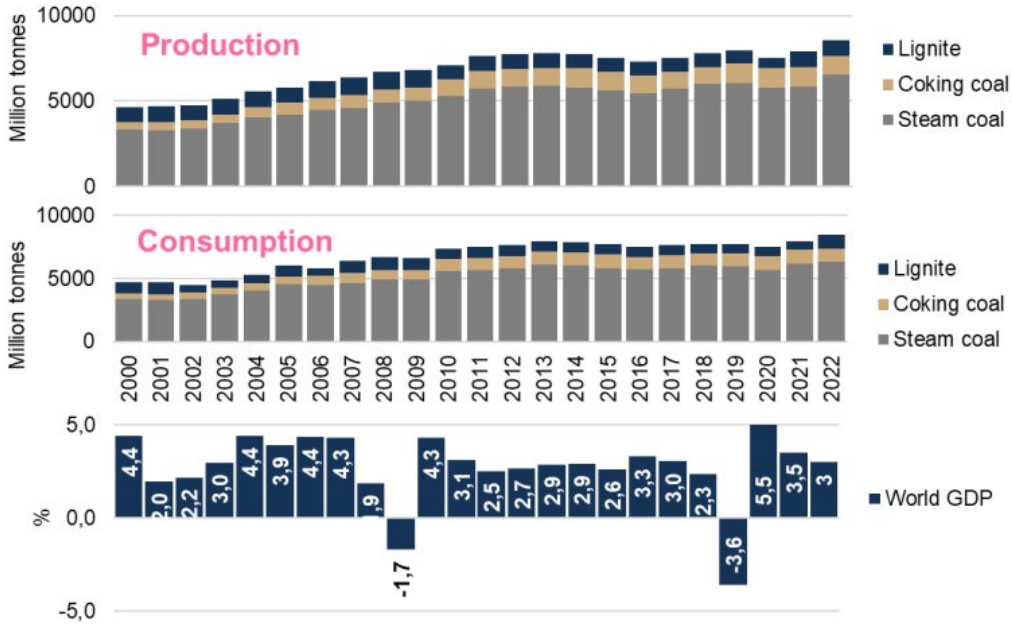


Fig. 4. Comparison of global coal production and consumption from 2000 to 2022 [million tons]
Source: own study based on (IEA 2003–2019, IEA 2023b,c)

Rys. 4. Porównanie światowej produkcji i zużycia węgla w latach 2000–2022 [mln t]

in demand from power generation in China, the US and the UK (with a concomitant increase in gas-fired generation) and the setting of mining quotas in China (2014–2016), the outbreak of the Covid-19 pandemic (2020).

Analyzing coal production and consumption by region (Fig. 5), it can be seen that it is primarily concentrated in the Asia-Pacific region. (A list of countries assigned to this and other regions is presented in Table 1.) The dominance of Asia-Pacific is primarily because it groups the world's leading producers (China, India, Indonesia, Australia) and consumers of coal (China,

