

# The Incentives and Subsidies of Fossil Fuel Sector and Renewables in Poland

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## Abstract

As one of the late liberalizing countries, Poland has implemented privatization and improvement reforms in the energy sector in the last thirty years. Poland, which has cities with heavy air pollution problems, has made various commitments for the removal of inefficient and old coal mines, as it is also a member of the European Union. In Poland, where the support for coal and other fossil fuels has been gradually reduced, the application of compensation measures has been avoided, as these sectors have economic consequences for the broad segment of society. Still, despite ongoing commitments to the closure of coal mines and the abolition of fossil fuel subsidies, unemployment and poverty growth concerns as a result of these changes are obstacles to reforms. In this study we aim to examine subsidies and incentives given to fossil fuel sector and renewables in Poland. First, commitments and changes regarding coal mining, which is at the center of Poland's fossil fuel industry, will be included, and then state subsidies to energy as a whole will be examined within the scope of the study.

**Keywords:** Subsidies, incentives, energy politics

**JEL Classification:** H23, H25, E62

## Polonya'da Fosil Yakıt Sektörüne ve Yenilenebilir Enerjiye Sağlanan Teşvikler ve Sübvansiyonlar

### Özet

Polonya geç liberalleşen ülkelerden biri olarak son otuz yıl içinde enerji sektörüne yönelik özelleştirme ve iyileştirmeye yönelik çok sayıda reform gerçekleştirmiştir. Yoğun olarak hava kirliliği sorunu yaşanan kentlere sahip olan Polonya, Avrupa Birliği üyesi de olması sebebiyle verimsiz ve eski kömür madenlerinin kaldırılmasına yönelik çeşitli taahhütlerde bulunmuştur. Kömüre ve diğer fosil yakıtlara olan destekleri aşamalı şekilde azaltan Polonya'da söz konusu sektörlerin toplumun geniş kesimini ekonomik açıdan etkileyecek sonuçlar doğurması nedeniyle tazminat tedbirlerine başvurulmasını kaçınılmaz kılmıştır. Yine de halen sürmekte olan kömür madenlerinin kapatılması ile fosil yakıt sübvansiyonlarının kaldırılması konusundaki taahhütlerine rağmen bu değişiklikler sonucunda ortaya çıkacak işsizlik ile yoksulluk artışı endişeleri reformların önündeki engellerdir. Öncelikle Polonya'nın fosil yakıt sektörünün merkezinde yer alan kömür madenciliğine ilişkin taahhütler ve değişimlere yer verilecek olup sonrasında bir bütün olarak enerjiye sağlanan devlet destekleri çalışma kapsamında incelenecektir.

**Anahtar Kelimeler:** Sübvansiyonlar, teşvikler, enerji politikası

**JEL Sınıflandırması:** 23, H25, E62

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## 1. Introduction

However, whereas coal production in the 1920s and 1930s was economically justified, during the post-World War II period, it became unviable after the inclusion of Poland in the Eastern Bloc (between the years 1945 and 1989) and the consequent nationalization of companies and implementation of central planning. Although coal production grew steadily until the late 1970s, the sector and related industries became dysfunctional. Combined with the lack of free market this situation led to a suboptimal economic structure. Shortages in domestic production of consumer goods are believed to be one of the economic reasons for the collapse of the communism in Poland. In the coal sector, the falling efficiency of collieries and lack of access to global markets were the main reasons for their catastrophic condition in the 1980 (Szpor and Ziółkowska, 2018: 2).

Production of hard coal in Poland dropped drastically during the 25 years of transformation, between 1990 and 2014 dropped more than two times, to 73 million tonnes. Still, Poland remains the largest hard coal producer among the EU member states (Szpor and Ziółkowska, 2018: 4).

In 1990s Poland started to transform its large and inefficient coal industry related to its wider economic transition process. The government of Poland had several attempts to reform sector with the purpose of closing unprofitable mines, reducing employment levels to improve labour productivity, and eliminating the sector's overcapacity in order to private mines. Therefore early attempts to reform the mining sector resulted very limited in terms of reducing capacity, employment, and fiscal costs. But there was some issues which prevented to achieve high success at reform attempt. Resistance from unions to proposed wage cuts and reductions in employment and insufficient resources provided by government in order to drive social programs and mine closures. Yet 1998 a new hard coal reform program started and it resulted successfully. After Poland coal market was liberalised (first privatisation was in 2009) it become profitable and able to adjust international price fluctuations (European Union, 2017: 20).

Poland has repeated its commitment to phase out fossil fuel subsidies every year since 2009 as a part of EU and G7. In 2016 Poland called on all nations to end fossil fuel subsidies by 2025. The European Commission (EC) has repeatedly called on EU Member States to end all environmentally harmful subsidies, including those to fossil fuels, by 2020. In 2012, the government introduced an excise tax on coal. Besides Poland is growingly phasing out some of its support to coal mines. While gradually phasing out some subsidies to coal mines, there have been efforts to alleviate the costs of closing mines, rehabilitation sites and support workforce transition. In 2016, European Commission approved allocation of good amount of aid to alleviate the environmental and social impacts of closing uncompetitive coal mines by 2018. All coal mining subsidies in Poland currently are allocated to coal mine decommissioning, rehabilitation and the support of former miners through reemployment in other sectors, compensatory pensions and social security benefits (Burg, 2019).

According to the draft Energy Policy of Poland to 2040, the share of coal and lignite in electricity generation will be reduced from just under 80% in 2017 to 60% by 2030. The draft policy also places priority on long-term energy security, has a strong emphasis on reducing greenhouse gas emissions and air pollution, increasing energy efficiency and decarbonising the transport system. Moreover the implementation of the new Energy Policy will require significant investments to reduce the share of carbon-intensive power plants and increase the share of low-carbon Energy (IEA, 2019).

Poland is less supportive of this “energy system transformation” and foresees fossil fuels as a fundamental element of its energy system over the long term. Whereas the government has placed a strong emphasis on reducing greenhouse gas (GHG) emissions and air pollution, increasing energy efficiency, meeting its renewable energy targets, decarbonising its transport system and introducing nuclear power, Poland is one of the countries which has highest carbon intensity in IEA Europe member states. In the power sector many coal-fired power plants are old, inefficient and polluting: 62% of coal capacity is over 30 years old and 13% is between 26 and 30 years old. (IEA, 2017: 9-10). Besides because of ageing and low efficiency of combustion in heating units, household heating is a major source of local air pollution in the country, and emissions from this sector are difficult, if not impossible, to regulate. The European Environment Agency estimates that household heating produces approximately 40% of particulate matter emissions (IEA, 2017: 10).

Poor air quality is shown as the the main environmental problem in Poland reflected by high levels of urban air pollution. Dependence on old and sometimes inefficient household heating infrastructure based on low-quality coal, and heavy reliance on aged car fleet are the main factors of urban air pollution (OECD, 2016).

