International Steam Coal Market and the Price Situation in Poland – Part I

***Katarzyna STALA-SZLUGAJ*[1)], *Zbigniew GRUDZIŃSKI*[2)]**

[1)] D. Sc., Eng. Associate Professor, Mineral and Energy Economy Research Institute of the Polish Academy of Sciences, Krakow, email: kszlugaj@min-pan.krakow.pl
[2)] D. Sc., Eng. Associate Professor, Mineral and Energy Economy Research Institute of the Polish Academy of Sciences, Krakow, email: zg@min-pan.krakow.pl

http://doi.org/10.29227/IM-2020-02-63

Submission date: 02-11-2020 | Review date: 18-12-2020

Abstract

The purpose of the paper was to analyse steam coal prices of Polish producers with reference to the main spot price indices of steam coal from international markets. The research covered the years 2010–2019. Due to the complexity of the discussed issues, the article is divided into two parts. The first part discusses the European steam coal market, with a particular focus on Poland. The investigation has shown that for many years both the production and consumption of steam coal in OECD Europe countries was in a declining trend. In the case of production, the CAGR for the years 2010–2018 was -6.6%, and the average annual rate of decrease in consumption of this raw material was 3.0%. Not only has decarbonisation policy contributed to this decline, but also the growing share of renewable energy, and coal and other energy sources price ratio (reduction of the share of coal in a country's fuel mix). The main exporters of steam coal to the OECD Europe market in those years were primarily: Russian Federation (43–77 Mt/y with 26–46% share), Colombia (35–63 Mt/y; 21–31%), USA (11.0–36.0 Mt/y; 7–16%) and South Africa (6.5–26.5 Mt/y; 4–12%). In the years analysed, the production of steam coal in Poland amounted to 50.0–67.5 million tonnes per year (Mt/y). In 2012–2015, Polish production exceeded domestic demand for this raw material by several percent, and in the remaining years accounted for 83–90% of domestic consumption. Along with declining Polish production, imports of steam coal, which varied between 6–16 Mt/y, grew in importance.

Keywords: *steam coal, prices, international coal market, Poland*

1. Introduction

Analysis of the statistics presented in the publications of the International Energy Agency (Coal Information, 2011–2019; during the drafting of the paper, data was available until 2018) shows that within Europe Poland is one of the most important producers and users of steam coal. According to official national data (ARE, 2010–2020), the production of steam coal in Poland in 2010–2019 totalled 50.0–67.5 Mt/y. In 2012–2015, domestic production exceeded Polish demand for steam coal by a few percent, and in the remaining years of the second decade of the 21st century accounted for 83-90% of domestic consumption of this raw material.

As of 31 December 2019 (PGI, 2020), Poland's steam coal reserves amounted to 45.2 billion tonnes (Bt), accounting for 70% of hard coal reserves and 52% of total hard coal and lignite reserves. On a European scale, at the end of 2019 (BP, 2020) the share of Polish total proved reserves of anthracite and bituminous coal was 37.0% (i.e. 21.1 Bt), and on a global scale 2,8%.

The question is often asked: since domestic steam coal production largely covers the demand of domestic consumers, does the price situation on the international market influence the prices of coal offered to Polish consumers? The purpose of the paper is to analyse the prices of steam coal of Polish producers in relation to the main spot price indices of steam coal from international markets in 2010–2019.

Due to the complexity of the discussed issues, the article is divided into two parts. The first part discusses the European steam coal market, with a particular focus on Poland.

2. European steam coal market

The introduction mentions that Poland is among the leading European producers and consumers of steam coal. So what exactly was the production and consumption of steam coal in Europe and Poland in the second decade of the 21st century?

The analysis of the data published in Coal Information (2011-2019) shows that steam coal production in Europe has been in a downward trend for years. Although during the first three years of the second decade of the 21st century, the total production of steam coal in OECD Europe countries annually exceeded 100 Mt, it decreased in the following three years to over 80 Mt/y, and in 2018 to 62 Mt (Figure 1). The average annual rate of decrease in the production of this raw material between 2018 and 2010 was -6.6%. Among the leading producers of steam coal in the OECD Europe countries in 2010-2018 Poland should be mentioned first with its 60–83% share in total coal production, and then follow smaller producers: Czech Republic (4–7%), Spain (3-8%), Turkey (2–3%) and Germany (2–6%); the latter stopped using hard coal in 2018.

