MIDDLE POMERANIAN SCIENTIFIC SOCIETY OF THE ENVIRONMENT PROTECTION

Rocznik Ochrona Środowiska

Volume 22. Year 2020 ISSN 1506-218X 998-1013

The State of the Air Quality in Poland

Izabela Gabryelewicz[1], Roman Stryjski[1],*
Maciej Wędrychowicz[1], Tomasz Dąbrowski[2]
[1]University of Zielona Góra, Poland
[2]Koszalin University of Technology, Poland
corresponding author's e-mail: igabryel@uz.zgora.pl

1. Introduction

The causes of climate change and the loss of biodiversity are global and transgenic and largely depend on air quality. The European Union (Poland has been in the EU since 2004) wants to achieve a European Green Deal by 2050. The main elements of the transformation of the EU economy with a view to a sustainable future which will lead to the Green Deal in Europe (Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the committee of the Regions) are as follows:

- achieving climate targets by 2030 – reduction of emissions of harmful substances by 2050 – achieving climate neutrality,
- providing clean, affordable and secure energy,
- mobilising the industrial sector for a clean, circular economy,
- building and renovating in a way that saves energy and resources,
- zero emissions to achieve a non-toxic environment,
- conservation and restoration of ecosystems and biodiversity,
- from field to table, a fair, healthy and environmentally friendly food system,
- accelerating the transition to sustainable and smart mobility.

The Green Deal is possible, inter alia, by achieving zero emissions. Directive 2016/2284 on the "Commitment for a National Reduction in Emissions" is the main legislative instrument for achieving the "Clean Air for Europe" target by 2030, (Directive 2016/2284). A fully implemented directive would reduce the negative health effects of air pollution by almost 50% and bring environmental and climate benefits. The Directive includes national emission reduction commitments for the period 2020-2029 and commitments from 2030 onwards, for five substances that contribute significantly to air pollution (Table 1). Compliance with the 2020 emission reduction commitments will be tested in 2022, when the 2020 emission balances will be available.

Table 1. Polish obligations to reduce emission (Directive 2016/2284)

Substance	Reduction compared to 2005	
	Each year from 2020 by 2029	Each year from 2030
Reduction of SO_2 compared to 2005	59%	70%
NO_x reduction compared to 2005	30%	39%
NMLZO reduction compared to 2005	25%	26%
NH_3 reduction compared to 2005	1%	17%
Reduction of PM2.5 compared to 2005	16%	58%

2. Air quality standards in force in Poland

By decree of the Minister of the Environment, of 8 June 2018, on the evaluation of the levels of substances in the air, are determined which substances should be included in the assessment of the state of air quality in Poland (Legal Journal of 2018 item 1119). This takes into account 12 substances which have been categorised as meeting the criteria laid down in order to protect human health (SO_2 sulphur dioxide, NO_2 nitrogen dioxide, CO carbon monoxide, benzene C_6H_6, ozone O_3, PM10 dust, PM2.5 dust, PB lead in PM10, arsenic As in PM10, cadmium Cd in PM10, nickel in PM10, benzo(a)pyrene B(a)P in PM10) and for compliance with plant protection requirements (sulphur dioxide SO_2, nitrogen oxides NOx, ozone O_3). The Regulation of the Minister of the Environment (Legal Journal of 2012 pos. 1031, Legal Journal 2019 pos. 1931) on the levels of certain substances in the air, specifies the amount of emissions and other parameters that determine the status of air quality. Table 2 shows the exposure concentration ceiling, the period for which the measurement results are averaged and the time limit for reaching the exposure concentration ceiling. Table 3 shows the limit and target levels for substances in the air, the periods for which measurement results and the permitted frequencies for exceeding those levels, are averaged. Table 4 lists the alert levels and information levels for certain substances in the air and the periods for which their measurement results are averaged.