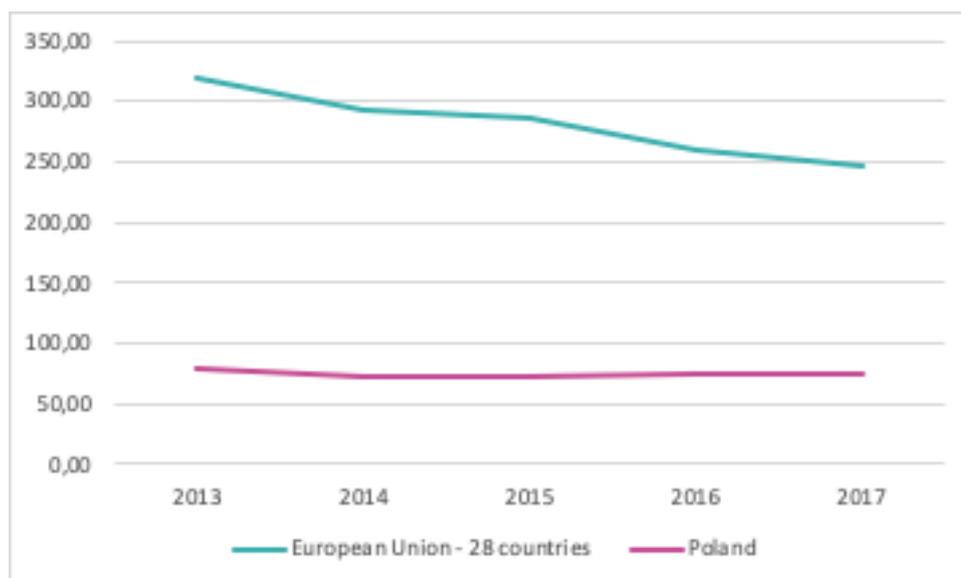
Main incentive and subsidies given to energy sector in Poland can be seen as follows:

- Restructuring the hard coal mining industry (subsidies and cancellation of debt owed to the state, including debt related to the payment of social security contributions and environmental levies).
- Subsidies to pensions and social security benefits for miners.
- Free allocation of EU-ETS allowances.
- Power Purchase Agreements and stranded costs.
- Green certificates.
- EU subsidies.
- Tax regulations
- Support for RES.

### **1.1. Polish Energy Sector Overview**

Poland’s strategic approach is that the use of hard coal and lignite is the cornerstone of the energy system. In 2015, coal provided over 50% of primary energy supply, the second largest share among Organisation for Economic Co-operation and Development (OECD) countries and 81% of total electricity generation (IEA, 2017: 11).

Figure 1 shows gross inland consumption of hard coal by Poland and EU28 countries. Figure 1 shows that Poland gross inland consumption has been steady during 2013-2017 years while EU28 countries’ gross inland consumption has fallen.



**Figure 1:** Gross inland consumption of hard coal by Poland and EU28, 2013-2017 (million tonnes)

Source: Eurostat

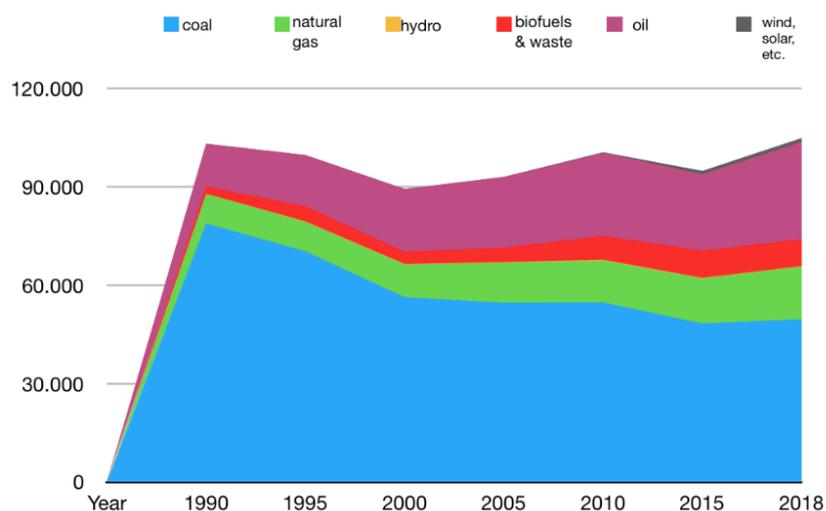
Table 1 indicates Poland electric generation by energy carrier. It's understood from the Table 1 that hard coal is the biggest energy source used for electric generation is hard coal with. Between 2013-2018 hard coal usage had fallen. Lignite is the second largest energy source at the electric generation. It needs to be noted that RES-renewable energy sources usage has ever increased over the years 2010-2018. Especially wind energy and photovoltaic made progress dramatically. It can be said that transition process to greener and more environmentally friendly energy sources for the Polish economy achieved in terms of renewable energy sources' usage through incentive policies. Figure 2 provides information about total primary energy supply by source in Poland over the years 1990-2018.

**Table 1:** Poland electric generation by energy carrier

Specification	2010	2011	2012	2013	2014	2015	2016	2017	2018
	GWh								
Hard coal	87863	87326	80568	81568	76162	77693	79400	79022	81257
Lignite	48651	52529	54054	56150	53365	52825	50920	52166	49331
Gas Fuels	4890	5821	6259	5247	5329	6405	7831	10141	12709
Pumped storage	568	430	428	558	551	603	482	474	417
<b>RES</b>	<b>10889</b>	<b>13137</b>	<b>16879</b>	<b>17066</b>	<b>19841</b>	<b>22679</b>	<b>22808</b>	<b>24050</b>	<b>21580</b>
Biomass and biogas	6305	7601	10094	8622	9976	9932	7957	6416	6511
Water	2920	2331	2037	2439	2182	1832	2139	2560	1970
Wind	1664	3205	4747	6004	7676	10858	12588	14903	12799
Photovoltaic	0	0	1	1	7	57	124	165	300
Other fuels	4797	4305	3991	3968	3810	4739	5193	4613	4745
<b>Total</b>	<b>157658</b>	<b>163548</b>	<b>162139</b>	<b>164557</b>	<b>159058</b>	<b>164944</b>	<b>166634</b>	<b>170465</b>	<b>170039</b>

Source: Statistics Poland, 2019: 27.

Figure 2 showed that primary energy supply. Coal has biggest portion at the total primary energy supply in Poland. Oil as an fossil energy source takes second place at the total primary energy supply. Wind, solar and other renewable energy sources except from hydro had become visible since 2010's. When we compare the coal supply over the years 1990-2018, decrease at the coal supply is obvious. Decreasing at the coal supply over the years 1990-2018 can be observed clearly by the Figure 3 below.