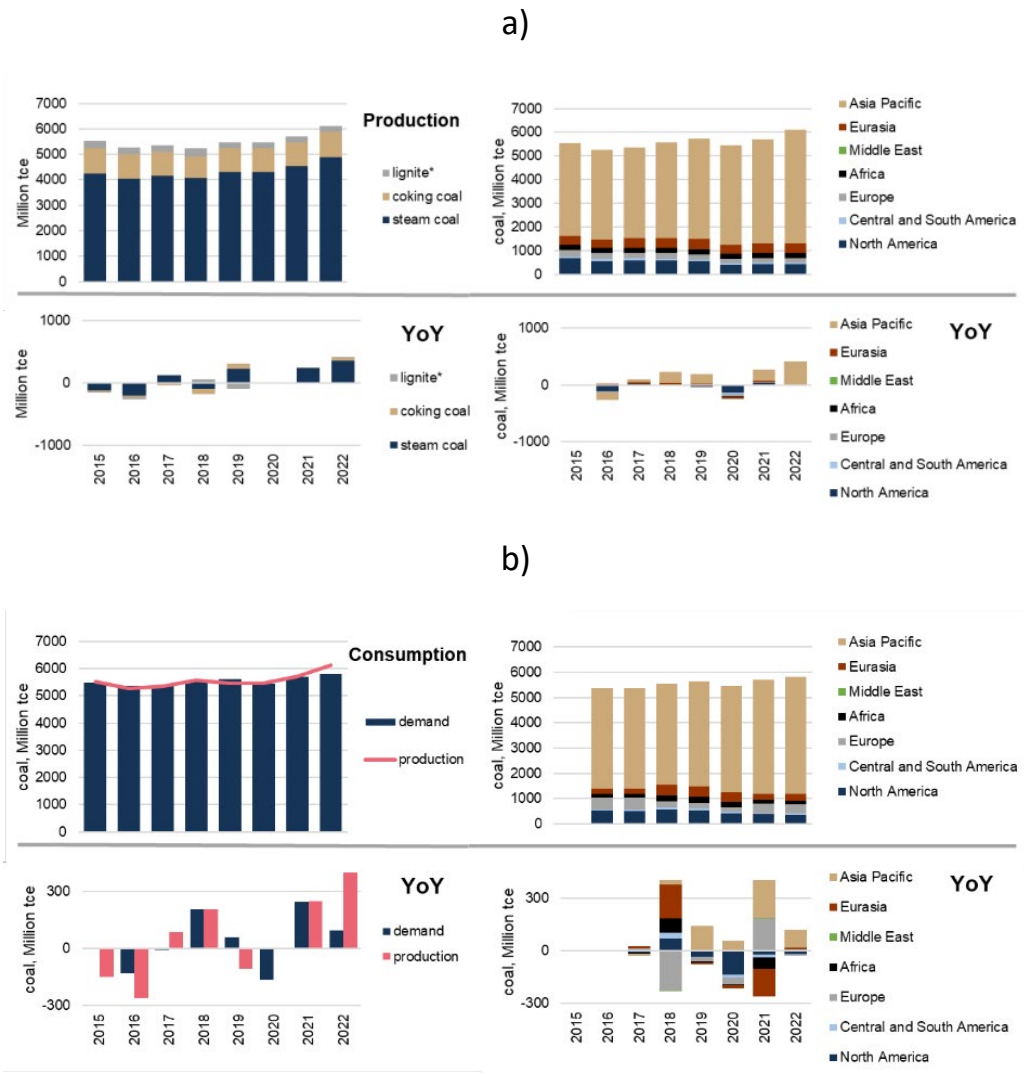


Fig. 5. World coal production (a) and demand (b) in 2015–2022 by country groupings
Source: own study based on (IEA 2003–2019; IEA 2023b,c)

Rys. 5. Światowa produkcja (a) i zapotrzebowanie (b) na węgiel w latach 2015–2022 w podziale regionalnym

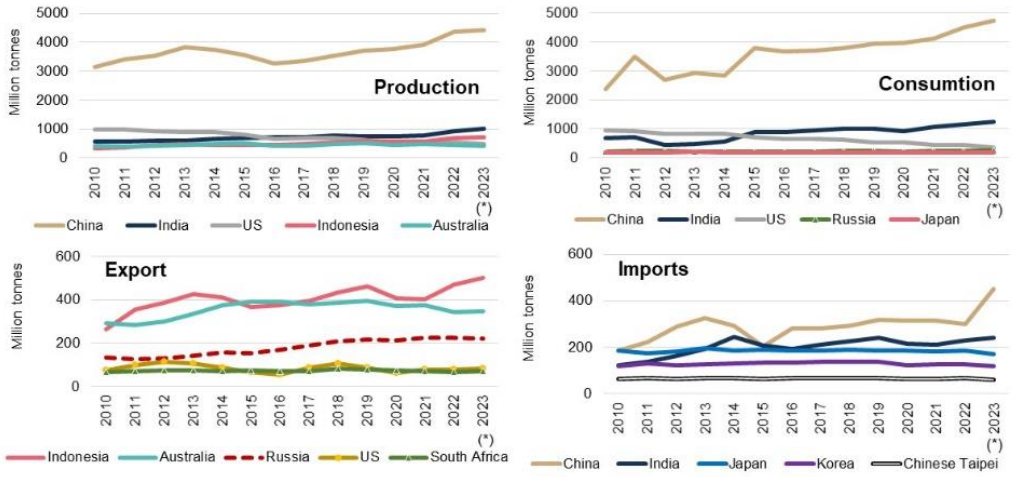
India, Japan) (Fig. 6). Most of the listed coal producers are also among the world's top countries in terms of national area, as well as among the world's top countries in terms of production of all raw materials (Table 2).

