



NAJWYŻSZA IZBA KONTROLI



AIR PROTECTION IN POLAND

Summary of the most important findings
(NIK's audit No. P/17/078)

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TABLE OF CONTENTS

LIST OF DEFINITIONS AND ABBREVIATIONS	4
1. INTRODUCTION.....	9
2. CONCLUSIONS	10
3. MAIN FINDINGS.....	14
4. RECOMMENDATIONS	43

List of definitions and abbreviations

- AAQ Directive** Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe;
- Anti-smog resolution** Resolution taken by self-government of a given voivodship pursuant to Article 96 of EPL Act, which specifies the standards for devices used for solid-fuel burning, types of such fuel or the quality of the fuels authorized for use;
- AQP** Air Quality Plan is a document whose development is obligatory for zones (and agglomerations) where the levels of pollutants in ambient air exceed any limit value or target value. Its development is a responsibility of competent bodies of given voivodships. Requirements in this regard are specified under provisions of Article 91 of EPL Act as well as in relevant regulations;
- B(a)P** Benzo(a)pyrene is an organic chemical substance representing the group of polycyclic aromatic hydrocarbons (PAH). Benzo(a)pyrene shows low acute toxicity, but high chronic toxicity, which is related to its ability to accumulate in the organism. It is a highly carcinogenic compound, just like other PAH substances. Benzo(a)pyrene is a common component of air pollution, resulting from low emission;
- CIEP** Chief Inspectorate of Environmental Protection or Chief Inspector of Environmental Protection. Chief Inspector of Environmental Protection is a central body of government administration appointed and dismissed by the Prime Minister. Chief Inspector of Environmental Protection through Chief Inspectorate of Environmental Protection, together with voivodship inspectors of environmental protection comprising combined governmental administration in voivodship perform Inspection of Environmental Protection tasks. Principal tasks of Inspection of Environmental Protection are: auditing observance of environmental law, examining state of the environment under SEM, (including air quality monitoring) as well as counteracting serious accidents;
- Clean Air NP** Clean Air National Programme is a collection of 15 recommendations of the Economic Committee of the Council of Ministers (ECCM) concerning activities necessary to be undertaken in relation to high concentration of air pollution present in a large area of the country. It was presented to the Cabinet during the 17th January meeting. The Council of Ministers accepted those recommendations by circulation during the 25th April 2017 meeting;
- coal flotoconcentrate** Flotation process used in mining industry for recovering coal substance from water-sludge circulation in hard coal mines. As a result of this process so called flotation concentrate (coal flotoconcentrate) is obtained, which has the form of fine powder (similar to powdered sugar). The suspension remaining from this process, which still contains small quantities of coal, is headed to sedimentation tanks, where so called coal slurries are recovered. Flotoconcentrate burning (i.a. due to its fine-graining) is difficult, and emission of air pollution – apart from coal slurries – is the biggest among all other types of coal assortment;

- coal slurries** Coal slurries emerge in the process of coal refinement. Material extracted from mine seams is a combination of coal and waste rock, which accompanies coal seams. Such polluted coal has no commercial qualities and is not suitable for energetic purposes. In order to improve its energetic qualities, it is subjected to processing. Refinement process takes place in water facility, and separation products arising therefrom are subsequently dewatered. Static or dynamic devices for dewatering, containing fixed slotted sieves, are used in such processes. As a result of dewatering water floats through the slot sieves together with grains of 1÷0 mm granulation. And this is the material which is called coal slurry. Coal slurry, due to high content of tiny ash (even up to 50%) and high addition of heavy metals is particularly poisonous against other carbonaceous fuels, even when burned without smoke;
- EEA** The European Environment Agency is an agency of the European Union, whose task is to provide sound, independent information on the environment. The EEA aims to support sustainable development by helping to achieve significant and measurable improvement in Europe's environment, through the provision of timely, targeted, relevant and reliable information to policymaking agents and the public;
- EPL Act** The Act of 27th April 2001 Environmental Protection Law – basic national regulations, which shall lay down the principles of environmental protection and the conditions for the use of its resources, taking into account the requirements of the principles of sustainable development;
- EU** European Union;
- KAWKA Programme** In 2013 Ministry of Environment together with NFEP&WM prepared a system of financing remedial actions related to improvement of air quality, under which it was possible to obtain co-financing of up to 90% of eligible costs of the undertaking (up to 45% of costs were financed separately by NFEP&WM and territorially responsible VFEP&WM). Such a system was operating from February 2013 in the form of a priority Programme named KAWKA – Reducing air pollution by supporting an increase of energy efficiency and development of distributed renewable energy sources. This programme was an instrument supporting execution of AAQ Directive provisions, and its purpose was to decrease population's exposure to air pollution in the zones with exceeded limit and target values. Since 2016 KAWKA has not been enlisted as a priority programme of NFEP&WM;
- LEZ** Low Emission Zone – part of the city where admission by car is possible only and solely by vehicles meeting the exhaust emissions standards (EURO). Introducing LEZs is one of the instruments of reducing the amount of emission from transportation sector, especially in big agglomerations. Such solutions have been functioning in many European countries (i.a. Austria, Belgium, Denmark, Czech Republic, France, Greece, The Netherlands, Germany, Norway, Portugal, Sweden, Great Britain, Italy and Hungary);
- Limit value** Limit value shall mean a level fixed on the basis of scientific knowledge, with the aim of avoiding, preventing or reducing harmful effects on human health and/or the environment as a whole, to be attained within a given period and not to be exceeded once attained (AAQ Directive);

Low emission Emission of dust and harmful gases mostly from local coal-fired boiler houses and domestic heating furnaces, in which coal combustion takes place in an ineffective manner, usually with cheap coal with low heating parameters. Characteristic feature of low emission is the fact that it is caused by numerous sources introducing small amounts of pollution into the air. Large number of emitters producing pollution on limited height makes the phenomenon cumbersome as the pollution concentrates around the place of its production, which is usually an area of compact housing constructions;

Mg ton;

microgram [μg] derived metric measurement unit of mass in SI equal to 0,000001 g;

nanogram [ng] derived metric measurement unit of mass in SI equal to 0,000000001 g;

NFEP&WM National Fund for Environmental Protection and Water Management. The NFEP&WM which was established in 1989 as a result of the regime transformation in Poland, in cooperation with voivodship funds for environmental protection and water management is the pillar of the Polish system of financing environmental protection. The basis of the National Fund's operation as a State legal person is the Act on Environmental Protection Law;

NIK The Supreme Audit Office of Poland;

NO_2 Nitrogen dioxide is a gas of reddish-brown colour and biting odour. Toxic effect of nitrogen dioxide consists in limiting oxygenation of the organism. It burdens the defensive abilities of the organism to bacterial infections, irritates eyes and respiratory tract, is a cause of breathing disorders, causes allergic conditions e.g. asthma – particularly in children living in smog affected cities. Nitrogen dioxide locally irritates conjunctiva and mucosal and may lead to intensive irritation of respiratory tract and lungs. Nitrogen oxides (NO_x) are co-responsible for photochemical smog (type of smog emerging during sunny days with high traffic) as well as increased ozone level in the atmosphere (nitrogen oxides present in the car exhaust fumes in the presence of light enter into reaction which leads to creation of strong oxidisers such as ozone);