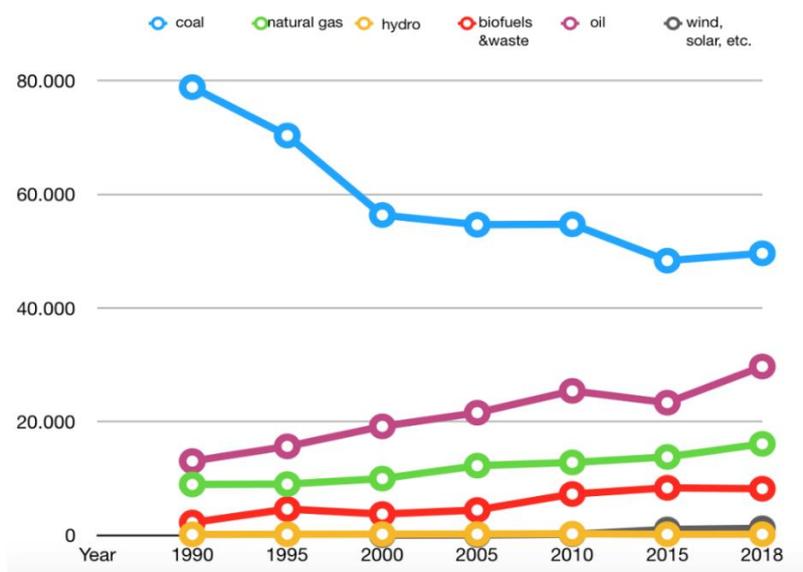


**Figure 2:** Total primary energy supply (TPES) by source, Poland 1990-2018

Source: IEA , World Energy Balances 2019.

Coal supply was equal to 78872 ktoe in 1990 year. After 90s till today coal production slowly decreased as to 56353 ktoe in 2000, 54738 ktoe in 2010, 49629 ktoe in 2018. Instead of coal, oil supply in the total primary energy supply increased since 90s to today. Oil supply was 13044 in 1990. When we come to see 2000's ,its notable that oil supply increased slightly. Oil supply amount at years observed as follows: 19159 ktoe in 2000, 25405 ktoe in 2010, 29703 ktoe in 2018. Hydro energy supply amounted 124 ktoe in 1990, 251 ktoe in 2010, and 169 ktoe in 2018. Biofuels and waste sourced energy indicates by red color at the Graph 2 amounted 2230 ktoe in 1990, 3720 ktoe in 2000 and 8173 ktoe in 2018. Wind, solar, etc. Are renewable energy sources place smallest portion with hydro power at the total primary energy supply of Poland. Wind, solar and other renewables energy amounted 3 ktoe in 1990, 167 ktoe in 2010. In a 5 years period that kind of energy sources achieved a dramatic increase by 838 ktoe, and calculated as 1005 in 2015, finally 1200 ktoe in 2018.

Poland looks to coal for its energy supply. It makes up 79% of energy production and 51% of total primary energy supply (TPES). The majority of the coal (71%) is used for heat and power generation, and coal provides 81% of the electricity and 86% of the heat produced in Poland. Both oil and natural gas have increased their share of TPES in recent decades. Oil is the second-largest source of energy with 24% of TPES, and the biggest in terms of total final consumption (TFC) with 32%. Domestic oil production is small and Poland is dependent on imports. Natural gas is the third-largest source of energy with a 15% share of TPES, of which one-third is produced domestically and the rest is imported. On the other hand, Poland has started a slow transition from coal towards more oil, gas and renewables. The largest renewable energy source is biofuels and waste, which makes up 88% of renewables in the energy supply and a 9% share of TPES. Wind power is the second largest source of renewable energy with a small yet growing share of TPES (IEA, 2017: 18-19). Figure 3 shows T-total primary energy supply (TPES) by source in Poland for the years 1990-2018.



**Figure 3:**Total primary energy supply (TPES) by source, Poland 1990-2018

Source: World Energy Balances 2019.

As it's seen by the Figure 3, coal's share in total primary energy supply of Poland has been decreased dramatically since 1990. Shares of oil and natural gas has been increased.

## 2. Subsidies Given to Fossil Fuel Sector and Renewables in Poland

The objective of the Polish energy policy until 2040 has been stated by Ministry of Energy (2018) as is to provide energy security, while ensuring competitiveness of the economy, energy efficiency and reduction of the environmental impact of the energy sector, and with optimum use of Poland's own energy resources.

Main indicators which are planned to be used as the overall measure to realize Polish energy policy until 2040 are listed below: (Poland Ministry of Energy, 2018: 2)

- 60% share of coal in the generation of electricity in 2030
- 21% RES in gross final energy consumption in 2030
- introduction of nuclear energy in 2033
- improvement in energy-efficiency by 23% by 2030 relative to the 2007 forecasts
- reducing CO<sub>2</sub> emissions by 30% by 2030 (in relation to 1990)

Improving energy efficiency is one of eight strategic directions within the Polish energy policy. It aims to lower energy cost by ensuring energy efficiency. While its come to the EU-wide target for 2030 is 32.5%, Poland declares a 23% energy savings compared to the forecast from 2007. Increased efficiency of the economy will be achieved by requiring a group of entities to improve energy efficiency or to purchase energy efficiency certificates, and usage of legal and financial incentives for pro-efficiency actions (Poland Ministry of Energy, 2018: 5).

Main incentive and subsidies given to energy sector in Poland can be seen as follows:

Restructuring the hard coal mining industry (subsidies and cancellation of debt owed to the state, including debt related to the payment of social security contributions and environmental levies).

Subsidies to pensions and social security benefits for miners.

Free allocation of EU-ETS allowances.

Power Purchase Agreements and stranded costs.

Green certificates.

EU subsidies.

Tax regulations

Support for RES

Additionally, new types of support instruments that emerged in Poland between 2013 and 2016 were taken into account:

- Recapitalisation of hard coal mines by state-owned enterprises.
- Capacity remuneration mechanisms: Operational Capacity Reserve (OCR) and Supplemental Contingency Reserve (SCR).
- Discount system for prosumers.

Figure 4 shows financial support to fossil fuels in Poland and EU for the years 2008-2016 by 2017. As its seen by the Figure 4, apart from 2012 financial support to fossil fuels in Poland and in EU has gone parallel with each other.

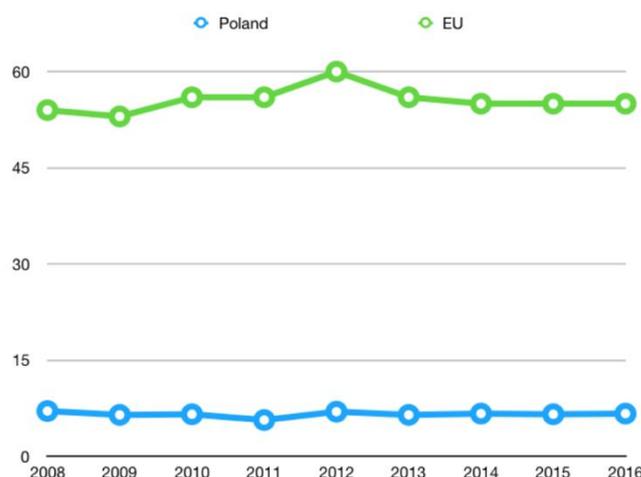


Figure 4: Financial support to fossil fuels in Poland (2008-2016, €2017bn)

Source: European Commission, 2018: 268.