Table 1. Names of regional and country groupings used in IEA publications

Tabela 1. Nazwy grup regionalnych i krajowych używane w publikacjach IEA

Names of region	Country groupings*
Africa	AO, BJ, BW, CM, CI, CD, CG, DZ, GQ, EG, ER, ET, GA, GH, KE, LY, MA, MG, MU, MZ, NA, NE, NG, RW, SD, SN, SS, SZ, TN, TZ, TG, UG, ZA, ZM, ZW, and other African countries and territories
Asia Pacific	BN, ID, KH, LA, MM, MY, PH, SG, TH, VN, other Asia Pacific countries and territories, and: AU, BD, CN, IN, JP, KP, KR, LK, MN, NP, NZ, PK, TW
Central and South America	AR, BO, BR, CL, CO, CR, CU, CV, CW, DO, EC, GT, GY, HT, HN, JM, NI, PA, PG, PE, SR, TT, UY, VE, other Central and South American countries and territories
Eurasia	AM, AZ, GE, KG, KZ, TJ, TM, RU, UZ
Europe	AT, BE, BG, HR, CY, CZ, DK, EE, ES, FI, FR, DE, GR, HU, IE, IT, LV, LT, LU, MT, NL, PL, PT, RO, SE, SI, SK, (EU27), and: AL, BY, BA, CH, GI, IL, IS, KS, MD, ME, MK, NO, RS, TR, UA, UK
Middle East	BH, IR, IQ, JO, KW, LB, OM, QA, SA, SY, AE, YE
North America	CA, MX, US

* Country names by ISO 3166-1:2020 country codes.
Source: IEA 2023d, ISO 3166-1:2020.



* preliminary data

Fig. 6. Leading countries in the global coal balance, 2010–2023
Source: own study based on (IEA 2003–2020, IEA 2023b,c)

Rys. 6. Czołówka państw w bilansie węgla na świecie w latach 2010–2023

Table 2. Ranking of major coal producers in terms of raw material production

Tabela. 2. Ranking głównych producentów węgla pod względem wydobycia surowców

Country	Total number of raw materials mined	Ranking in 2021 among 165 countries, place						
		country area	total	iron and ferro-alloy metals	non--ferrous metals	precious metals	industrial minerals	mineral fuels
China	61	3	1	3	1	2	1	1
India	40	7	7	4	4	12	3	4
US	49	4	2	10	8	9	2	2
Indonesia	23	14	8	19	18	16	37	5
Australia	43	6	4	1	5	5	10	7
Russia	63	1	3	6	3	4	5	3
Poland	26	69	23	83	n	8	20	22

Source: own study based on (World Minning Data 2023).

2. Forecasts of global coal production and demand

International Energy Agency (IEA) publications annually present global coal demand and supply forecasts. According to IEA analyses (IEA 2023a,b), in 2023, there was expected to be a maximum in global coal production and consumption of respectively: 8.7 and 8.5 billion tons. In the following three years, there is expected to be a gradual decline. In the short term, global coal production is expected to reach 8.5 billion tons in 2026, a decrease of 4% compared to 2023. For global coal demand, the decline is expected to be 2%, with demand expected to fall to 8.3 billion tons. A maximum of 1.5 billion tons of world coal trade is also projected for 2023.