NPAP National Programme for Air Protection. In situations when exceedance of accepted and target levels of substances occurs in large areas of the country and actions undertaken by local administrative bodies do not improve the air quality a minister competent for the environment matters may, according to Article 91c of EPL Act, develop National Programme for Air Protection. NPAP is a strategic document specifying objectives and directions of activities which should be taken into consideration, especially on local levels and in regional programmes for air protection. NPAP developed by Minister of Environment has been in force since 1st October 2015. Its execution was supposed to allow attaining accepted levels, resulting from legal regulations in force, of concentration of particulate matter and other harmful substances in a possibly short time. And in the perspective of 2030 to attain target levels recommended by WHO;

PAH Polycyclic Aromatic Hydrocarbons emerge mainly in the process of solid fuels, waste, and plant debris burning etc. in conditions of local oxygen deficiency in stoves. Such a phenomenon occurs mainly in household stoves using solid fuels, household central heating boilers, furnaces, and fireplaces etc. Among many PAH there is benzo(a)pyrene and its concentration is one of the parameters on the basis of which assessment of air quality for given zones is made;

- PM** Particulate matter is a pollution consisting of mixture of solid particles, liquid particles or both at the same time suspended in the air and being a combination of organic and inorganic agents. Particulate matter may contain toxic substance such as PAH (e.g. benzo(a)pyrene), heavy metals as well as dioxins and furans. Those particles vary in size, composition, and origin. It may cause heart attacks and arrhythmia or worsen lungs and cardiovascular system disorders. It also affects central nervous system, reproductive system and may cause cancer. Eventually, it may lead to premature death;
- PM₁₀** Particulate matter with a diameter of 10 µm or less, which may reach upper respiratory tract and lungs;
- PM_{2.5}** Particulate matter with a diameter of 2.5 µm or less, which may reach upper respiratory tract and lungs as well as penetrate walls of the blood vessels. According to WHO reports, long-term exposure to PM_{2.5} results in reducing average life expectancy. Short-term exposure to high concentrations of PM_{2.5} is equally dangerous and may cause increased number of deaths due to respiratory tract and cardiovascular system disorders. It also increases the risk of cases requiring hospitalization;
- ROP** Regional Operational Programme is an instrument of a given voivodship enabling using means from European Funds (such as: European Regional Development Fund, European Social Fund);
- SAI** Supreme Audit Institution;
- SEM** The State Environmental Monitoring was established pursuant to the Act of 20th June 1991 on the Inspection of Environmental Protection to provide reliable data on the state of the environment. State Environmental Monitoring is the system of measurements, assessments and outlooks of the state of the environment as well as the system of collecting, processing and disseminating information on the environment (including air quality monitoring). The Chief Inspector of Environmental Protection is responsible for developing long-term programmes under the State Environmental Monitoring and to implement the tasks arising from separate legislative acts, international commitments as well as development strategies and programme documents. The SEM programmes have been developed since 1991. The activity of the SEM is coordinated by the bodies of the Inspection of Environmental Protection. At voivodship level, the SEM tasks are performed by the Voivodship Inspector of Environmental Protection as a government administration body in the voivodship. At national level, the SEM tasks are performed by the Chief Inspector of Environmental Protection; the CIEP also coordinates all the tasks conducted for the purposes of the State Environmental Monitoring;
- Target value** Target value shall mean a level fixed with the aim of avoiding, preventing or reducing harmful effects on human health and/or the environment as a whole, to be attained where possible over a given period (AAQ Directive);
- VFEP&WM** Voivodship Fund for Environmental Protection and Water Management (16 entities in the whole country) – one of the main pillars of the Polish system of financing environmental protection;
- VIIEP** Voivodship Inspectorate of Environmental Protection or Voivodship Inspector of Environmental Protection;

Visitors' tax Local self-government may introduce visitor's tax, which shall be charged on natural persons staying for touristic, recovery, and/or training purposes for the period longer than 24 hours in localities having beneficial climatic properties, scenic values, or conditions enabling such stay. Council of Minister's regulation of 18th December 2007 concerning the conditions to be fulfilled by such localities to be able to impose visitor's tax specifies i.a. that minimum climatic condition that should be fulfilled by the locality to impose a visitor's tax is maintaining the accepted values of some substances in the air, specified in environmental protection regulations, in the zones mentioned in Article 87 para 2 of EPL Act on the terrain of which a given locality is situated. Hence, the possibility of imposing visitor's tax is related to the air quality of the whole zone on the terrain of which the locality is situated, not the air quality of the locality itself. According to the law in force, it is not accepted to impose visitor's tax in localities situated in such zones where accepted values of some substances (e.g. PM₁₀) have been exceeded, despite the fact that in the locality in question such exceedance may not occur. In the previous legal situation, the list of localities which could impose visitor's tax were specified by the voivode in a regulation (air quality standards did not have to be fulfilled), and new regulations did not eliminate previous decisions in this regard from legal transactions;

WHO World Health Organisation;

WHO AQG World Health Organisation *Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulphur dioxide*, Global update 2005 (http://apps.who.int/iris/bitstream/handle/10665/69477/WHO_SDE_PHE_OEH_06.02_eng.pdf?sequence=1&isAllowed=y);

WHO RL World Health Organisation has not set an Air Quality Guidelines for B(a)P, however reference level was estimated (0,12 ng/m³) assuming an acceptable risk of additional lifetime cancer risk of approximately 1 in 100 000.

1. INTRODUCTION

Main audit question

Do public entities undertake proper and efficient actions to protect the air from pollution?

Audited entities

3 ministries
5 marshal offices
13 municipal and communal offices

Sources of other data used in information about the audit results:

- information submitted by 24 external units,
- results from audits performed by 3 VIEPs in 9 communities, and ordered by NIK,
- 3 external professional evaluations,
- WHO, EEA and CIEP data bases.

Period of time covered by the audit

2014–2017 (1st half of the year)

Air pollution is an important determinant of the quality and length of life. More and more research indicates that air pollution is the largest contributor to the burden of disease from the environment, which causes particularly cancers, cardiovascular, cerebrovascular and respiratory diseases.

Despite significant reduction of air pollution over the past decades (mainly as a result of introducing restrictive requirements in the industry sector), the air quality in Poland is still far from standards adopted by the European Union. That is why European Union Court of Justice passed the decision of 22nd February 2018, stating that Poland infringed the EU law in the area of air quality and that concentrations of PM₁₀ exceeded the UE limit values in a continuous manner. Such a situation may also result in imposing substantial financial sanctions on Poland.