The consumption of steam coal has been decreasing at a lower rate. For all OECD Europe countries the 2010–2018 CAGR was -3.0%; the maximum consumption happened in 2012 amounting to 286 Mt, and the minimum in 2018 – amounting to 207 Mt (Figure 1). Several factors influenced the volume of coal consumption in those countries. In addition to decarbonisation policy and growing share of renewable energy, the coal-gas price ratio also had a significant impact contributing to a reduction in the share of coal in a country's fuel mix. As recently as 2010, the total production

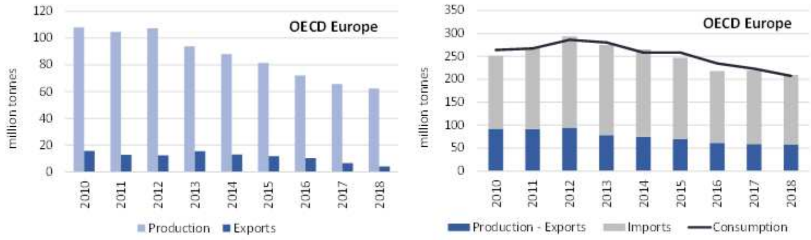

Fig. 1. Comparison of production and exports (a), and consumption and imports (b) of steam coal to OECD Europe, 2010–2018. Source: Own study based on (Coal Information 2011–2019)

Rys. 1. Porównanie produkcji i eksportu (a) oraz zużycia i importu (b) węgla energetycznego do krajów OECD Europe, lata 2010–2018

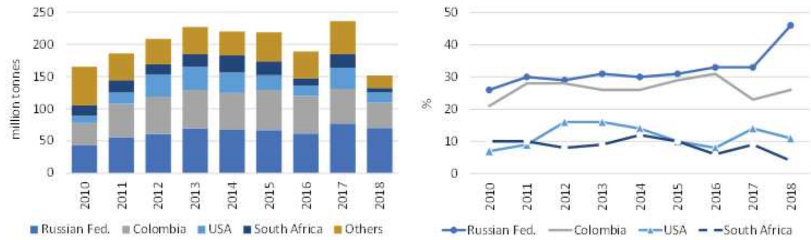

Fig. 2. Main steam coal exporters to OECD Europe, 2010-2018; a) volume in million tonnes, b) share in %. Source: Own study based on Coal Information (2011–2019)

Rys. 2. Główni eksporterzy węgla energetycznego do OECD Europe, lata 2010-2018; a) wolumen w mln ton, b) udział w %

of OECD countries covered 41% of their needs for steam coal, and in 2018 dropped by 11 percentage points. Coal from international markets grew in importance. For comparison, at the beginning of the second decade of the 21st century, the share of imported coal in production was 60%, and in 2018 increased by 13 percentage points. Despite this fact, since 2013 total steam coal consumption in OECD Europe countries has been in a downward trend, and the average annual rate of decrease in consumption of this raw material for 2010–2019 was -3.0%.

3. Major suppliers of steam coal

The graph in Figure 2 shows in volume terms the main exporters of steam coal to OECD Europe countries in 2010–2018 (Figure 2a) as well as their share (Figure 2b) across all countries in this group. The analysis of steam coal suppliers to the aforementioned European countries exhibits two groups of exporters: the first with a share in total imports exceeding 20% (Figure 2b) and the second with a share of several dozen percent (Figure 2b). The first group includes the Russian Federation and Colombia while the second group includes the US and South Africa.

For the Russian Federation, the European market has for years been an important destination for coal exports. According to Coal Information statistics (2011–2019), in 2010–2018 the Russian Federation exported 43.2–76.9 Mt of steam coal annually to recipients from OECD Europe countries, which accounted for 26–46% of total coal exports to these countries. In the case of Colombia, annual coal supplies to OECD Europe countries in 2010–2018 amounted to 34.8–62.6 Mt (21–31%).