According to the latest long-term projection, IEA analyses (IEA 2023d) estimate that, in the 2050 horizon under the State Policies Scenario (SP), coal production will decrease by 43% compared to 2022 and fall to 3.5 billion tce (tons of coal equivalent; tce = 0.7 tons of oil equivalent) (Fig. 7). The State Policies Scenario (IEA 2023d) is based on the latest assumptions of various policies, including energy policy, climate policy and related industrial policy. The second scenario, the Announced Pledges Scenario (AP), assumes that the decline in coal production is expected to be as high as 75%, with production expected to fall to 1.5 billion tce. Looking ahead to 2050, in percentage terms, the largest declines in coal production relative to 2022 are experienced by North America and Europe. According to the State Policies Scenario assumptions, these will amount to 81 and 69%. According to the Announced Pledges Scenario, coal production and consumption, relative to 2022, are expected to fall by 92 to 96%. For the AP scenario, the IEA analysis assumed that countries would meet all their energy and climate targets. Under the AP

scenario, the largest production declines will be experienced by Europe (down 96% to 8 million tce), Central and South America (down 95% to 3 million tce), and North America (down 92% to 35 million tce).

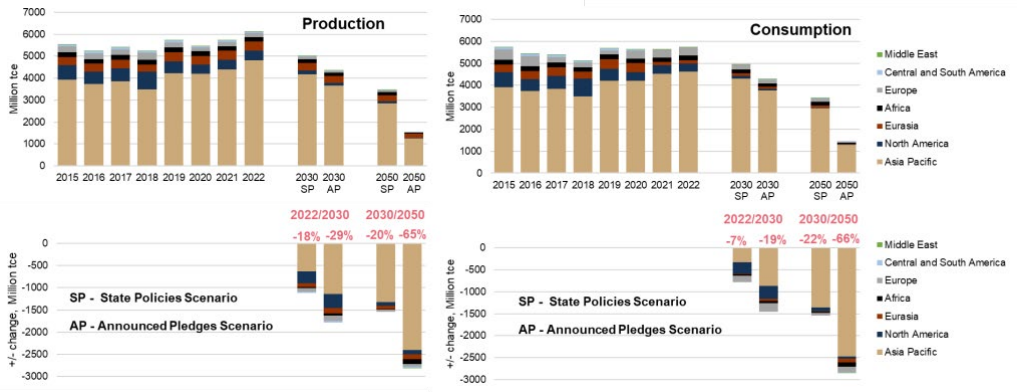


Fig. 7. Long-term global coal supply and demand forecasts according to the IEA, by country groupings
Źródło: own study based on (IEA 2023d)

Rys. 7. Długoterminowe prognozy światowej podaży i popytu na węgiel według IEA w podziale regionalnym

Also, in the long-term forecast relating to coal supply and demand, the significant dominance of Asia-Pacific countries is evident. Despite projected declines in this region (Fig. 7), it will continue to be a major producer as well as a user of coal. For coal consumption under the AP scenario, North America (down 95% to 19 million tce), Europe (down 87% to 49 million tce), and Eurasia (down 82% to 27 million tce) will experience the most significant declines from 2022 to 2050. Although Asia Pacific's consumption in 2050 is expected to fall by 72%, in volume terms, it is expected to reach 1.3 billion tce, representing 85% of global coal consumption.

As of April 2024 (GCMT 2024 data), there were 8,000 coal mines (1 Mtpa+ – coal mines whose production is more than 1 million tons per year) in operation worldwide, of which as many as 48% were in China, 11% in India, and 7% each in Australia and Indonesia. Looking at new projects, of the 504 proposed projects of coal mines in the world (GCMT 2024 data), as many as 56% are expected to be built in China, followed by new projects in India (16%). Coal power generation is also being developed rapidly in Asia Pacific countries. As of January 2024 (GCPT 2024 data), 2,400 coal-fired power plants were in operation worldwide, with 47% in China, 12% in India, and 4% in Indonesia. There are 200 new coal-fired power plants under construction (GCPT 2024 data), of which 63% are built in China and 8% in India.