Table 2. Exposure concentration ceiling, the period for which the measurement results are averaged and the time limit for reaching the exposure concentration ceiling (Legal Journal of 2012 pos. 1031)

Substance	Period wherein the measurements are averaged	Exposure concentration ceiling in µg/m^3
particulate matter PM2.5	three calendar years	20

Table 3. The limit and target levels for substances in the air, the periods for which the measurement results are averaged and the permitted frequencies for exceeding those levels (Legal Journal of 2012 pos. 1031)

Substance	Period wherein the measurements are averaged	Limit/target level of the substance	Frequency with which it is permissible to exceed levels per calendar year
benzene	calendar year	5 µg/m^3	–
nitrogen dioxide	one hour	200 µg/m^3	18 times
	calendar year	40 µg/m^3	–
nitrogen oxides	calendar year	30 µg/m^3	–
sulphur dioxide	one hour	350 µg/m^3	24 times
	24 hours	125 µg/m^3	3 times
	calendar year and period from 1.10 to 31.03	20 µg/m^3 (plant protection)	–
lead	calendar year	0.5 µg/m^3	–
particulate matter PM2.5	calendar year	25 µg/m^3	–
		20 µg/m^3 (plant protection)	–
PM10 suspended dust	24 hours	50 µg/m^3	35 times
	calendar year	40 µg/m^3	–
carbon monoxide	eight hours	10,000 µg/m^3	–
arsenic	calendar year	6 ng/m^3	–

Table 3. cont.

Substance	Period wherein the measurements are averaged	Limit/target level of the substance	Frequency with which it is permissible to exceed levels per calendar year
benzo(a)pyrene	calendar year	1 ng/m^3	–
cadmium	calendar year	5 ng/m^3	–
nickel	calendar year	20 ng/m^3	–
ozone	eight hours	120 µg/m^3	25 days
	growing season (1 V – 31 VII)	18,000 µg/m^3·h	–
	growing season (1 V – 31 VII)	6,000 µg/m^3·h	–

Table 4. Alert levels and Information levels for certain substances in the air and the periods for which the measurement results are averaged (Legal Journal of 2012 pos. 1031, Legal Journal 2019 pos. 1931)

Substance	Period wherein the measurements are averaged	Level	
nitrogen dioxide	one hour	400[1)] µg/m^3	emergency
sulphur dioxide	one hour	500[1)] µg/m^3	
ozone	one hour	240[1)] µg/m^3	
PM10 suspended dust	24 hours	150 µg/m^3	
ozone	one hour	180 µg/m^3	informed
PM10 suspended dust	24 ours	100 µg/m^3	

[1)] The value for three consecutive hours at measurement points representing air quality in an area of at least 100 km^2 or within a zone, whichever is smaller

3. Sources of PM10, PM2.5 and PAHs in Poland

National emissions of individual air pollutants are reported on the basis of the current structure of the source of emissions, in the NFR Classification System (Nomenclature for Reporting). The main source of PM10 emissions in Poland are stationary combustion processes. The volume of PM10 emissions in 2018 remains at levels similar to those of 2017. The primary source of PM2.5 particulate matter emissions are those of the energy (fuel combustion) category, which accounts for 85% of the total emissions of this pollutant. Particulate emissions are mainly associated with the burning of hard coal and wood in households. PM2.5 dust is a pollutant covered by the emission limit laid down in Directive 2016/2284 (Directive 2016/2284), currently in force. According to this directive, Poland should achieve a 16% reduction in this pollution, by 2020, compared to 2005. Data on PM10 and PM2.5 dust emissions and their sources are presented in Table 5 and Table 6.