Air protection audit performed by NIK in 2014 showed that Poland is one of the EU countries with the worst air quality. Another alarming problem was exceptionally large scale of exceedances of limit and target values of some substances, with carcinogenic B(a)P at the head, whose concentration in Poland was by far the highest among all EU countries. As a result of the audit, NIK assessed the activities of public authorities' bodies towards air protection as inefficient.

The present air protection audit was carried out on NIK's own initiative. It also aimed at assessing the level of implementation of conclusions reached as a result of the previous audit. The audit scope focused on the activities of public entities aiming at emission reduction of substances causing the biggest problems for air quality in Poland i.e. particulate matter (PM₁₀ and PM_{2.5}), B(a)P and NO₂. Given the dominating influence of emission from commercial and residential as well as transportation sectors, the audit activities were not carried out directly in the industrial plants, whose activity is subject to separate legal regulations.

Air protection audit was one of the audits carried out simultaneously within international cooperation. Supreme Audit Institutions (SAIs) from 15 countries, together with European Court of Auditors, took part in the common project. The project was coordinated by Dutch and Polish SAIs.

2. CONCLUSIONS

Public entities have not taken efficient and adequate action towards air protection. Consequently, they have not provided the citizens and natural environment with protection from adverse effects of air pollution (smog)

According to NIK the activities of the audited public entities do not provide sufficient protection of citizens and natural environment from adverse effects of air pollution by the following substances: PM₁₀, PM_{2.5}, B(a)P and NO₂.

Despite a bigger scope of activities than that in the period of time audited previously by NIK (P/14/086)¹ the air quality in the country in the years 2014–2017 still significantly differed from limit and target values. Exceeding the normative values of B(a)P, PM₁₀ and PM_{2.5} commonly occurred in the mentioned period. However, exceedances of the limit value of NO₂ were recorded on a smaller scale (the problem referred to four cities). In the years 2014–2017 maximum annual concentrations of PM₁₀, PM_{2.5} and NO₂ were almost twice as high as the accepted values for those substances. Cases have also been recorded where too high PM₁₀ daily concentrations occurred for more than half a year and annual concentration of B(a)P exceeded the target value by almost 20 times.

According to NIK, such a situation – with the exception of very few cases – resulted both from inefficient activity of public entities on every level of their operation (national, regional and local) and from insufficient coordination, and therefore lack of consistency of activities undertaken within extensive structure of air protection system. Such conditions do not foster effective spending of public funds for air protection.

Activities of public entities on the national level were insufficient for providing significant improvement in air quality in the time perspective prescribed by both NPAP and regional programmes (AQP).

Minister of Environment has not provided proper functioning of important mechanisms of the air protection system, including being an unreliable national coordinator for the activities executed towards air protection and monitoring the process in an inadequate manner. Minister of Energy, for his part, despite NIK's findings presented in the years 2000, 2014 and 2016, did not take immediate actions to prepare regulations specifying quality standards for solid fuels. Admittedly, a relevant project of regulation was addressed to the Standing Committee of the Council of Ministers in February 2018, however, according to NIK the provisions present therein secure mainly the interests of the coal lobby, and do not fully protect the citizens and natural environment from the negative effects of air pollution. Legal regulations prepared by the Minister of Energy concerning limitations in road transportation in the cities and providing significantly lower rates for electrical energy, due to imperfections in the solutions chosen, raise – in NIK's opinion – the risk of inefficacy of such activities and therefore they do not help to achieve the objectives of air quality improvement. Only the Minister of Development

¹ Audit no. P/14/086 *Air protection* was performed in 2014. It covered the period between 2008 and 2014 (1st half of the year). Its findings were presented in the report on audit findings published in December 2014.

and Finance, whose duties subject to audit have been taken over by the Minister of Entrepreneurship and Technology, executed assigned tasks by regulating requirements for solid fuel boilers. It has to be noted, however, that such a single provision, not supported by any other actions shall be insufficient in lowering the amount of emission from commercial and residential sector (i.e. low emission), which could enable attaining required air quality in the national scale.

Autonomous authorities within voivodships, with the exception of Małopolskie voivodship, have not created complex systems enabling management of the air quality improvement process in the regional scale. Admittedly, the construction of air protection programme in Śląskie voivodship was similar to that in Małopolska region, however, due to inadequate implementation of rules concerning establishing the results of remedial actions (lack of consistent methodology) and insufficient supervision over the reliability of data reported by communities, the bodies of autonomous authorities of Śląskie voivodship possessed information which were disproportionate to the effects of those actions actually attained. Meanwhile, construction of AQPs in the remaining units subject to audit was marked by a significantly lower usefulness of activities towards providing satisfactory air quality on the area of a given voivodship. According to NIK, such a situation resulted particularly from imprecise and too general regulations specifying rules for developing AQPs, and from lack of consistent methodology while creating those programmes. What should be positively evaluated is the fact that the audited autonomous authorities of the voivodships used their competence to introduce anti-smog resolutions. In those resolutions there have been specified standards for equipment used in a given region to burn solid fuels for heating purposes as well as types and quality of such fuels. However, efficient implementation of those regulations and attaining planned effects shall be difficult because of limited inspection possibilities (small number of audits in households performed by some of the audited communities, high costs of examining samples from solid-fuel boilers) and because of proposition of provisions prepared by Minister of Energy concerning quality standards for solid fuels. Those regulations, in that shape (project of regulation of 1st February 2018), do not guarantee meeting the emission requirements for Class 5 boilers and solid-fuel boilers set in Ecodesign regulation – a standard which has been adopted in the anti-smog resolutions. In the context of the abovementioned findings, NIK points out that attaining radical improvement of air quality with respect to concentration of PM_{10} , $PM_{2.5}$, and above all B(a)P, shall not be possible without introducing a fundamental change in the way of household heating. Particularly it should be done by reducing the possibility of using solid fuels in commercial and residential sector and by increasing use of municipal heating networks and gas grids or other *less emitting* sources of heating.

CONCLUSIONS

So far, the scale and pace of the remedial actions undertaken by audited communities – except Kraków – has been insufficient to attain results specified in AQPs, i.e. ecological effects for activities related to reducing emission from commercial and residential sector. Collected data and performed analyses point out that achieving required values of reduction of PM_{10} , $PM_{2.5}$ and B(a)P emission, with the present pace of remedial actions, may take between 24 to almost 100 years in different voivodships. Not all the communities performed activities that could be characterized as economically efficient or having big ecological effects, i.e. activities consisting in replacing or removal of old and low efficient heating sources which are powered by solid fuels. Only four out of 13 audited communities (31%) carried out a thorough inventory of commercial and residential emission sources. And only one community implemented a covering programme providing refunds to higher heating costs after replacing heating source powered by solid fuels. NIK also points out that costs of the activities necessary to achieve the required air quality largely exceeded the financial possibilities of the communities, which accompanied by lack of consistent and lasting financing mechanisms from the external sources – in the audited period of time – did not allow the execution of the remedial actions on the level adequate to the needs. According to NIK, such omissions and improper actions – on the central, voivodship and communal levels – bear a serious risk of not achieving results leading to achieving air quality standards applicable in the EU. Therefore, the probability of approaching the concentrations of some substances in the air in Poland to a significantly more restrictive levels resulting from WHO recommendations decreases even more, whereas this is the actual objective arising from general assumptions of EU policy in the area of environment protection and provisions of national strategy (NPAP).