3. Prospects for coal supply and demand in Poland

In Poland, coal is an important energy carrier. Its base is indigenous production, supplemented by imports (mainly from Russia until 2022). A particular threat to the security of supply of this raw material was evident in 2022. The effect of the introduction of sanctions on coal from Russia (the result of Russia's armed attack on Ukraine) was to seek alternative directions for the supply of this raw material (Stala-Szlugaj and Grudziński 2022) and to increase domestic production (Bąk and Turek 2024).

Poland is one of the important producers and users of coal in Europe and the European Union. Between 2016 and 2022, Poland's coal production decreased from 36 to 28 million tce (Table 3). Coal production in Poland accounted for 14–15% of coal production in Europe and 20–22% of EU27 production. In relation to global production, Poland's share is relatively small and amounted to 0.5–0.7% in the analyzed years. In terms of coal consumption, Poland's share was relatively stable, accounting for 8–10% of European consumption, 11–16% of EU27 consumption, and 0.6–0.7% of global coal consumption. Between 2016 and 2022, consumption fluctuated between 32–38 million tce (Table 4).

Table 3. Share of Polish coal production [million tce] in world and European production

Tabela 3. Udział produkcji węgla w Polsce [milion tce] w produkcji światowej i europejskiej

Production	2016	2017	2018	2019	2020	2021	2022
Poland	36	35	33	31	28	29	28
Poland's share of [%]:							
World	0.7	0.7	0.6	0.6	0.5	0.5	0.5
Europe	15	15	14	14	15	15	15
EU27	20	21	20	21	22	22	21

Source: own study based on (IEA2023d; SP 2017–2023).

Table 4. Share of Polish coal demand [million tce] in world and European production

Tabela 4. Udział zużycia węgla w Polsce [milion tce] w produkcji światowej i europejskiej

Demand	2016	2017	2018	2019	2020	2021	2022
Poland	38	38	38	34	32	36	33
Poland's share of [%]:							
World	0.7	0.7	0.7	0.6	0.6	0.6	0.6
Europe	8	8	9	9	10	10	9
EU27	11	11	12	14	16	15	13

Source: own study based on (IEA2023d; SP 2017–2023).

When considering the prospects for coal production and consumption in Poland, it is necessary to take into account the national energy strategies currently in force, as well as the climate and energy policy of the European Union. In the case of Poland, particular attention should be paid to the energy Policy of Poland until 2040 (EPP 2021, 2022). In the document from 2021 (EPP 2021), the Energy Policy of Poland until 2040 assumed that coal production in Poland would decrease. In the 2040 outlook, it will be 20 million tce (29 million toe), down 47% from the 2015 baseline. Consumption is expected to decrease by 51% to 18 million tce (26 million toe). The Energy Policy of Poland until 2040 takes into account the long-term vision of moving towards EU climate neutrality by 2050 and the regulatory mechanisms to stimulate the achievement of effects in the coming decades. The Social Plan 2021, signed in May 2021, regulates the principles and pace of phasing out hard coal mines (excluding coking coal) in Poland until 2049. The Social Plan also sets out a package of social protection and a comprehensive system of employee allocation.

As a result of Russia's armed attack on Ukraine in February 2022, there was a need to change the approach to ensuring energy security towards greater diversification and independence (EPP 2022). A decision was made to revise and modify the provisions of Poland's energy policy until 2040. The revision is intended to neutralize or reduce risks related to potential crisis situations in the country and internationally, as well as to guarantee energy security (while ensuring the economy's competitiveness and reducing the environmental impact of the energy sector). In June 2023, the Ministry of Climate and Environment of the Republic of Poland conducted a pre-consultation on the national vision for a low-carbon energy transition in the context of strengthening energy security and energy sovereignty, as well as shaping Poland's contribution to the EU's climate and energy targets by 2030 (Pre-consultation EPP/NECP 2023). However, only limited information is available on projected coal consumption in Poland.