Table 5. Sources and volume of PM10 dust emissions in Poland in the years selected. (National balance of emissions of SO_2, NO_X, CO, NH_3, NMLZO, particulate matter, heavy metals and TZO for the period 1990-2018)

Sources of emission according to NFR categories /Nomenclature of Reporting/	1990	2005	2010	2017	2018
	Gg				
Total	**315.0**	**278.27**	**273.54**	**242.79**	**242.76**
Energy	231.88	219.49	212.30	177.47	174.28
Industrial processes	39.74	24.56	30.37	32.37	34.29
Agriculture	40.21	30.38	26.81	28.45	29.48
Waste	3.28	3.84	4.07	4.50	4.71

Table 6. Sources and volume of PM2.5 dust emissions in Poland in the years selected. (National balance of emissions of SO_2, NO_X, CO, NH_3, NMLZO, particulate matter, heavy metals and TZO in the period 1990-2018)

Sources of emission according to NFR categories /Nomenclature of Reporting/	1990	2005	2010	2017	2018
	Gg				
Total	**154.64**	**153.63**	**152.53**	**137.85**	**136.73**
Energy	133.35	138.28	136.29	120.21	118.13
Industrial processes	12.73	8.30	9.31	10.08	10.70
Agriculture	5.38	3.30	2.96	3.16	3.31
Waste	1.12	1.06	1.17	1.29	1.36

The emission of PAHs into the air is estimated by assessing the emissions of four indicator compounds: benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)-fluoranthene, and indeno (1,2,3-cd) pyrene. A crucial part of PAH emissions (91%) comes from the energy category. The main part of these emissions is from households – as much as 96%. About 4% of the estimated domestic emissions of PAH come from the industrial processes sector – mainly from steel smelting in electric furnaces and sinter production (National balance of emissions of SO_2,

NO_X, CO, NH_3, NMLZO, particulate matter, heavy metals and TZO in the period 1990-2018). The structure of PAH emissions is presented in Table 7.

Table 7. PAH emissions (polycyclic aromatic hydrocarbons) in selected years in Poland (National balance of emissions of SO_2, NO_X, CO, NH_3, NMLZO, particulate matter, heavy metals and TZO in the period 1990-2018)

Sources of emission according to NFR categories /Nomenclature of Reporting/	1990	2005	2010	2017	2018
	Mg				
Total	**305.75**	**289.00**	**309.19**	**235.37**	**231.14**
Energy	295.35	277.31	297.18	223.06	218.33
Industrial processes	7.98	8.43	8.46	8.42	8.70
Agriculture	0.05	0.07	0.02	0.02	0.02
Waste	3.37	3.20	3.53	3.87	4.09

Even so, over about the last 30 years, there has been a trend towards a significant reduction in PAH emissions in the energy category and a gentle growth in the category of industrial processes. The first is mainly influenced by changes in lifestyle and habits as well as the technologically and economically justified modernisation of households in terms of the extraction and processing of heating fuels. In the second category, despite an increase in production and the dynamic development of transport (both rolling stock and the transport network), it is the technology and modern management that keeps PAH emissions at a similar level. It should be assumed that the implementation of the Lean Method in production (Sąsiadek 2016) and the optimisation and reduction of transport (Woźniak et al. 2015, 2016) in the industrial processes category, will be consistent with the reduction of PAHs emissions in Poland. It is also important to take into account the high recycling potential to reduce the emission of pollutants into the atmosphere (Wędrychowicz et al. 2019).

4. The state of the air quality in Poland

Poland is at the forefront of European Union countries in terms of exposure of urban population to air, polluted by PM2.5 and PM10 dust. The highest values for both types of particulate matter were recorded in 2017 in central Europe (Poland, Bulgaria, Croatia, Slovenia, Romania and Hungary) and Italy and Cyprus. Table 8 lists the emissions of PM10 and PM2.5 particulate matter in the years selected in the countries of the European Union.