CONCLUSIONS

Figure 1
Territorial coverage of NIK's audit



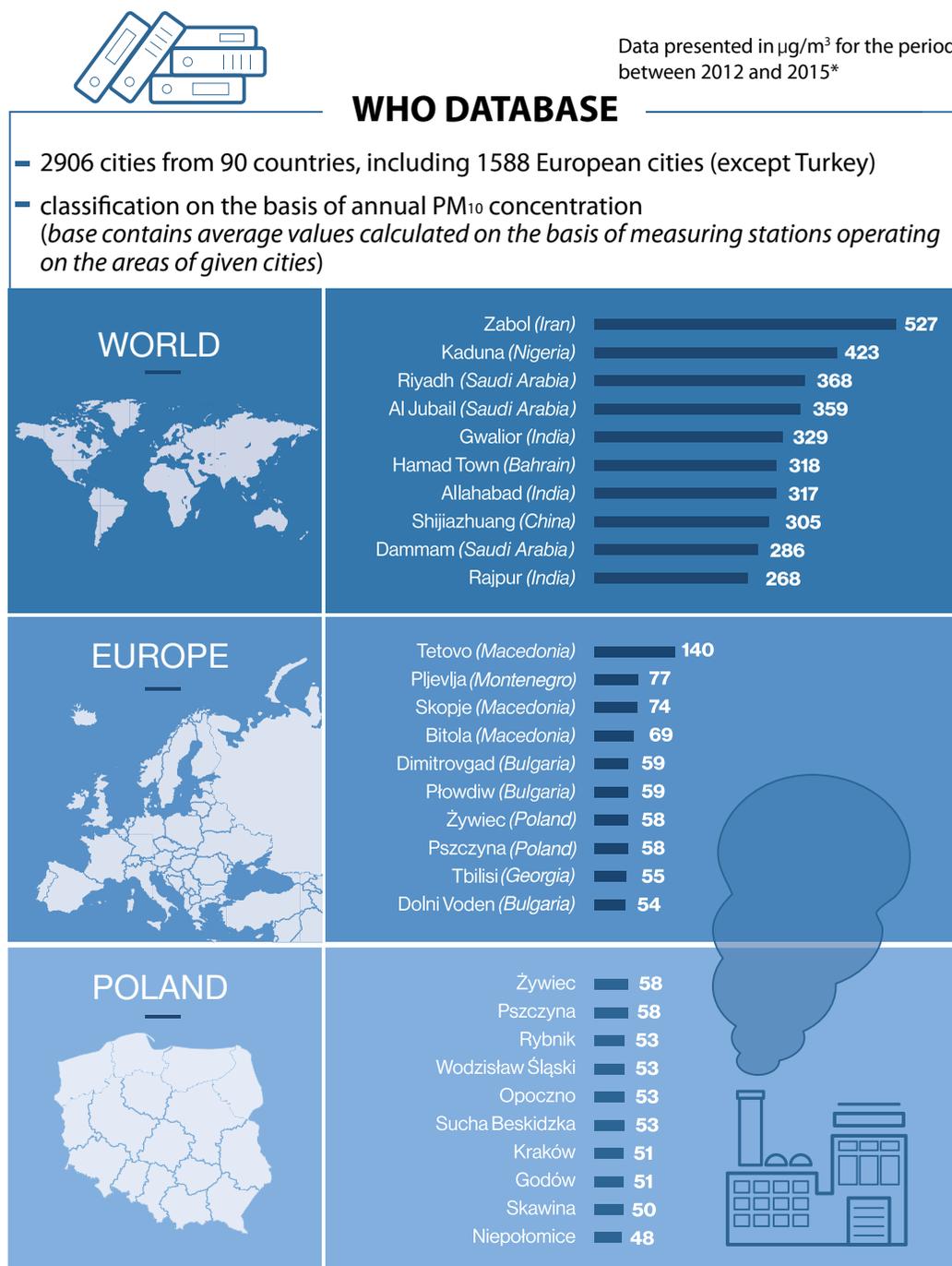
Source: Prepared by NIK.

3. MAIN FINDINGS

Air pollution is currently one of the major environmental challenges in the world and it poses a serious problem in the EU countries as well

Combating air pollution is becoming a more and more important issue among various units and social groups. Air pollution is a global problem; however, its scale varies in different regions. In some Asian and African countries it has been noted that the annual concentration of PM₁₀ amounted to 300–500 micrograms per cubic meter, while in European countries a maximum level of such concentrations was several times lower.

Figure 2
The most polluted cities regarding the amount of yearly PM₁₀ concentration, according to WHO database



* Due to the fact that data concerns different time periods and that part of data (26 %) on PM₁₀ concentration does not come from actual measurements but was introduced on the basis of the PM_{2.5} concentration measurements, the "ranking of the cities" presented has only indicative value.

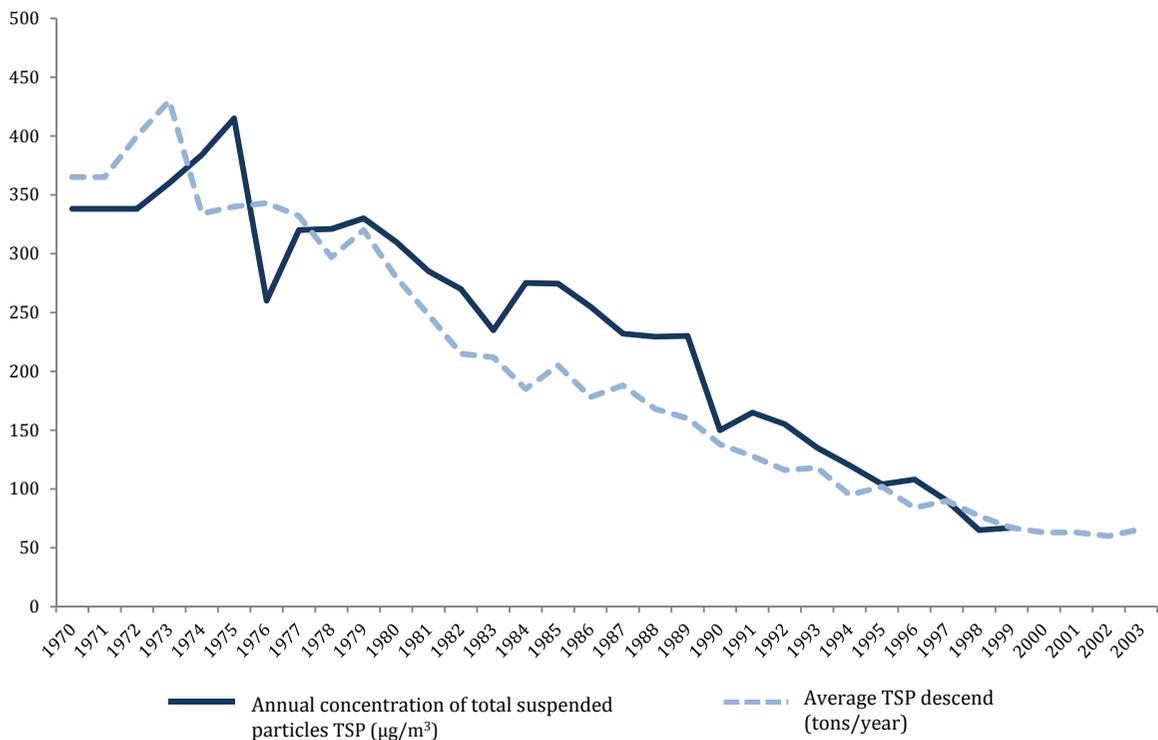
Source: prepared by NIK on the basis of Ambient Air Pollution Database, WHO, 2016.