Another important document is the National Energy and Climate Plan for 2021-2030 (NECP for short). It sets out the assumptions and objectives as well as the policies and actions for achieving the 5 dimensions of the energy union, i.e. (NECP 2019): energy security, internal energy market, energy efficiency, decarbonization, and research, innovation, and competitiveness. In February 2024, a draft update of this plan (NECP 2024) was released, entitled: 'National Plan Energy and Climate Plan to 2030 (2019 update of the NECP)', abbreviated as dNECP. For the aforementioned update, assumptions are available according to the baseline scenario - with existing measures – WEM. The WEM scenario takes into account instruments already in place and policies already planned. However, the WEM scenario does not meet the EU GHG emission reduction target of 55% compared to 1990.

Tables 5 and 6 juxtapose (respectively) projections of coal production and consumption in Poland in the 2030 perspective according to the projections of the Energy Policy of Poland until 2040 (EPP 2021), and the draft update: National Energy and Climate Plan for the years 2021–2030 (NECP 2024), with projections of global coal consumption made by IEA analyzes (IEA 2023d).

The Energy Policy of Poland until 2040 of 2021, (EPP 2021) assumed a 7% increase in coal production by 2030 compared to 2020. In contrast, the update of the National Energy and Clima-

te Plan to 2030 (NECP 2024) places greater emphasis on the decarbonization of many sectors of Poland's economy; production is expected to decrease by 32% to 30 million tce. For coal consumption projections (NECP 2024), it assumes a 23% decrease to 19 million tce. Compared to the 2021 assumptions of the Energy Policy of Poland until 2040, the adjustment (downward) of coal consumption is 4 million tce, and the adjustment (downward) of coal production is 11 million tce.

Table 5. Comparison of coal production forecasts in Poland with IEA forecasts

Tabela 5. Porównanie prognoz produkcji węgla w Polsce z prognozami IEA

Production		Historical	Forecast		Change. +/– 2020/2030	
		2020	2030 SP	2030 AP	SP	AP
		Milion tce			%	
IEA data	World	5,459	5,007	4,337	–8	–21
	Europe	185	107	69	–42	–63
	UE	125	43	32	–66	–74
Poland data	EPP 2021	28	30	30	7	
	World	0.5%	0.6%	0.7%		
	Europe	15.1%	28.0%	43.5%		
	UE	22.4%	69.8%	93.8%		
	dNECP 2024	28	19	19	–32	
	World	0.5%	0.4%	0.4%		
	Europe	15.1%	17.8%	27.5%		
	UE	22.4%	44.2%	59.4%		

Source: own study based on (IEA 2023d; PEP 2021; NECP 2024).

Summary

Coal in Poland is one of the most important energy carriers. However, between 2010 and 2020, its share in the gross national consumption of all fuels and energy was on a downward trend, decreasing from 39 to 20%. Coal-fired power plants constitute the basis of the Polish electricity system (Kielerz and Porzeczyńska-Antonik 2019; Stala-Szlugaj and Grudziński 2022; Grudziński et al. 2023; Szczerbowski 2023; Malec 2024). Between 2010 and 2020 (according to NECP 2024), coal-fired power plants generated 109–138 TWh/year of electricity. The share of generation from coal-fired power stations decreased from 87 to 69% between 2010 and 2020. Renewable-based power generation is the beneficiary. Its share of electricity generation in Poland increased from 8% in 2010 to 26% in 2020 (according to NECP 2024).

Table 6. Comparison of coal demand forecasts in Poland with IEA forecasts

Tabela 6. Porównanie prognoz zużycia węgla w Polsce z prognozami IEA

Demand		Historical	Forecast		Change. +/– +/– 2020/2030	
		2020	2030 SP	2030 AP	SP	AP
		Milion tce			%	
IEA data	World	5,462	5,007	4,337	–8	–21
	Europe	330	220	173	–33	–48
	UE	206	107	50	–48	–76
Poland data	EPP 2021	31	28	28	–10	
	World	0.5%	0.6%	0.6%		
	Europe	15.7%	12.7%	16.2%		
	UE	13.6%	26.2%	56.0%		
	dNECP 2024	31	24	24	–23	
	World	0.5%	0.5%	0.6%		
	Europe	15.7%	10.9%	13.9%		
	UE	13.6%	22.4%	48.0%		

Source: own study based on (IEA 2023d; PE P2021; NECP 2024).