Table 8. Urban population exposure to air pollution by particulate matter PM10, PM2.5 in the countries of the European Union (Environment 2019)

Countries	PM10				PM2.5			
	2010	2015	2016	2017	2010	2015	2016	2017
	micrograms per m^3							
Poland	**39.7**	**33.1**	**31.2**	**32.2**	**30.5**	**23.8**	**23.0**	**23.8**
EU – 28	26.3	22.7	21.2	21.6	18.1	14.6	13.8	14.1
Bulgaria	48.4	36.2	37.9	37.3	31.1	25.0	20.2	23.8
Hungary	31.3	26.9	25.3	26.5	22.3	–	–	20.9
Romania	34.9	27.7	23.4	26.6	19.1	17.1	17.2	20.4
Slovenia	28.2	27.7	25.6	24.8	21.8	21.6	21.6	19.7
Italy	30.5	30.5	27.5	29.2	23.4	21.6	19.3	19.4
Croatia	–	33.1	34.7	35.1	–	20.8	20.6	19.0
Czech Republic	29.9	24.3	22.6	23.9	22.8	17.4	18.1	18.4
Slovakia	29.6	23.9	20.7	24.2	22.8	19.0	14.7	17.5
Cyprus	48.0	35.2	27.3	29.2	22.2	17.3	14.6	14.7
Austria	26.9	20.8	18.4	19.2	19.9	14.4	13.1	13.8
Latvia	24.4	19.9	19.0	17.2	–	15.9	15.4	13.6
Belgium	27.0	21.4	20.9	20.4	17.7	13.5	13.3	12.9
Germany	22.9	18.9	17.7	17.5	17.4	13.3	12.8	12.7
Spain	23.9	23.4	20.7	21.9	12.4	13.0	11.3	12.1
France	25.0	20.5	19.2	19.1	18.3	13.5	12.7	12.0
Portugal	25.4	19.9	18.0	18.3	8.8	10.3	10.1	12.0
The Netherlands	24.7	19.7	19.0	19.2	17.1	12.7	11.2	11.3
Luxembourg	17.0	21.4	20.5	20.3	16.0	11.7	13.4	11.2
United Kingdom	17.8	16.4	17.4	15.6	13.6	9.9	10.1	10.0
Denmark	12.1	18.3	15.1	15.5	11.0	11.3	10.0	9.2
Ireland	15.6	13.2	12.5	11.5	10.9	7.9	8.5	7.7
Sweden	14.0	13.0	12.3	11.8	7.4	5.8	5.6	5.4
Estonia	13.9	13.0	12.1	10.5	7.6	6.7	5.4	5.3
Finland	13.4	11.3	12.2	10.0	8.4	6.0	5.7	4.9
Malta	–	–	–	–	–	–	–	–
Lithuania	26.9	21.7	24.1	22.8	–	–	–	–
Greece	33.4	26.5	29.0	–	–	16.4	14.7	–

The summary reports on the emissions of various substances to the atmosphere in Poland are provided in the form of Excel sheets by the General Inspectorate of Environmental Protection (GIOŚ).

4.1. PM10 and PM2.5 dust emissions

PM10 suspended particles are all particles smaller than 10 µm, while PM2.5 is less than 2.5 µm. Particulate pollutants can come in different sizes and shapes. Moreover, they have the ability to adsorb on their surface other very harmful impurities (dioxins and furans, heavy metals, polycyclic aromatic hydrocarbons, such as benzo(a)pyrene). Particulate matter is primarily emitted from fires, rising dust from buildings, roads, and combustion processes.

Particulate matter, suspended in the air due to its size, can easily enter the lungs, causing poisoning, upper respiratory tract inflammation, dust, lung cancers, allergic diseases and asthma. PM2.5 dust is particularly dangerous. It has the ability to penetrate deep into the lung-alveoli, causing permanent damage to them and can then enter the blood stream (Jędrak et al. 2017, Pope III et al. 2006, Kampa & Elias 2008, Clifford et al. 2016, Sówka et al. 2020).

Table 9 summarises the emissions of PM10 dust between the years 2015-2019 and the volume of PM2.5 emissions in 2019 in selected cities in Poland. In 2015, the level of PM10 dust emissions in Poland was measured at 159 points. At 28 points, dust emissions exceeded more than 40 µg/m^3. The highest emission of PM10 dust was in the city of Opoczno – 56 µg/m^3, a calendar average. The lowest calendar average was in the Borecka Forest and was 17 µg/m^3.