The other two countries: the US and South Africa are referred to as 'shuttle exporters', and their share in supplying a given geographical region - in addition to the external demand for steam coal – also depends on its price level on the international market. This issue will be discussed in more detail later on in the paper. In 2010–2018 the exports of steam coal from the US to OECD Europe countries totalled 11.0–36.0 Mt/y (7–16%) and the exports from South Africa amounted to 6.5–26.5 Mt/y (4–12%).

4. Poland in comparison with other European countries

Analysis of individual steam coal producers in OECD Europe countries from Coal Information statistics (2011–2019) shows that in 2010–2018 Poland was its most important producer, and the country's share in total output steadily increased (Figure 3). For the first four years of the analysed decade Polish steam coal production accounted for over 60% of total output in OECD Europe countries and although Poland reduced the number of active coal mines, similarly to other OECD Europe countries (e.g. Germany, Spain, the Czech Republic), its share in comparison with the whole group of countries exceeded 80% starting from 2016.

In addition to the fact that Poland is the main producer of steam coal in OECD Europe countries, its share in total exports of this raw material is also at relatively high levels (see Figure 3). In 2010–2015, exports fluctuated between 42–55%, and in the subsequent two years accounted for as much as two thirds of OECD Europe exports. With consumption remaining at similar levels (see Figure 4) and decreasing demand from the main countries importing Polish steam coal, the decline in domestic production observed for several years has not been conducive to an increase in exports.

Poland also ranks first in terms of steam coal consumption, its share however being not as dominant as in the case of other OECD countries. And although in volume terms coal consumption was in a downward trend (Figure 4) (in 2018 it fell by 9.9 Mt compared to 2010 and totalled 62.6 Mt), Poland's share in total consumption of OECD Europe countries fluctuated between 23–30%, and from 2015 onwards its

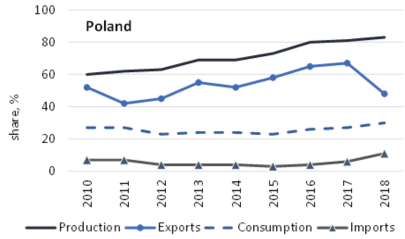

Fig. 3. Poland's share in steam coal production and consumption, exports and imports against OECD Europe countries, 2010–2018. Source: Own study based on Coal Information (2011–2019)

Rys. 3. Udział Polski w produkcji i zużyciu oraz eksporcie i imporcie węgla energetycznego w krajach OECD Europe, lata 2010–2018

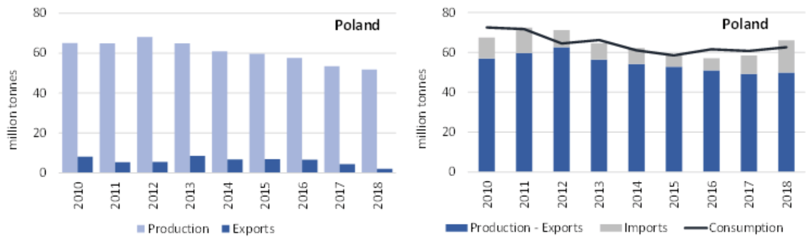

Fig. 4. Comparison of steam coal production and exports (a), consumption and imports (b) to Poland, 2010–2018. Source: Own study based on Coal Information (2011–2019)

Rys. 4. Porównanie produkcji i eksportu (a) oraz zużycia i importu (b) węgla energetycznego do Polski, lata 2010–2018

steady growth is observed. The growing share of Poland in the consumption of steam coal at European level was due not only to the improvement of the efficiency of transformations in the energy sector, but also to the reduced demand resulting from replacing coal with other energy sources (e.g. RES, gas) (Grudziński, 2013; Szczerbowki and Ceran, 2015; Gawlik, 2018; Grudziński, 2018; Olkuski, 2018; Stala-Szlugaj and Grudziński, 2019; Kaszyński and Kamiński, 2020; Nyga-Łukaszewska et al., 2020, Sobczyk et al., 2020).

5. Imports of steam coal to Poland

The slow decline in domestic steam coal production and the demand remaining at similar levels in the last years were among the factors that influenced the volume of steam coal imports to Poland. However, before discussing import volumes, the authors first want to focus on steam coal buyers in Poland.

The graph in Figure 5 illustrates the sales structure of steam coal imported to Poland. Due to the fact that Poland started detailed monitoring of imported steam coal (as well as the directions of the sales) in 2012, the data presented in the graph begin with that year.