MAIN FINDINGS

Interestingly, such a level of air pollution (300–400 $\mu\text{g}/\text{m}^3$) occurred also in Poland in the seventies of the previous century. However, as a result of economic transformation and restructuring of the industry in the eighties and nineties of the 20th century, the volume of emissions of air pollutants from those sources was significantly reduced.

Chart 1

Annual concentrations of total suspended particles (TSP) and its descend in the City of Katowice in the period of time between 1970–2003

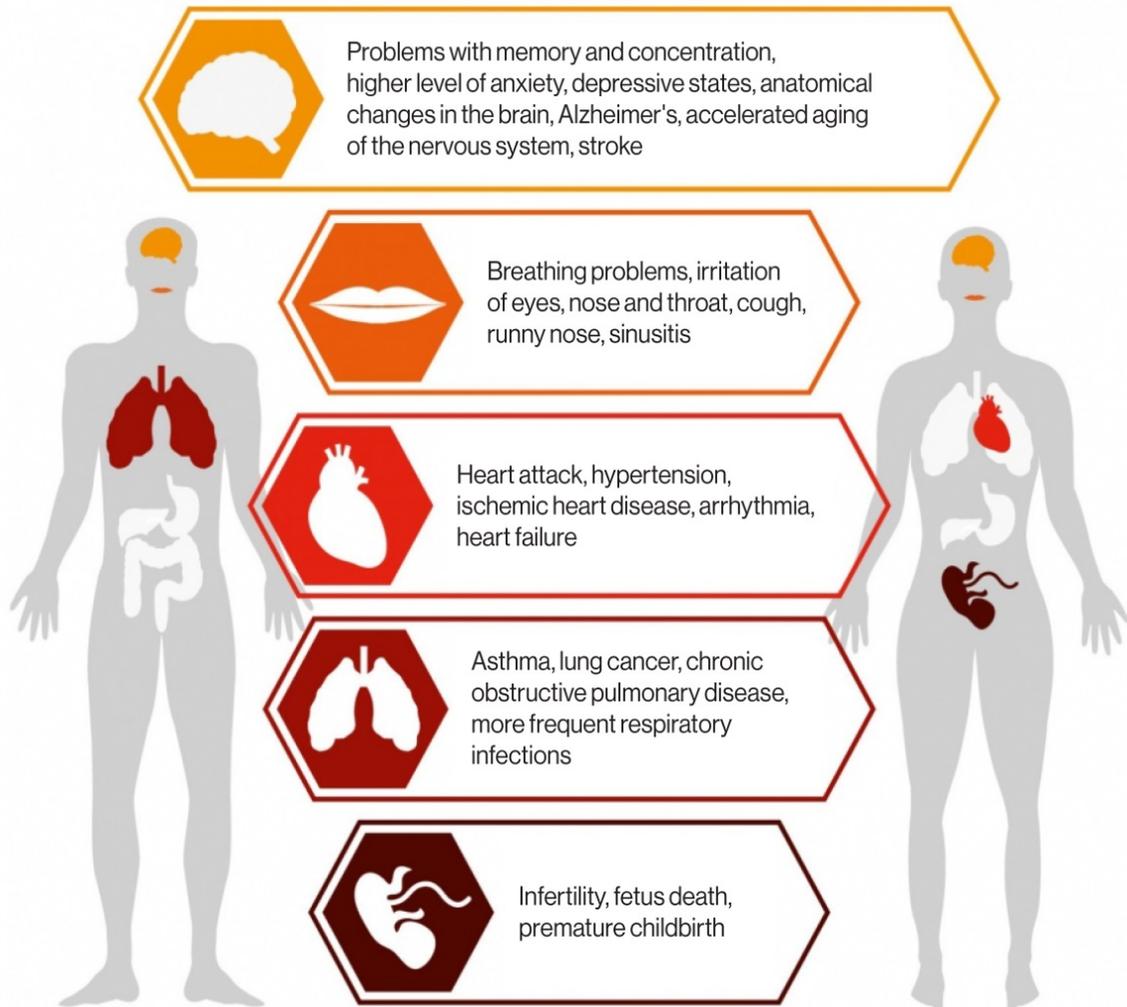


Source: Expert evaluation by Institute of Meteorology and Water Management – National Research Institute, ordered by NIK.

The EEA report from 2017² reveals similar trends related to reducing amounts of emission of the most important air pollutions was observed in the EU countries in the years 2000–2015. Despite those changes, still a considerable proportion of population of EU countries was exposed to air pollutant concentrations above limit and target values, such as particulate matter (PM_{10} and $\text{PM}_{2.5}$), nitrogen dioxide (NO_2) or polycyclic aromatic hydrocarbons e.g. B(a)P. It caused serious and very often irreversible negative health consequences.

² Air quality in Europe – 2017 report, EEA, 2017 (<https://www.eea.europa.eu/publications/air-quality-in-europe-2017>) – access on 30th June 2018.