In 2016, PM10 emissions were measured at 161 points. At 19 points, the emissions standard was exceeded. The largest emission was in the city of Kraków – 56.7 µg/m^3, the lowest emission was in Bory Tucholskie – 15.57 µg/m^3.

In 2017 there were 166 measurement points of PM10 emission in Poland. PM10 emissions were exceeded at 21 measurement points. The highest emission was in Katowice – 52.03 µg/m^3, the lowest emission was in the Puszcza Borecka – 15.22 µg/m^3.

In 2018 there were 169 measurement points of PM10 emission in Poland. PM10 emissions were exceeded at 24 points. The highest emission was in the city of Kraków – 49.46 µg/m^3, the lowest emission was in the Puszcza Borecka – 15.22 µg/m^3.

In 2019, there were 179 PM10 emission points. PM10 emissions were exceeded at 5 measurement points. The highest emission of 49.59 µg/m^3 was measured in the city of Kraków, and the lowest emission of 15.40 µg/m^3 was in Bory Tucholskie.

In 2019 there were 64 measuring stations in Poland which measured a level of PM2.5 in the air. Four points recorded an average above the limit of

25 µg/m^3 in a given calendar year. But as many as 21 measurement points recorded annual averages above 20 µg/m^3. The lowest calendar average was recorded at the measurement point in Bory Tucholskie (9.64 µg/m^3), the highest annual average was recorded in Godów 30.61 µg/m^3.

Table 9. PM10 dust emissions in Poland in 2015-2019 and PM2.5 dust emissions in 2019 (Selected cities) (Data of the Main Inspectorate of Environmental Protection)

Town	PM10 Limit value = 40 µg/m^3					PM2. 5 Limit value: for humans = 25 µg/m^3, for plants = 20 µg/m^3
	Annual average [µg/m^3]					
	2015	2016	2017	2018	2019	2019
Kraków (communication station)	52	56.7	44.99	49.46	49.59	24.70
Pszczyna	52	50.9	55.59	54.89	44.29	no data
Rybnik	47	47.5	46.52	50.80	42.97	no data
Katowice (communication station)	46	46.9	52.03	47.30	40.55	27.69
Myszków	48	47.8	46.20	49.11	40.26	no data
…						
Nowa Ruda	46	45.5	48.35	42.78	39.73	no data
Zabrze	44	42.82	39.23	44.89	38.70	no data
Opoczno	56	52.2	37.08	35.14	30.54	no data
Ożarów	29	19.9	24.07	24.74	23.75	no data
Szczecin	26	22	21.98	24.49	20.31	13.69
Suwałki	24	19.2	21.04	24.05	19.77	no data
Białystok	25	19.8	20.99	23.98	19.2	no data
Osieczów	19	19.62	19.59	22.10	18.38	13.10
Słupsk	24	19.2	20.93	22.70	18	11.24
Gdynia	22	20.7	19.77	26.80	17.16	no data
Puszcza Borecka	17	15.69	15.52	16.79	16.07	11.10
Bory Tucholskie	18	15.57	16.03	19.86	15.40	9.64

In addition to emissions, an important parameter in determining the state of air quality is the number of days with PM10 concentrations higher than 50 µg/m^3, as summarised in Table 10.

In 2015, at as many as 118 measuring points, the number of days with PM10 concentrations levels higher than 50 µg/m^3 was exceeded (35 days).

In 2016, the number of days with PM10 concentrations higher than 50 μg/m^3 (35 days) was exceeded at 89 measuring points out of 161 measuring points.

In 2019, 33 of the 179 measuring points were exceeded, over the number of days with concentrations of PMP10 higher than 50 μg/m^3 – i.e. 35 days.