Although Poland has constantly stated that governments aim were to reform fossil fuel sector and mines, for the years 2008-2016 financial support to fossil fuels remained. Post-tax subsidies in US \$ billions and post-tax subsidies US \$ per capita can be seen at Table 2 (2013) and Table 3 (2015 projected).

**Table 2:** Poland Post-tax Subsidies by Product (2013)

Post-tax subsidies in US \$ billions (nominal)				Post-tax subsidies in US \$ per capita (nominal)			
Petroleum	Coal	Natural Gas	Total	Petroleum	Coal	Natural Gas	Total
2,76	41,03	2,94	46,73	72,60	1077,99	77,12	1227,71

Source: IMF

**Table 3:** Poland Post-tax Subsidies by Product , 2015 Projected

Post-tax subsidies in US \$ billions (nominal)				Post-tax subsidies in US \$ per capita (nominal)			
Petroleum	Coal	Natural Gas	Total	Petroleum	Coal	Natural Gas	Total
3,31	47,64	3,25	54,20	87,15	1253,03	85,53	1425,71

Source: IMF

As its showed at the Table 3, biggest amount of post-tax subsidies has paid to coal sector by 41,03 billion US \$. According to IMF post-tax subsidies projection in Poland, post-tax subsidies had been expected to grow instead of decreasing. Also Greenpeace (2014) estimates average support to coal production in Poland at about 0.45 billion Euro per year.

Gençsü and Zerzawy (2017) have examined that subsidies have primarily been provided through state-owned enterprise (SOEs) investment of PLN18.8 billion (€4.5 billion)1 per year between 2014 and 2016, of which PLN11.7 billion (€2.8 billion) per year supported fossil fuel-based power generation, and PLN5.8 billion (€1.4 billion) supported oil and gas production. It seems that significant investments are also provided through major state-owned coal companies although information about the scale of these investments is very scarce. Subsidies are also provided through fiscal support (including budget expenditure and foregone revenue in the form of tax exemptions) of at least PLN1.8 billion (€555 million) per year was provided between 2014 and 2016. Investment by Polish public finance institutions was at least PLN416 million (€159 million) per year between 2014 and 2016 (Gençsü and Zerzawy, 2017).

Subsidies in Poland are divided into four support schemes as direct subsidies, fiscal measures, transfer of risk to government, and non-fiscal measures. Table 4 indicates those support schemes according to field they are allocated to.

**Table 4:** Support schemes of subsidies in Poland

Country: Poland												
Support schemes	Electricity and heat production			Consumption				Transport		Supply and others		
	RES	Fossil	Nuclear	RES	Fossil	Electricity	Heat	Biofuels	Fossil	RES	Fossil	El.\heat
<b>1. Direct subsidies</b>												
Direct on-budget subsidies	3			4								
Feed-in tariffs												
Feed-in premiums												
Adjustment Aids		12, 10										
Inherited liabilities		11										
Induced transfers		7										
Others												
<b>2. Fiscal measures</b>												
Energy Tax Allowance												
Energy Tax Exemptions				2								
Other Tax Deductions		6										
Earmarked refunds of taxes					13							
<b>3. Transfer of risk to government</b>												
Adjustment Aids												
Inherited liabilities												
Others												
<b>4. Other financial measures</b>												
Adjustment Aids		9										
Other Tax Deductions												
Others												
<b>5. Non-fiscal measures</b>												
Quota obligations	1			1				5				
Priority Grid Access	1											
Others					8							

Source: European Environment Agency

According to Table 4 mostly applied supports are defined as direct subsidies and they are allocated to electricity and heat production. In the concept of direct subsidies except from direct on-budget subsidies to RES (3 to electricity and heat production, and 4 to consumption), others given to fossil energy sources.

The period of 2013-2016 brought a series of changes, which influenced the amount and structure of subsidies in the mining and power industries. Most importantly, the recapitalization of unprofitable mining enterprises by state-owned companies was applied for the first time as a new type of aid (Siedlecka and friends, 2017: 34)

### 2.1. Restructuring the hard coal mining industry (subsidies and cancellation of debt owed to the state, including debt related to the payment of social security contributions and environmental levies).

Throughout the last quarter of century Polish public institutions used different ways of direct financial support for mining enterprises. Among them, the most important one has been a direct fund allocation to mines in the form of subsidies for mine operation and their restructuring, as well as deferral or even cancellation of outstanding debts, including the unpaid pension contributions or mining damage compensation. Direct support for the mining industry in the period of 1990-2016 (except for subsidies to pensions and social security benefits for miners) is estimated at PLN 81 billion. It should be stressed that during the last four years the total value of support has increased by 7% in comparison with the period of 1990-2012. Two most cost-absorbing activities during the analysed period were debt cancellations and subsidies, which amounted to PLN 24 and 22 billion, respectively. Deferrals, installments and other forms of debt bail-in contributed to the recapitalization of the mining industry by nearly PLN 6 billion. In recent years, a key type of support has been a combination of investments in unprofitable mines made by state-owned companies as well as mine-closure subsidies for mines acquired by the Mines Restructuring Company (Spółka Restrukturyzacji Kopalń, SRK) (Siedlecka and friends, 2017: 16). Figure 5 indicates the structure of subsidies and grants for the coal mining industry.

Figure 5 indicates that debt cancellations and grants have the biggest part among restructuring supports. Meanwhile, Ministry of Economy and the Polish Social Insurance Institution are leading support provider organizations in the country in terms of restructuring the hard coal mining industry in 2016.

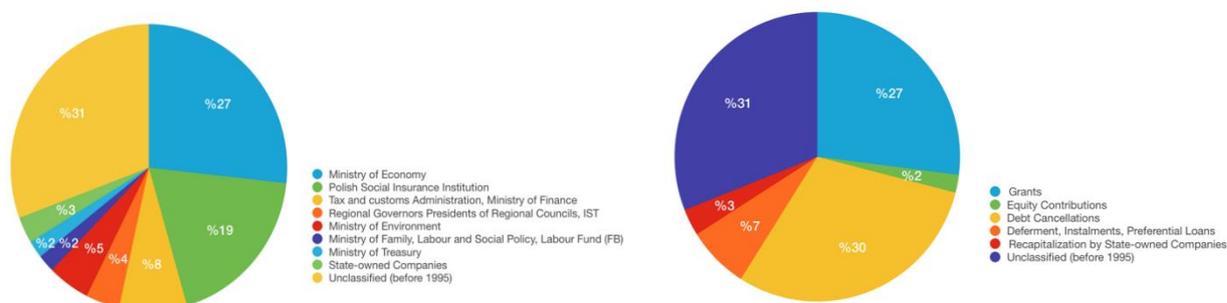


Figure 5: Structure of subsidies and grants for the coal mining industry (except for subsidies to pensions and social security benefits for miners) in the Period of 1990-2016 by type of Support (upper diagram) and by Donors Support (lower diagram) totaling 81 billion PLN

All monetary values are presented in local currency in constant 2016 prices.