Figure 3
Influence of air pollution on human organism



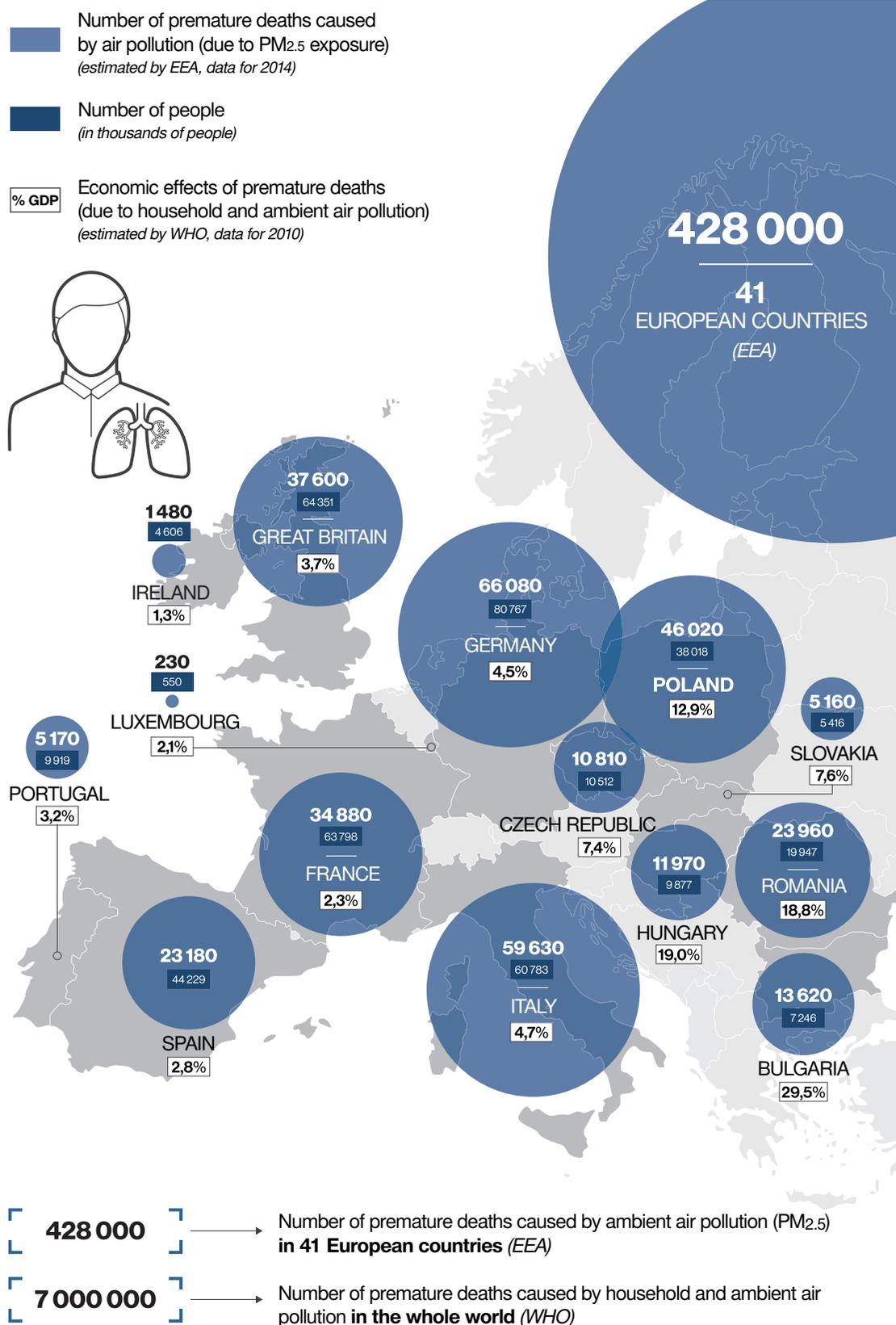
Source: *Influence of pollution on health, Krakowski Alarm Smogowy Association, 2017.*

According to foreign entities' data (WHO, EEA) air pollution in its extreme form led to 7 million premature deaths a year in the whole world (12,5% of all the deaths, taking into consideration all the causes of deaths), and in Poland itself this number surpassed 46 thousand people (due to negative influence of $PM_{2.5}$). That was the third biggest rate (after Germany and Italy) among 41 European countries included in the EEA report. Economic consequences of premature deaths caused by household and ambient air pollution in Poland were estimated by WHO at 12,9% of GDP annually.

MAIN FINDINGS

Figure 4

Health and economic impacts of exposure to PM_{2.5} in selected countries, according to EEA and WHO reports



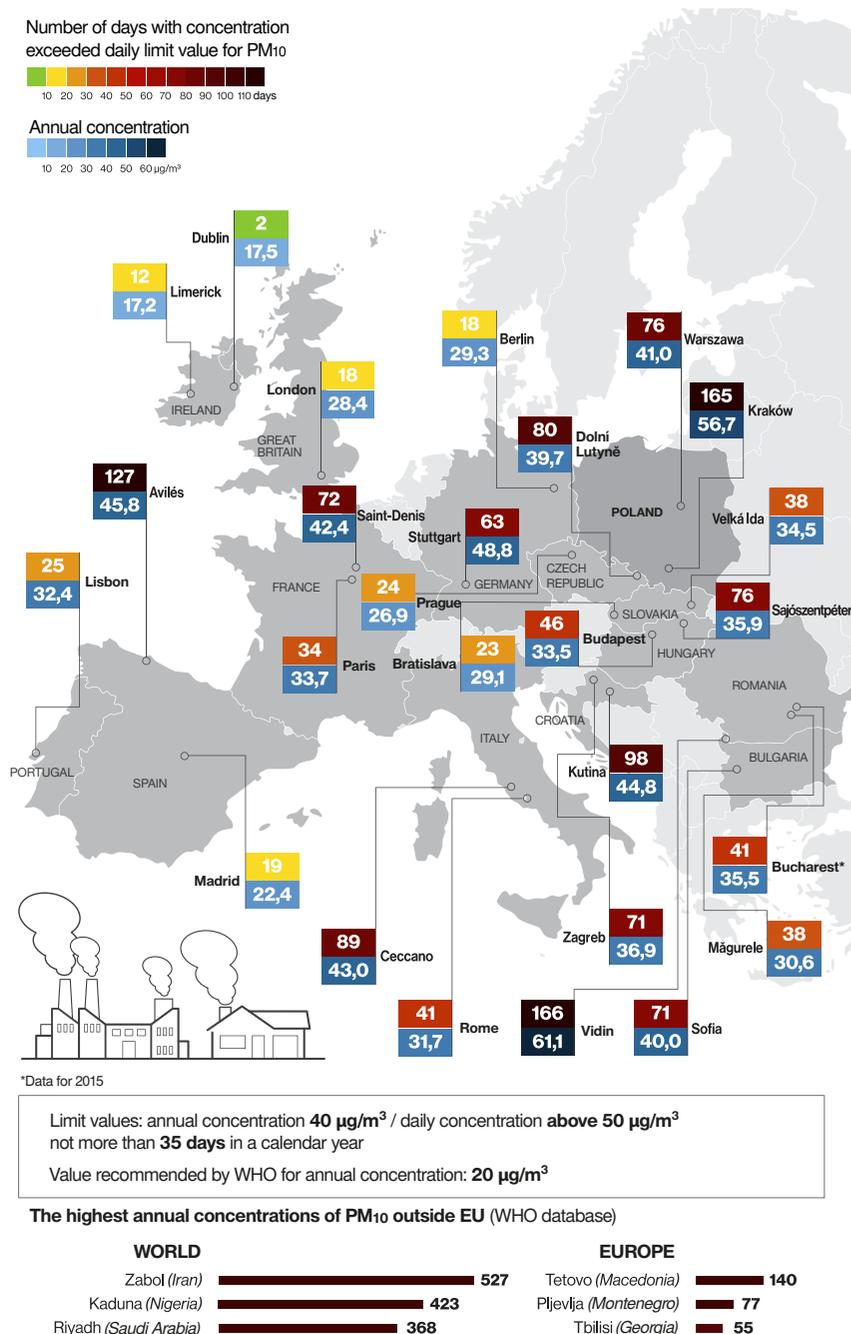
Source: prepared by NIK on the basis of Economic cost of the health impact of air pollution in Europe, WHO, 2015 and Air quality in Europe – 2017 report, EEA, 2017.