Poland is one of the important producers and users of coal in Europe and the European Union. Poland's share in coal production and consumption in 2016–2022 was 14–15% of production in Europe and 20–22% of production in the EU27. For coal consumption, Poland's share was 8–10% in Europe and 11–16% in the EU27. In relation to coal production and consumption in the world, Poland's share is relatively small and amounts to 0.5–0.7% respectively, and 0.6––0.7% (2016–2022).

IEA projections (IEA 2023d) indicate that in the 2030 horizon, coal production and consumption in Europe, according to the SP Scenario, will decrease (respectively:) by 43% and 40% compared to 2022. Similarly to global trends, Poland is also pursuing a policy of decarbonization of many branches of the economy. This policy takes into account the long-term vision of striving for climate neutrality in the European Union by 2050. The most recent Polish forecasting document, Draft Update of the National Energy and Climate Plan to 2030 (NECP 2024) assumes (relative to 2020) a 32% decrease in coal production to 30 million tce, and a 23% decrease in coal consumption to 19 million tce.

Publication prepared within the statutory research of The Mineral and Energy Economy Research Institute, Polish Academy of Sciences.

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Katarzyna Stala-Szlugaj

Polityka energetyczna Polski w kontekście perspektyw światowego zapotrzebowania na węgiel

Streszczenie

W artykule zaprezentowano najnowsze prognozy dotyczące światowego popytu i podaży węgla w horyzoncie krótko- i długoterminowym. Według analityków IEA w 2023 r. miało wystąpić maksimum światowej produkcji i zużycia węgla (wynoszące odpowiednio: 8,7 oraz 8,5 mld ton), a kolejne trzy lata przynieść jej sukcesywny spadek. W perspektywie 2026 r. światowa produkcja węgla wyniesie 8,5 mld ton, malejąc o 4% względem 2023. Zapotrzebowania na węgiel spadnie o 2% do 8,3 mld ton. W perspektywie 2050 r. według State Policies Scenario produkcja węgla zmaleje w porównaniu z 2022 r. o 43% do poziomu 3,5 mld tce. Natomiast według Announced Pledges Scenario spadek ten wyniesie 75%, a produkcja ma zmaleć do 1,5 mld tce. Produkcja i zapotrzebowanie na węgiel będzie maleć ze względu na dekarbonizację wielu światowych gospodarek. W artykule zaprezentowano także prognozy światowej produkcji i zapotrzebowania na węgiel w podziale regionalnym.

W Polsce węgiel jest istotnym nośnikiem energii, którego bazą jest rodzima produkcja, uzupełniana jego importem. Polska jest jednym z istotnych producentów i użytkowników węgla w Europie i UE27. W latach 2016–2022 produkcja węgla w Polsce zmalała z 36 do 28 milionów tce. Stanowiło to 14–15% produkcji węgla w Europie i 20–22% produkcji EU27. W stosunku do produkcji światowej, udział Polski jest relatywnie niewielki wynosząc 0,5–0,7%. Pod względem zużycia węgla udział Polski jest relatywnie stabilny (32–38 milionów tce w latach 2016–2022). Stanowił on 8–10% zużycia w Europie, 11––16% zużycie w EU27 i 0,6–0,7% światowego zużycia węgla. Najnowszy polski dokument prognostyczny: draft aktualizacji National Plan Energy and Climate Plan to 2030, zakłada w horyzoncie 2030 r. względem 2020 r.: 32% spadek produkcji węgla do 30 milionów tce, oraz 23% spadek jego zużycia do poziomu 19 milionów tce. Podobnie, jak w trendach ogólnoświatowych, w Polsce również realizowana jest polityka dekarbonizacji wielu gałęzi gospodarki.

Słowa kluczowe: Polska, świat, węgiel, prognozy, podaż, popyt