Source : Siedlecka and friends, 2017: 16.

In addition to support mentioned above, aid for employment restructuring comprises various social schemes over the last two decades but its aim has always been to bring about a reduction in unemployment in the mining sector without a significant loss of the dismissed workers' welfare. Also there is a support for rehabilitation for mining sites which damaged and abandoned. It provides funding for the of regions damaged by both past coal-mining activity and the reactivation of abandoned mining sites. Funding provided for the rehabilitation of regions damaged by the reactivation of abandoned mining sites is a producer subsidy (EEA, 2014). The Rehabilitation of Regions Damaged by Coal Mining Activity scheme forms part of the broader restructuring programme. The state is committed to continue the programme until at least 2015, as outlined (Gençsü and Zerkawy, 2017: 3).

## 2.2. Subsidies to pensions and social security benefits for miners

In Poland mining sector employees enjoy some benefits according to legislation in force. There is no coincidence about mining sector's importance stems from historical and political reasons. Because of miners well organized and influential political group, after change of political system in Poland, no political party had courage to change advantages of employees and employers in the mining sector. Today, miners are one of the working group benefit from favourable pension scheme. They are also the only employee group covered by the universal, entitled to early retirement. Mining pensions are paid out from the public Social Insurance Fund. Miners and mines or mining companies pay identical contributions to the social security fund as other insured employees covered by the social security fund. The mining pensions are calculated on contribution assessment basis applying favourable conversion rate of the employment period of working underground. Also miners have right to retire early. Thanks to privileged treatment by the social security regulations, the retirement pensions and disability pensions are almost twice as high as average retirement pensions and disability pensions paid out to other insured individuals (Swiatkowski, 2018).

Mining work has been defined in the Act on old-age and disability pensions from the Social Insurance Fund and according to its content, workers performing mining work are employed, among others: (Matuszewska-Majcher, 2019: 1).

- a) Underground in coal mines and other raw materials;
- b) Underground and at sinking and construction of shafts and in enterprises performing mining works and renovation works underground;
- c) On the outcrops in sulfur and brown coal mines (with strictly defined works);
- d) Underground in the positions of traffic supervision and mine traffic management, enterprises involved in the aforementioned works;
- e) As members of the rescue teams of mines, mechanics of rescue equipment and professional rescuers performing duties in mining rescue stations;
- f) At stations of hoist drivers on windscreens and at whistleblower positions on shaft shafts in underground mines;
- g) In underground workplaces in inactive underground mines;
- h) At the positions of instructors working in mining training fields located underground

Miners' pensions are a special sub-system in social insurance regulations in Poland, based on the defined-contribution principle and financed from general social security contributions. Before 2009 the list of arduous or hazardous occupations, based on decrees and other regulations, had been extended widely during 1980s and 1990s and had not been revised in line with technological and work organisation changes in the last decades. Since 2009 the Act on Bridging Pensions means that people working in arduous or hazardous conditions can take early retirement only if their health status might worsen significantly if they continued working until official retirement age, or if (a) their jobs involve demanding psycho-physical conditions that worsen with age, and (b) they are responsible for the health and lives of other people. The Act on Bridging Pensions (which come into force in 1999) includes new definitions of jobs treated as having special conditions or a special nature that establish eligibility for bridging pensions: work under special conditions and work of a special nature: (Chłoń-Domińczak, 2016).

- ❖ *Work under special conditions* – work performed under conditions that, with age, carry the risk (significant probability) of causing permanent health damage. The work must be performed under special environmental conditions, determined by forces of nature or technological processes, which – despite using all available technical, organisational or medical preventive measures – impose requirements that exceed workers' capabilities as they approach retirement age, and consequently pose a risk of health damage. Risk factors determined by forces of nature include: (a) work underground, (b) work on water, (c) work underwater, and (d) work in the air. Risk factors determined by technological processes include:
  - Work in hot conditions (microclimate),
  - Work in cold conditions (microclimate),
  - Very heavy physical work,
  - Works in conditions of elevated atmospheric pressure, or
  - Heavy physical work associated with very high static load resulting from having to work in a forced, unchanging body posture
- ❖ *Work requiring special responsibility and special psychophysical performance*, the ability to discharge which (in a manner not prejudicial to public security, including the health or life of other people) diminishes before pensionable age as a result of deteriorating psycho-physical efficiency associated with the process of individual ageing. The list for work under special conditions consists of 40 items (including work underground in mines, work in steel factories with blast furnaces, work underwater, working on sea ships, work in cold (sub-zero) temperatures, and very heavy physical work). Miners' early-retirement pensions are paid directly from the Social Insurance Fund, based on the defined-benefit principle. This means that miners do not receive a

pension from the funded part when they retire, but their assets in open pension funds are transferred to the Social Insurance Fund. Their entire pension contribution is paid to the pay-as-you-go (PAYG) part.

In addition to The Act on Bridging Pensions, The Act on Old-Age and Disability Pensions from the Social Insurance Fund defines the work of miners, including various types of jobs that require working underground (art. 50c of the Act).

Table 5 describes pension rules for miners according to The Act on Old-Age and Disability Pensions and Social Insurance Fund.

**Table 5:** Pension rules for miners

<b>Pensionable age</b>	55 if 10 years of working as a miner. 50 if 15 years of working as a miner. No age limit if 25 years of working as a miner
<b>Career requirements</b>	At least 10 years of working as a miner. 20 years of service in total for women, and 25 years for men. The law includes a detailed list of what is understood as working in a mine or equivalent. Time spent in the following types of work is enhanced by a factor of 1.5:1 for the purposes of reckonable service: working directly at the coalface when mining; loading of excavated material and other work at the coalface, the assembly, liquidation and transport enclosures; machine cutting drums; loading and transporting at the coalface; and shaft sinking and shaft work; and working in the rescue teams.
<b>Benefit calculation</b>	24% of base amount plus: 1.3% of individual pension base for each contributory year, plus: 0.7% of individual pension base for each non-contributory year that is counted for pension purposes (i.e. maternity periods). The base amount is equal to the average wage in the economy for the previous year, net of social security contributions. The individual pension base is the average of the individual and average wage in the economy over a period of 10 consecutive years chosen from previous 20 years of service. Each year of service is multiplied as follows: 1.5 years for each year of working full time underground; 1.8 years for each year of working at the coalface or in rescue teams; 1.4 years for each year of working partially underground;  1.2 years for each year of working full time at open-pit sulphur and coal mines, sulphur borehole mines and enterprises and other entities engaged in mining work for sulphur and lignite. The total number of years, with multipliers, is limited to 45 years.
<b>Contribution payment</b>	Contributions are paid according to the general rules.
<b>Source of financing</b>	Social Insurance Fund. Miners who claim miners' pensions should not be members of open pension funds in the mandatory funded tier. They should resign from their membership and transfer all savings to the state budget.