MAIN FINDINGS

Poland is still one of the EU countries with the worst air quality

Previous NIK's audit concerning air protection (P/14/086) revealed that Poland was one of the countries with the worst air quality in the years 2008–2013. This situation did not improve in the period of time covered by the present NIK's audit (air quality data concerning time between 2014 and 2017). Poland was still among the countries with the worst air quality in the EU concerning PM_{10} and $PM_{2.5}$ concentration, and air pollution with carcinogenic B(a)P was on the highest level among all member countries.

Figure 5
Concentrations of PM_{10} (daily and annual limit value) in 2016 in selected EU countries

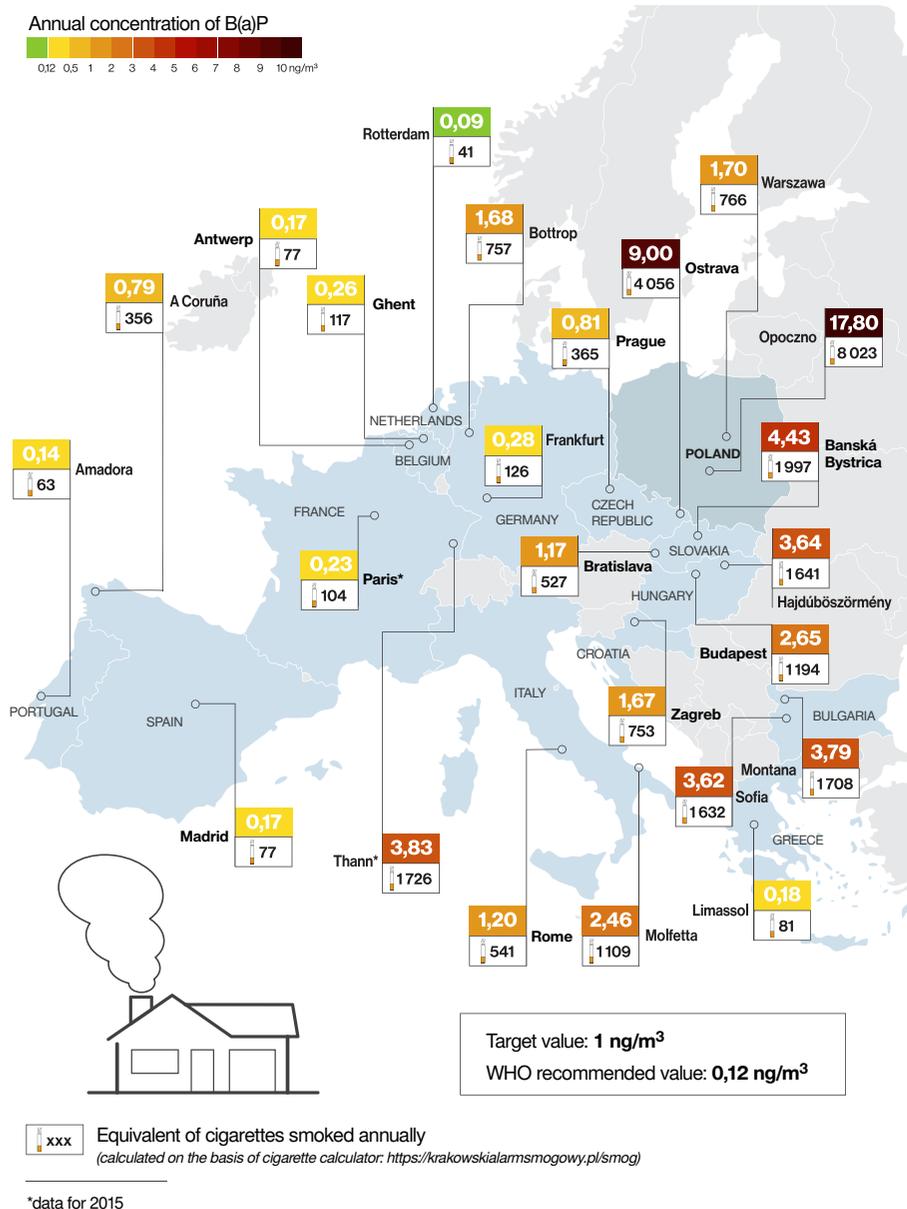


Due to data capture indicator which is lower than required, in some cases (not in case of cities in Poland) values presented on the map have only indicative character.

Source: prepared by NIK on the basis of EEA and WHO data bases.

MAIN FINDINGS

Figure 6
Concentrations of B(a)P (annual limit value) in 2016 in selected EU countries