Table 10. Cities with the highest and lowest number of days with PM10 concentration (Data from the Chief Environmental Inspectorate)

Location	Number of days with concentrations above 50 μg/m^3 Permissible number of days = 35		
	2015	2016	2019
Kraków (communication station)	219	164	178
Pszczyna	119	102	107
Rybnik	103	101	88
Nowa Ruda	114	108	79
Myszków	93	109	63
Zduńska Wola	95	102	63
Opoczno	152	150	51
Nakło nad Notecią	111	107	50
…			
Gdańsk	39	14	12
Elbląg	30	14	10
Gdynia	24	13	7
Olsztyn	24	11	7
Gdynia	24	9	7
Suwałki	26	3	7
Koszalin	21	7	6
Szczecin	23	18	3
Słupsk	19	6	3
Puszcza Borecka	8	5	3
Białystok	26	2	3
Bory Tucholskie	10	3	2

To assess the state of air quality in terms of PM10 particulate emissions, in a given location, three parameters should be analysed simultaneously:

- average annual dust emissions,
- the number of days with concentrations above the limit, and
- dust emissions in individual months, not just the average calendar year.

In 2019, the city of Opoczno reached the permissible annual concentration of PM10 particulate emissions. However, there were as many as 51 days in this city where the emissions limit was exceeded. The breakdown of excess emissions is shown in Fig. 1.

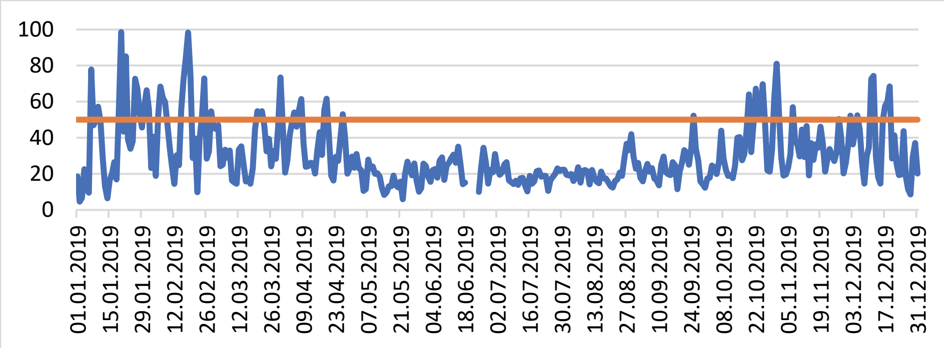

Fig. 1. PM10 dust emissions in the city of Opoczno in 2019

Let us consider a city that meets both the condition of the average annual concentration of dust and the number of days with a permissible concentration of dust, such a city, among others, is the city of Bielsko Biała. In this city the average annual emissions of PM10 particulate matter is 27.54 μg/m^3 (the limit value = 40 μg/m^3), the number of days with concentrations above 50 μg/m^3 is 30, so the condition for exceeding the limit per calendar year is met. However, by analysing data from Fig. 2, it can be seen that standards are exceeded significantly in the colder months; this is a characteristic of almost all cities in Poland.

Benzo(a)pyrene belongs to the group of polycyclic aromatic hydrocarbons (PAHs). It is persistent in the environment, with low volatility and water solubility. It can be adsorbed on dust surfaces (e.g. PM10 and PM2.5), which poses a greater risk to human health due to its ability to enter the lungs directly through the breathing process. Natural sources of emissions include forest fires, volcanic eruptions and grass burning. Anthropogenic sources of emissions include the burning of fossil fuels and waste, as well as industrial activities. It is present in car exhaust fumes and cigarette smoke. Benzo(a)pyrene can be formed in food by prolonged heat treatment (grilling, frying, smoking). This compound has strong carcinogenic, mutagenic or teratogenic effects which negatively affects foetal development. It can be bio-accumulated and can be accumulated in tissues for longer periods of time and metabolised to even more reactive derivatives (Brook et al. 2010, Kunzli et al. 2010, Kelly & Fussell 2011, Genc et al. 2012, Wojdat et al. 2016, Krzyżanowski 2016).