Source: Chłóń-Domińczak, 2016.

The topic of early retirement for miners is often discussed in discussions about the national pension system. People who hired out of mining sector has been questioning the reason for miner's privilege as one of the professional groups (Matuszewska-Majcher, 2019: 1). Tablo 6 provides numbers about estimated subsidies for mining pensions from social insurance fund.

**Table 6:** Estimated subsidies for mining pensions from the Social Insurance Fund, PLN billion

	2006	2007	2008	2009	2010	2011	2012
<b>ZUS subsidies to mining pensions</b>			5,0	5,5	6,0	6,5	8,8
<b>Total subsidy to FUS, in PLN million</b>	312,7	319,3	322,9	324,7	324,5	327,1	(.)
<b>Number of mining pensioners, thousand people</b>	186,8	194,0	198,5	201,3	201,9	203,3	(.)
<b>Average benefit, thous. zł / msc</b>	2472,87	2526,33	2750,42	2949,38	3119,07	3253,86	(.)
<b>Forecast of subsidies for mining benefits according to MPiPS</b>	0	0	195,4	843,2	1852	3138,5	4173,4

Source: Berbeka, 2014: 26.

While the amount for 2012 is estimated in a government document, the estimates for previous years refer to unspecified press reports and oscillate around PLN 6 billion for 2010 and 2011. Subsidies to the Social Insurance Fund adopted in subsequent budget acts for subsequent years are not they disaggregate components, treating subsidies for all en-block pensions (without separating how much is added to individual privileged groups). Therefore, the estimation of subsidies for 2006-2009 based on information from 2010-2012 and the total amount of subsidies to FUS was adopted. The described valuation seems to be the only solution. Earlier government analyzes do not see the problem of the growing deficit of mining pensions at all. The issue of the amount of payments growing at a much faster rate than the amount of contributions made was not the subject of a sectoral analysis. Also, statistical studies of the Social Insurance Institution itself do not aggregate the so-called "Efficiency" of the mining retirement system (Berbeka, 2014: 25).

### 2.3. Free allocation of EU-ETS allowances

Free allocation of allowances in the European energy sector was brought to an end in 2012. One exception is the derogation mechanism for Poland and other Central and Eastern European countries that enables governments to allocate a certain part of allowances to the energy sector completely free of charge, in exchange for modernisation investments. This mechanism as a kind of subsidy aimed for rewarding enterprises that own emission-

generating power plants, as those units receive free allowances based on historical data (Siedlecka and friends, 2017: 10).

#### **2.4. Power purchase agreements and stranded costs**

Support for fossil fuels in Poland mainly comes in the form of compensations for the decommissioning of coal mines and for the termination of long-term Power Purchase Agreements (PPAs) that were signed with power plants (OECD, 2016: 2). Subsidies towards fossil fuel fired power generation are provided through a number of fiscal support measures. A major support programme is the Stranded Costs Compensation, which provides subsidies to coal power plants to compensate them for the termination of long-term power purchase agreements (PPAs), a programme started in the 1990s to modernise the domestic electricity sector. Between 1994 and 1998 the programme awarded new modernised projects long-term PPAs for their generation capacity, and the state network operator had a purchase obligation for a guaranteed volume of electricity at a guaranteed price (Gençsü and Zerzawy, 2017: 4-5). Payments are financed from a parafiscal levy imposed on all consumers to make up a fund which is then disbursed among the power plants. State payments cover the costs and risks normally borne by the power plants under normal market conditions. Since Polish power plants rely mainly on coal (more than 90% of Polish electricity is produced out of coal), this scheme is an implicit subsidy to the coal sector (EEA, 2019). The last PPA was due to expire in 2027 (Gençsü and Zerzawy, 2017: 5).

#### **2.5. Green certificates**

Poland as a member country of EU and a country suffers from low air quality because of mostly coal production & consumption have adopted a transition process towards greener and cleaner energy sources in order to eliminate coal's dominance at energy generation and usage.

EU have adopted number of arrangements obliging members to be successful at reduction greenhouse gas emissions and at increasing share of renewable energy sources of energy used. In March 2007, the European Council adopted joint arrangements obliging member states to achieve the following goals by 2020 defined as reduction of at least 20% in greenhouse gas emissions (compared with 1990), to increase of up to 20% share of renewable energy in all sources of energy used and to improving energy efficiency by 20%. And then repeatedly increasing renewable energy sources target has been defined at Directive 2009/28/EC (DIRECTIVE 2009/28/EC). When it comes to 2010, the three above-mentioned objectives were included in the Europe 2020 strategy (Europe 2020). the Green Paper on the Climate and Energy Policy Framework by 2030 aims reduction of greenhouse emissions by at least 80 % by 2050 (Adamczyk and Graczyk, 2019).

Poland has intended to facilitate environmentally friendly-green economic growth by ensuring energy security and reach to modern, innovative technologies in order to eliminate old technologies which prevents to transition environmentally friendly growth. The Strategy for energy and Environment (BEiŚ) is indicated as a key document in green growth area by showing required reforms and strategies should be taken in the perspective of 2020 (Adamczyk and Graczyk, 2019).

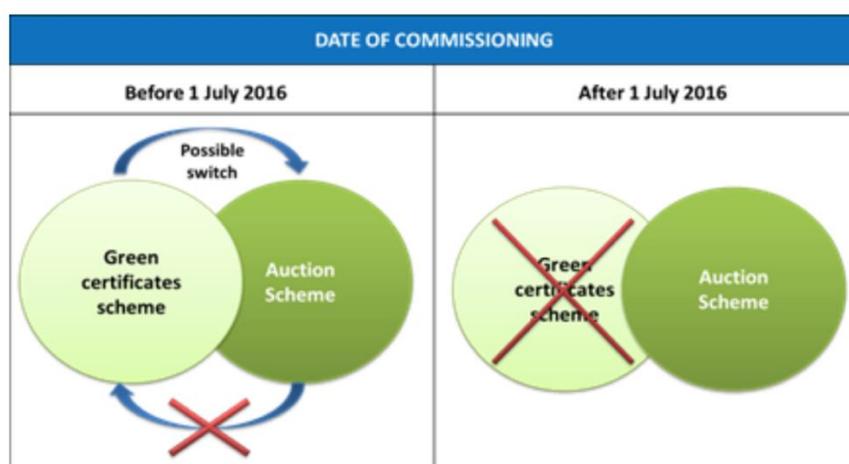
The main mechanism to support the production of electricity from renewable sources is the system of so-called green certificates. It has been defined in the Act of April 10, 1997 Energy Law (Journal of Laws of 2006, No. 89, item 625, as amended).