The analysis of imported steam coal sales (Figure 5) shows that the main buyer is a so-called group of other domestic customers (56–76%). The group consists of a large number of customers represented by (Stala-Szlugaj, 2017) individual buyers (households), agricultural and horticultural households, small industry, public administration, health care and a number of other unspecified recipients.

Due to the fact that the group of other domestic recipients uses steam coal mainly for heating purposes, among the factors influencing its consumption are the temperatures prevailing in a given winter season. Other key factors influencing the volume of steam coal consumed by this group include (Stala-Szlugaj, 2017; Stala-Szlugaj, 2018) its price ratio versus other energy carriers as well as the level of energy poverty.

The years 2010–2011 were characterised by relatively cold winters, so there was a relatively high demand for coal. The analysis of steam coal grades sold to domestic customers (ARP, 2011–2020) and the consumption of steam coal by households (CSO, 2011–2019) revealed that the share of domestic sales of coarse and medium-size grades (i.e. the grades most frequently used by households) in the consumption of steam coal in Polish households in those two years totalled 75–88%. Domestic sales of these grades (ARP, 2011–2020) were at 7–8 Mt/y. Although in volume terms, in the next two years domestic sales remained at similar levels, their share dropped to 72–74%. In the following years, the share of sales of the said domestic grades fell to 61–69%, and in volume terms to 6–7 Mt/y.

Also noteworthy is the second group of purchasers of imported steam coal (see Figure 5), i.e. the power industry (electric utilities and industrial plants combined). In 2012–2019, its share in the directions of sales of imported steam coal changed between 15–26%. In order to ensure the generation of electricity to domestic consumers, this group relies primarily on the supply of domestic raw material which it purchases on long-term contracts whereas deliveries from the international spot market are treated as complementary supplies. Annual coal consumption by this group in 2010–2018 (CSO, 2011–2019) was 37.6–44.1Mt. In terms of grades, electric utilities use coal fines and the annual volume of these grades sold by domestic producers amounted to 31.2–38.8 Mt in 2010–2019 (ARP, 2011–2020). Domestic supplies accounted for 79–90% of the coal consumed by this group of recipients.

In 2012–2019, these two groups of consumers purchased in total 83–94% of steam coal imported to Poland.

So how did imports of steam coal to Poland develop? In volume terms, in 2010–2019 they varied from 5.6 to 15.7 Mt/y

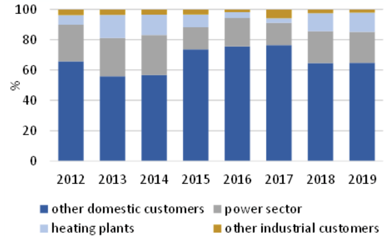

Fig. 5. Buyers of steam coal imported to Poland, 2012–2019. Source: Own study based on ARP (2012–2020)
Rys. 5. Struktura nabywców importowanego węgla energetycznego do Polski, lata 2012–2019

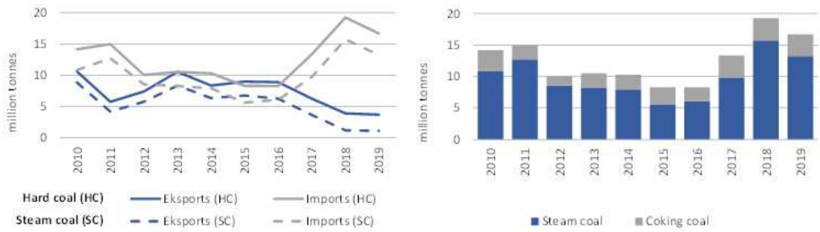

Fig. 6. Imports of steam coal to Poland in 2010–2019; a) imports compared to exports, b) imports broken down into steam coal and coking coal. Source: Own study based on (ARP, 2012–2020)
Rys. 6. Import węgla energetycznego do Polski w latach 2010–2019; a) import w porównaniu z eksportem, b) import w podziale na węgiel energetyczny i węgiel koksowy

(see Figure 6a) excluding the years 2013 and 2015–2016 where Poland was a net importer of this raw material. In 2010–2019, the share of steam coal in total hard coal imports to Poland was 68–85% (see Figure 6b). Within all OECD Europe countries, after Germany (20–29%) and Turkey (10–19%), Poland is the third importer of this raw material with a share of 4–11% (see Figure 3).