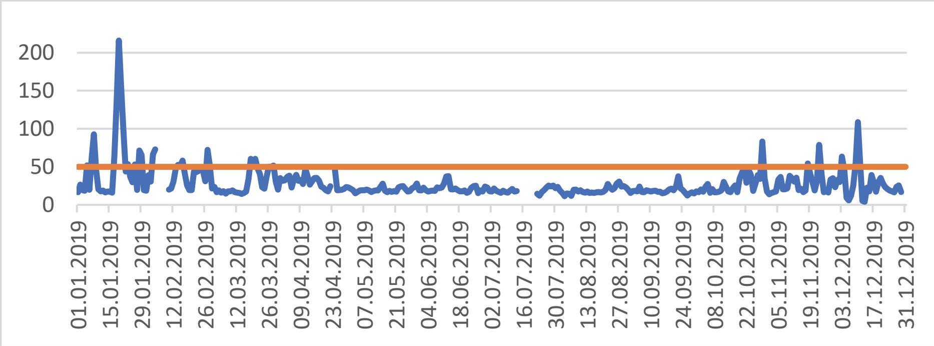

Fig. 2. PM10 dust emissions in Bielsko Biała in 2019.

4.2. Benzo(a)pyrene

Table 11 lists the emissions of benzo(a)pyrene in selected cities in Poland, in 2016 and 2019. In 2016, benzo(a)pyrene emissions were measured at 129 points, only two measurement points recorded levels of carcinogenic benzo(a)pyrene below 1 ng/m^3. The level of benzo(a)pyrene was exceeded more than ten times at eight measurement points.

Table 11. Carcinogen benzo (a)pyrene-emissions in selected cities in 2016 and 2019 (Data from the Chief Environmental Inspectorate)

Location	Annual average [ng/m^3] Target level = 1	
	2016	2019
Nowy Targ	no data	17.17
Rybnik	13.4	13.16
Nowa Ruda	16.86	8.13
Pszczyna	10.9	6.92
Radomsko	9.76	4.89
Opoczno	17.06	4.04
Tomaszów Mazowiecki	14.85	3.43
Białystok	1.1	0.94
Olsztyn	1.3	0.91
Koszalin	1.5	0.7
Bory Tucholski	0.8	0.55
Puszcza Borecka	0.7	0.53

In 2019, emissions of benzo(a)pyrene were measured at 159 points. Emissions below 1 ng/m^3 were recorded at 10 measurement points. The level of benzo(a)pyrene was exceeded more than ten times at 3 measurement points.

The emissions target for benzo(a)pyrene needs to be 1 ng/m^3. In Nowy Targ, from 16 to 22.12.2019, emissions amounted to 95 ng/m^3 every day (Fig. 3).

Even in the city of Kalisz, where the emission level of benzo(a)pyrene meets the requirements of the emissions target below 1 ng/m^3, this level is exceeded in the winter months (Fig. 4).

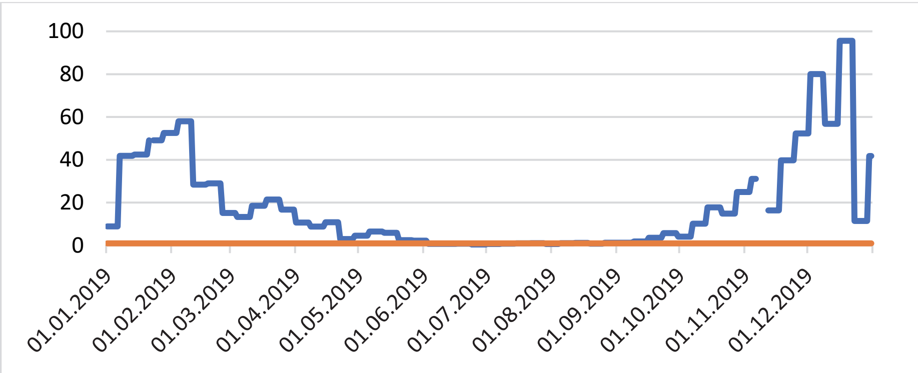

Fig. 3. Emissions of benzo(a)pyrene in Nowy Targ in 2019 (own study based on Table 11)