Green certificates operate in Poland since 2005, then came into force new regulations, amending the scope of the obligation to purchase energy from renewable sources. So that the Act and new regulations provide producers of electricity from renewable energy sources to demonstrate that under the Directive of the European Parliament and Council of Europe

2009/28/EU of April 23, 2009 on the promotion of energy from renewable sources, changing and in the result repealing Directives 2001/77/EU and 2003/30/EU the electricity they sell is produced from renewable energy sources. The incentive schemes applicable to renewable energy sources are regulated in the Renewable Energy Sources Act dated 20 February 2015 (Krzysztof and friends, 2019: 3).

There are two main incentives schemes in Poland defined as green certificates scheme and auction schemes. As its shown at the scheme below if the date of commissioning is before the 1 July 2016, switch is possible between schemes. But if the date of commissioning is after 1 July 2016 switch is no possible between green certificates scheme and auction schemes (see the Scheme 1).

**Scheme 1:** Certificate-based incentive scheme



Source: Krzysztof and friends, 2019: 3.

The certificate-based incentive scheme is based on tradable certificates of origin whereby renewable energy producers receive: (Krzysztof and friends, 2019: 3)

- a) price for electricity sold at competitive market
- b) price for tradable certificates of origin granted to the operator of the RES Installation

In addition to the green certificate system, there are also different certificates systems in Poland: (Green Energy Poland SA, 2020)

- ◆ red certificates, their origin of the electricity derived from so-called cogeneration and combined heat and power production;
- ◆ yellow (formerly blue) certificates, their of origin from small cogeneration sources gas-fired or of power below 1 MW,
- ◆ purple certificates, their of origin from sources that use gas from demethanation mines;
- ◆ orange certificates from sources equipped with installations to capture and store carbon dioxide (CCS – Carbon Capture and Storage);
- ◆ blue certificates from new, highly efficient sources;
- ◆ white certificates aimed at promoting energy efficiency and reducing consumption of the final energy.

White certificates have been in force in Poland since 2012. Main features of White certificates are given below: (Düzgün, 2014: 52)

Obligatory participants: companies operates at electricity, natural gas and regional heating

Suitable Energy Consumers: All final consumers

System Administrator: Regulatory Authority (ERO)

Goal-setting: state

Measurement Method of Savings: annual primary energy savings

Targets: Until 2016: 53452 GWhPenalty: Up to € 2 million in case of non-compliance

Certificate trading: Yes

## 2.6. EU Subsidies

The **Multiannual Financial Framework (MFF)**, for 2014-2020, ensures that at least 20 % of the European budget is dedicated to climate-related expenditure. Climate adaptation actions have to be integrated into all major EU spending programmes, and a tracking system monitors achievement of the main objectives. A wide array of funding is available at EU level to finance the transition in coal regions. Technical assistance is also available via the **Structural Reform Support Service and the Platform for Coal Regions in Transition**. Besides, EU support for coal regions 5 European structural and investment funds (ESI funds) for 2014-2020 have several thematic objectives that can support coal regions. The European Regional Development Fund (ERDF), with a budget of €196 billion, supports the shift to a low-carbon economy (between 12 % and 20 % of its resources, depending on the type of region). **Cohesion Fund**, with a budget of almost €75 billion, provides funds focusing mainly on the transport and energy sectors. ERDF also supports European Territorial Cooperation (ETC), including cross-border cooperation on climate action between **Member States The European Social Fund (ESF)**, with a budget of over €86 billion, supports the shift towards a low carbon and climate-resilient economy through the improvement of the education and training systems necessary for the adaptation of skills and qualifications, the up-skilling of the labour force, and the creation of new jobs in sectors related to the environment and energy. **The European Globalisation and Adjustment Fund (EGF)** has an annual budget of €150 million for 2014-2020 provides support for people who lose their jobs as a result of structural changes linked to globalisation (for instance when a large company shuts down, or production is moved outside the EU). projects designed to help workers find another job or set up their own business via advice, retraining and allowances (Widuto, 2019: 5).

Poland also have allocations from EU-ETS system. Taking into account the current negotiations of the EU-ETS system reform, which will probably lead to a rise in allowance prices, as well as the possibility of extending the derogation mechanism until 2030, which Poland successfully negotiated, free allowance allocation will constitute one of the key support instruments for the Polish energy sector in the next decade (Siedlecka and friends, 2017: 34)

Table 7 shows annual costs including EU subsidies of support for mining and coal-based power generation per capita and per household PLN, based on constant 2016 prices.

**Table 7 :** Annual costs of support for mining and coal-based power generation per capita and per household (PLN, based on constant 2016 prices)

	Annual costs :			
	Per capita		Per household	
	2016	Mean value 1990- 2016	2016	Mean value 1990- 2016
<b>Incurring by tax-payers</b>				
Subsidies to pension and social security benefits for miners	86	84	234	240
Costs of mining restructuring	99	78	270	230
EU subsidies	1	2	4	6
<b>Included in the electricity bill</b>				
PPA stranded costs	24	13	66	35
Capacity remuneration mechanisms (DCR, OCR)	17	1	45	4
Free emission allowances	11	34	30	95
Green certificates- co-firing biomass with coal	1	10	3	28
<b>Harm to health and environment degradation</b>				
External costs (mean value)	806	1689	2191	4936
<b>TOTAL</b>	<b>1045</b>	<b>1910</b>	<b>2843</b>	<b>5572</b>

**Table 8:** Annual costs of support for the renewable energy sector per capita and per household (PLN based on constant 2016 prices)

	Annual costs :			
	Per capita		Per household	
	2016	Mean value 1990- 2016	2016	Mean value 1990- 2016
<b>Incurring by tax-payers</b>				
EU subsidies	3	3	8	10
<b>Included in the electricity bill</b>				
Green certificates- old hydroelectric power plants	4	6	12	16
Green certificates- new RES infrastructure	35	13	94	37
Discount system for prosumers	0	0	1	0
<b>TOTAL</b>	<b>42</b>	<b>23</b>	<b>115</b>	<b>63</b>

Kaynak: Siedlecka and friends, 2017: 33.

Subsidies to pension and social security benefits for miners is the biggest part of the annual costs of support for mining and coal-based power generation. After subsidies to pension and social security benefits for miners, costs of mining restructuring comes second among costs of support for coal-based generation. Green certificates given to new RES infrastructures rank first in Annual costs of support for the renewable Energy sector per capita and household for the years 1990-2016.

## 2.7. Tax regulations

There are several tax regulations in Poland related to energy consumption and special tax rules to support energy security.

**Special tax rules:** For general income tax purposes, depreciation expenses are calculated according to rules which are unique to the oil and gas industry: expenses incurred in acquiring pipelines and production facilities may be completely written off in straight line over six years. If oil and gas companies terminate their activities in Norway with losses, the government reimburses the tax value of those losses. Since 2005, oil and gas companies reporting a loss for tax purposes can also obtain a reimbursement of the tax value (for regular corporate tax and resource tax) of their direct and indirect exploration expenses (excluding financial expenses). In practice, this means a government reimbursement of up to 78% of all the direct and indirect exploration expenses (EEA, 2014).