6. Summary

The first part of this article was devoted to discussing the European steam coal market. Poland was given particular attention.

Steam coal production in Europe has been in a downward trend for years. The average annual rate of decrease in the production of this raw material between 2018 and 2010 was -6.6%. The consumption of steam coal has been decreasing at a lower rate, and for all OECD Europe countries the 2010–2018 CAGR was -3.0%. As recently as 2010, the total production of OECD countries covered 41% of their needs for steam coal, and in 2018 dropped by 11 percentage points. Coal from international markets grew in importance. The main exporters of steam coal to the OECD Europe market in those years were primarily: Russian Federation (43–77 Mt/y with 26–46% share), Colombia (35–63 Mt/y; 21–31%), USA (11.0–36.0 Mt/y; 7–16%) and South Africa (6.5–26.5 Mt/y; 4–12%).

Within Europe, Poland is one of the most important producers and users of steam coal. Between 2010 and 2018, Polish production of 52–68 Mt/y accounted for 60–83% of the extraction of this raw material in all OECD Europe countries. The annual consumption of 58–72 Mt represented 23–30% of the consumption of OECD Europe countries. For many years, Poland's domestic production was the primary supplier of coal to its domestic market. However, with the decreasing number of mines, which resulted in lower extraction, imports of steam coal have grown in importance. According to Polish statistics, between 2010 and 2019 the import of steam coal to Poland varied from 6 Mt (in 2015) to 16 Mt (in 2018).

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

Literatura – References

1. ARE 2010–2020 – Energy situation in Poland (In Polish: Sytuacja energetyczna w Polsce. Krajowy bilans energii). Energy Market Agency SA, Warsaw, Poland, 2010–2020.
2. ARP 2011–2020 – Basic Information About the Market and the Hard Coal Sector in Poland (In Polish). Industrial Development Agency JSC: Katowice, Poland, 2011–2020.
3. ARP 2012–2020 – Import and Intra-EU Acquisition of Hard Coal (In Polish). Industrial Development Agency JSC: Katowice, Poland,2012–2020.
4. BP 2020 – BP Statistical Review of World Energy June 2020. [Online] Available at: http://www.bp.com/statisticalreview (Cit: August 11, 2020).
5. Coal Information 2011–2019 – Coal Information. Publ. International Energy Agency, Paris. Editions from 2011–2019.
6. CSO 2011–2019 – CSO. Energy Statistics. Central Statistical Office, Warsaw, Poland, 2011–2019.
7. GAWLIK, L. The Polish power industry in energy transformation process. Mineral Economic 31, 2018, pp. 229–237 . https://doi.org/10.1007/s13563-017-0128-5
8. globalCoal 2010–2019 – platforma internetowa www.globacoal.com (dostęp on-line)
9. GRUDZIŃSKI, Z. Coal economy in the international markets of the Atlantic and the Pacific regions. (In Polish: Gospodarka węglem kamiennym energetycznym na międzynarodowych rynkach Atlantyku i Pacyfiku). Gospodarka Surowcami Mineralnymi – Mineral Resources Management, 29(2), 2013, pp. 5-23, DOI 10.2478/gospo-2013-0022.
10. GRUDZIŃSKI Z. The development of the international steam coal market (In Polish: Rozwój międzynarodowych rynków węgla energetycznego). Zeszyty Naukowe Instytutu Gospodarki Surowcami Mineralnymi i Energią PAN, Issue 105, 2018, pp. 41-52. DOI: 10.24425/124384.
11. KASZYŃSKI, P.; KAMIŃSKI, J. Coal Demand and Environmental Regulations: A Case Study of the Polish Power Sector. Energies, 2020, 13, p. 1521. https://doi.org/10.3390/en13061521
12. NYGA-ŁUKASZEWSKA, H.; ARUGA, K.; STALA-SZLUGAJ, K. Energy Security of Poland and Coal Supply: Price Analysis. Sustainability 2020, 12, p. 2541; https://doi.org/10.3390/su12062541
13. OLKUSKI, T. Global primary energy consumption and future demand for it (In Polish: Światowe zużycie energii pierwotnej oraz zapotrzebowanie na nią w przyszłości). Polityka i społeczeństwo, 2(16), 2018, pp. 56-70.
14. PGI 2020 – Bilans zasobów złóż kopalin w Polsce wg stanu na 31 XII 2019 r. (In Polish) Państwowy Instytut Geologiczny – Państwowy Instytut Badawczy, Warszawa 2020, p. 498.
15. STALA-SZLUGAJ, K. Assessment of prospects for the demand of coal for the municipaland household sector in Poland. (In Polish: Ocena perspektyw zapotrzebowania drobnych odbiorców węgla w Polsce). Studia Rozprawy Monografie No 203, Wyd. IGSMiE PAN, Kraków, 2017, p. 216.
16. STALA-SZLUGAJ, K. The demand for hard coal for households in Poland and the anti-smog bill. Archives of Mining Sciences, Vol 63, No 3, 2018, pp. 701-711. DOI 10.24425/123692
17. STALA-SZLUGAJ, K., GRUDZIŃSKI Z. Rosja na międzynarodowym rynku węgla energetycznego a eksport do Polski. (In Polish: Russia on the international steam coal market and exports to Poland). Zeszyty Naukowe Instytutu Gospodarki Surowcami Mineralnymi i Energią PAN, Issue 108. 2019, pp. 21-38. DOI: 10.24425/znigsme.2019.130172
18. SOBCZYK, E.J.; KACZMAREK, J; FIJOREK, K.; KOPACZ, M. Efficiency and financial standing of coal mining enterprises in Poland in terms of restructuring course and effects. Gospodarka Surowcami Mineralnymi – Mineral Resources Management, 36(2), 2020, pp. 127–152. DOI: https://doi.org/10.24425/gsm.2020.132565
19. SZCZERBOWSKI, R.; CERAN, B., 2015 – Transformation of Polish Energy Policy in the Context of Changes in European Union Member States. Acta Energetica 3(24), 2015, pp.108-113; DOI: 10.12736/issn.2300-3022.201531