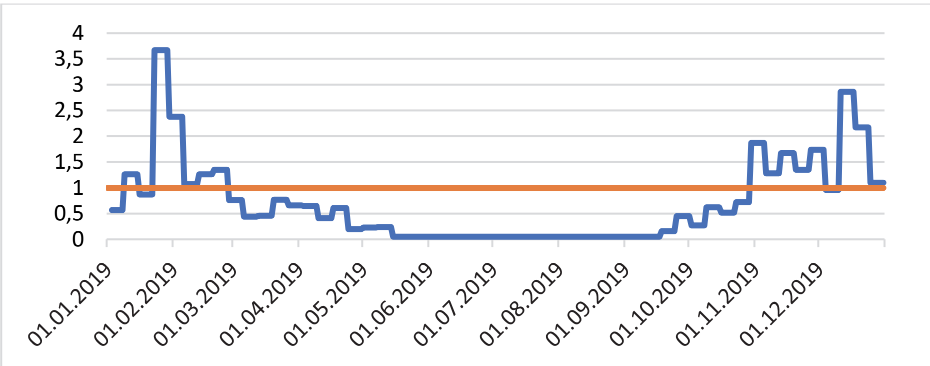

Fig. 4. Emissions of benzo(a)pyrene in Kalisz in 2019 (own study based on Table 11)

5. Summary

All air, water and soil pollution impair human health, affects life expectancy and well-being. The greatest impact of pollution on human and animal health is observed in industrial and urbanised areas. The size of the city is not as important as the structure of energy consumption which is at its highest during the cold season for heating purposes. Polluted air also has a negative impact on the health of ecosystems and the destruction of materials where there is the accelerated corrosion of metals, the erosion of buildings and the ever-changing conditions of production processes.

Despite the systematic improvement in air quality in Poland, concentrations of PM10 and PM2.5 particulate matter and benzo(a)pyrene remain a major problem during the winter season.

The effect of fine particles (PM10 dust) and very fine particles (PM2.5 dust) on health depends on the number of particles retained in different areas of the respiratory system. At the same time, PM2.5 dust has the ability to penetrate into the deepest parts of the lungs, where it accumulates and/or dissolves in biological fluids.

The main cause of the emission of gases and dust into the atmosphere is the lack of significant changes in the structure of energy consumption in Poland. Coal remains the primary energy carrier in the national economy, accounting for 51% of non-renewable energy.

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Abstract

This article analysed the state of air quality in Poland on the basis of data from the main Inspectorate of Environmental Protection. The emission limit values for PM10 and PM2.5 particulate matter were analysed along with the number of days in which their emission was exceeded. In addition to particulate emissions, target levels for benzo(a)pyrene, which is highly carcinogenic, have been assessed.

Keywords:
PM10 dust, PM2,5 dust, benzo(a)pyrene

Stan jakości powietrza w Polsce

Streszczenie

W artykule przeanalizowano stan jakości powietrza w Polsce na podstawie danych pochodzących z Głównego Inspektoratu Ochrony Środowiska. Przeanalizowano poziomy dopuszczalne emisji pyłów PM10 i PM2,5 wraz z ilością dni w których jest przekroczona wielkość ich emisji. Oprócz emisji pyłów oceniono poziomy docelowe dla benzo(a)pirenu, który ma silne działanie rakotwórcze.

Słowa kluczowe:
pył PM10, pył PM2,5, benzo(a)piren