**Tax regulation mechanism:** In Poland, a tax is levied on the sale of electricity to end users and their consumption (art. 9 Tax Act). Electricity from renewable sources is exempt from consumption tax (art. 30 par. 1 Tax Act) (EEA, 2014).

**Tax break for the Shale-Gas Industry:** In 2014, government had proposed a tax break with aim to increase energy security of Poland draft to the parliament and it has been enacted since 2014. Its main purpose was to accelerate the issuance of licensing permissions for investors and all tax-free exploration until 2020 as a six year tax break. Poland Prime Minister Donald Tusk had said the government decided not to charge special taxes, specifically designed for the shale gas industry, before 2020. He added "Today gas security is a fundamental prerequisite of sovereignty of every European country, including Poland," and told that "Poland has to do all it can to be free from "gas blackmail." According to him that the six-year tax break is supposed to be "a huge incentive" to drill faster. Therefore after 2020 its stated that Poland wanted to charge two special taxes on gas and oil production, one of them a fixed tax linked to production value and the other ranging from zero to 25% on earnings from oil or gas production, depending on production costs. (Wasilewski, 2014 and OECD, 2016: 2).

Thanks to oil shale gas usage, Poland would be get over of dirty fuel which creates larger effects in terms of health and environmental safety perspectives. Currently Polish electricity production's 95% coal-fired thermal are provided through power plants. In addition, the shale gas is to be extracted will may terminate import of natural gas from the Russian Federation into Poland (Taner, 2011).

**Rebates on Diesel Fuel Tax in Farming :** Rebates are financed out of the state budget and their value cannot exceed 86 litres per hectare of utilised agricultural area. The Minister of Agriculture and Rural Development determines the exemption rate on a yearly basis. Polish farmers can obtain rebates by submitting the relevant invoices to the local authority twice a year (EEA, 2014).

## 2.8. Support for Renewable Energy Sources

Share of renewable energy sources and its share in TPES of Poland increased from 5% in 2004 to 10.4% in 2014. This progress has achieved by the establishment of several support measures. There has been into force regulatory and financial supports. Quota system was one of the regulatory measure obliging suppliers of electricity to purchase power generated from renewables through a system of certificates of origin (IEA, 2017: 11).

Renewable Energy Supply Act came into force in 2012. It aims to halve subsidies for the co-firing of biomass in coal plants. But it will not apply to biomass co-firing installations that

meet the RES Act criteria, and still favours co-firing in coal-fired power plants over renewable energies (Gençsü and Zerzawy, 2017).

The fundamental form of support for the development of RES in the analysed period were the green certificates. Importantly, the terms of support during the period of 2013-2016 were more favourable for the development of new RES infrastructure than during the period of 2005- 2012, which is when co-firing biomass with coal and old hydroelectric power plants received most of the systemic support (Siedlecka and friends, 2017: 25).

Poland has been showing a slow transition away from coal-fired power towards oil, gas and renewables. Poland has set targets for renewable energy and energy efficiency: the National Action Plan on Energy from Renewable Sources, adopted in 2010, sets targets for the share of energy from renewable sources in the transport, electricity, heating and cooling sector. The Renewable Energy Supply (RES) Act, introduced in 2015, replaces the certificate system and aims to limit support by halving subsidies for the co-firing of biomass in coal plants. (Wiśniewski, 2016). With the adoption of a Renewable Energy Act in 2015, Poland overhauled its regulatory framework for renewable energy, moving away from a quotabased system to one built around an auction process. Late amendments to the legislation introduced a number of changes in the sector which could impact the future growth of renewable energy (IEA, 2017: 11). Table 9 shows support for renewable energy sources between the years 2005 and 2016. Table 9 provided the amount of support for renewable energy sources between 2005-2016, in PLN. Total green certificates including co-firing biomass with coal, old hydroelectric power plants and new RES infrastructure had amounted 30 billion PLN. After 2014, support for total green certificates had fallen dramatically.

**Table 9:** Support for renewable energy sources, 2005-2016 (billions of PLN)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
Total green certificates, including:	1.0	1.1	1.5	1.8	2.3	3.2	3.8	4.2	2.9	3.7	2.8	1.5	30.0
Co-firing biomass with coal	0.2	0.4	0.5	0.8	1.2	1.5	1.8	1.8	0.7	0.8	0.5	0.0	10.2
Old hydroelectric power plants	0.6	0.5	0.6	0.6	0.6	0.8	0.6	0.5	0.4	0.4	0.2	0.2	6.0
New RES infrastructure	0.2	0.3	0.4	0.5	0.6	0.9	1.4	1.9	1.9	2.5	2.0	1.3	13.8
Innovation grants	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	1.0
Grants for the construction of infrastructure	0.0	0.0	0.0	0.1	0.2	0.5	0.5	0.5	0.3	0.3	0.2	0.1	2.6
Discount system for prosumers	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total support for RES	1.0	1.1	1.5	1.9	2.7	3.8	4.4	4.8	3.4	4.1	3.0	1.7	33.6
Total except for co-firing biomass with coal	0.8	0.8	1.0	1.2	1.5	2.3	2.7	3.0	2.8	3.3	2.5	1.6	23.4

Kaynak: Siedlecka and friends, 2017: 26.

### 3. Conclusion

Poland has begun to change energy production and consumption towards to more environmentally friendly and add new sources to energy mix while increasing energy efficiency to secure energy supply. While Poland has its national economic transition agenda in order to decrease coal's intensity in economic system, EU's commitments to fight with climate change and international climate agreements Poland has been a party require to actions taken into account sooner. Due to reasons mentioned above Poland has stated that national supports to fossil fuel sector will be phased out gradually. On the other hand, green certificates and other kind of certificates came into force as incentives for the development of renewable energy sources. Recently, there has been different types of supports such as

Restructuring the hard coal mining industry, subsidies to pensions and social security benefits for miners, free allocation of EU-ETS allowances, power purchase agreements and stranded costs, green certificates, EU subsidies, tax regulations and support for renewable energy sources. Main critics about energy politics in terms of incentives and subsidies reluctance at phasing out supports to fossil fuel sector, mainly to coal mining. Particularly, workers at mining sector and employers enjoys early retirement advantage and special treatments when we compare to other sectors in industry. It has been seen as a unfair competition. Another issue about reforms is lack of transparency and availability of numbers of subsidies to fossil fuel sector and mining from the governmental institutions officially. Regarding limitations of such support reforms, Poland could have faced an important number of unemployed people after phasing out subsidies and force the mines closure soon. Especially coal sector has evaluated as a backbone for Polish economy for years. It needs delicate economic and financial measures in order not to spoil policies for climate problems, employment, and economic growth and welfare in one basket.

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