Międzynarodowy rynek węgla energetycznego a sytuacja cenowa w Polsce – część I

Celem artykułu była analiza cen węgla energetycznego polskich producentów w odniesieniu do głównych indeksów cen spot węgla energetycznego z rynków międzynarodowych. Badaniami objęto lata 2010–2019. Ze względu na złożoność poruszanej problematyki, artykuł został podzielony dwie części. W części pierwszej omówiono europejski rynek węgla energetycznego, szczególnie skupiając się na Polsce. W artykule omówiono także europejski rynek węgla energetycznego. Badania pokazały, że od wielu lat zarówno produkcja, jak i zużycie węgla energetycznego w krajach OECD Europe znajduje się w trendzie malejącym. W przypadku produkcji CAGR dla lat 2010–2018 wyniósł -6,6%, a średnioroczne tempo spadku zużycia tego surowca wyniosło 3,0%. Do tego spadku przyczyniła się nie tylko polityka dekarbonizacyjna, ale również rosnący udział energetyki odnawialnej oraz relacje cen między węglem a innymi nośnikami energii (zmniejszenie udziału węgla w miksie paliwowym danego kraju). Głównymi eksporterami węgla energetycznego na rynek OECD Europe w tych latach były przede wszystkim: Fed. Rosyjska (43–77 mln ton/rok, z 26–46% udziałem), Kolumbia (35–63 mln ton/rok; 21–31%) oraz USA (11,0–36,0 mln ton/rok; 7–16%) i RPA (6,5–26,5 mln ton/rok; 4–12%). W analizowanych latach produkcja węgla energetycznego w Polsce rocznie wynosiła 50,0–67,5 mln ton. W latach 2012–2015 polska produkcja o kilka procent przekraczała krajowe zapotrzebowanie na ten surowiec, a w pozostałych latach stanowiła 83–90% jego krajowego zużycia. Wraz z malejącą polską produkcją rósł na znaczeniu import węgla energetycznego, który zmieniał się w zakresie 6–16 mln ton/rok.

Słowa kluczowe: *węgiel energetyczny, ceny, międzynarodowy rynek węgla, Polska*