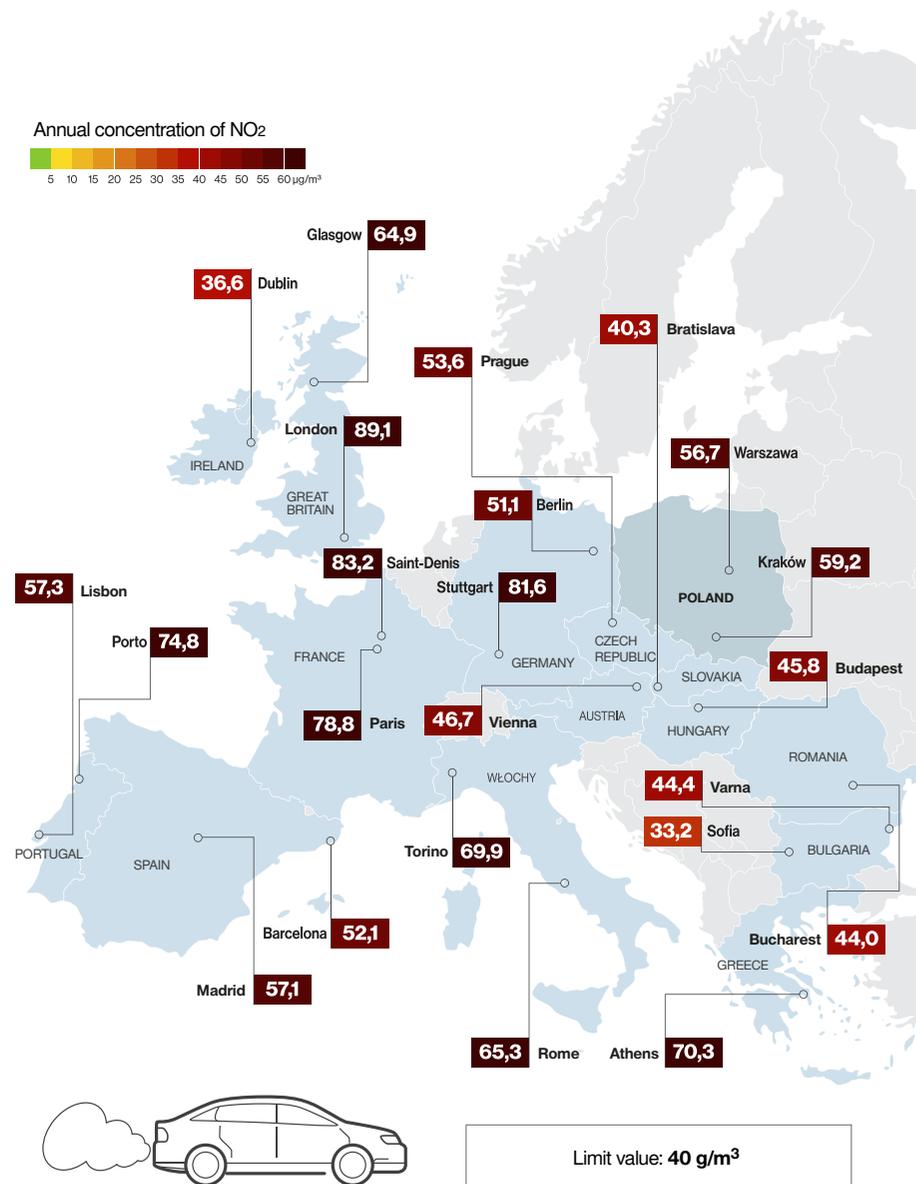
Due to low data capture indicator in some cases (not in case of cities in Poland) values presented on the map have only indicative character.

Source: prepared by NIK on the basis of EEA data base.

The situation of Poland looks slightly better against remaining EU countries concerning air pollution with NO₂. Exceeding of annual limit values for this substance was noted in only four cities in the country (Katowice, Krakow, Warszawa and Wroclaw), but the degree of this exceedance was high. The greatest problems with maintaining that standard can generally be observed in the countries with heavy road traffic in the rural areas (particularly in Great Britain, France, Germany, Spain and Italy).

MAIN FINDINGS

Figure 7
Concentrations of NO₂ (annual limit value) in 2016 in selected EU countries



Due to data capture indicator which is lower than required, in some cases (not in case of cities in Poland) values presented on the map have only indicative character.

Source: prepared by NIK on the basis of EEA data base.

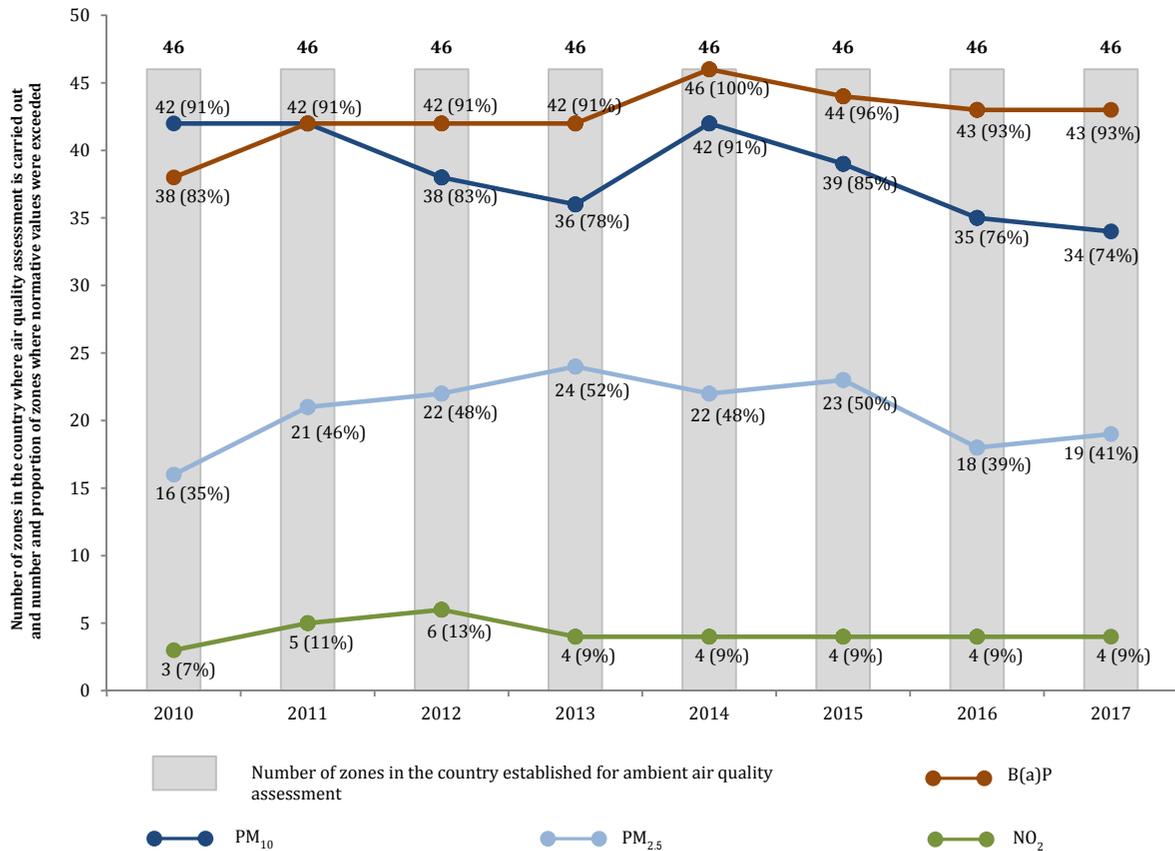
The biggest problem with the air quality countrywide was caused by the above-normative concentrations of PM₁₀, PM_{2.5}, B(a)P and to a lesser extent NO₂

Both in the period of time under audit and in the longer time perspective (2010–2017) the main problem concerning air quality in Poland was caused by too high concentration of particulate matter (PM₁₀ and PM_{2.5}) and B(a)P. In the abovementioned period of time exceedance of accepted values for particulate matter was recorded in 74%–91% (PM₁₀) and 35%–52% (PM_{2.5}) of all the zones where air quality evaluation was performed, and in the case of B(a)P exceeding of the target value occurred in 83% up to even 100% of all the zones. On the other hand, exceedance of the accepted level of NO₂ was recorded in 7%–13% of all the zones.

MAIN FINDINGS

Chart 2

Percentage of the on zones in the country where the limit values for PM_{10} , $PM_{2.5}$ and NO_2 as well as target value for B(a)P were exceeded in the period of time between 2010 and 2017



Source: Prepared by NIK on the basis of CIEP data.

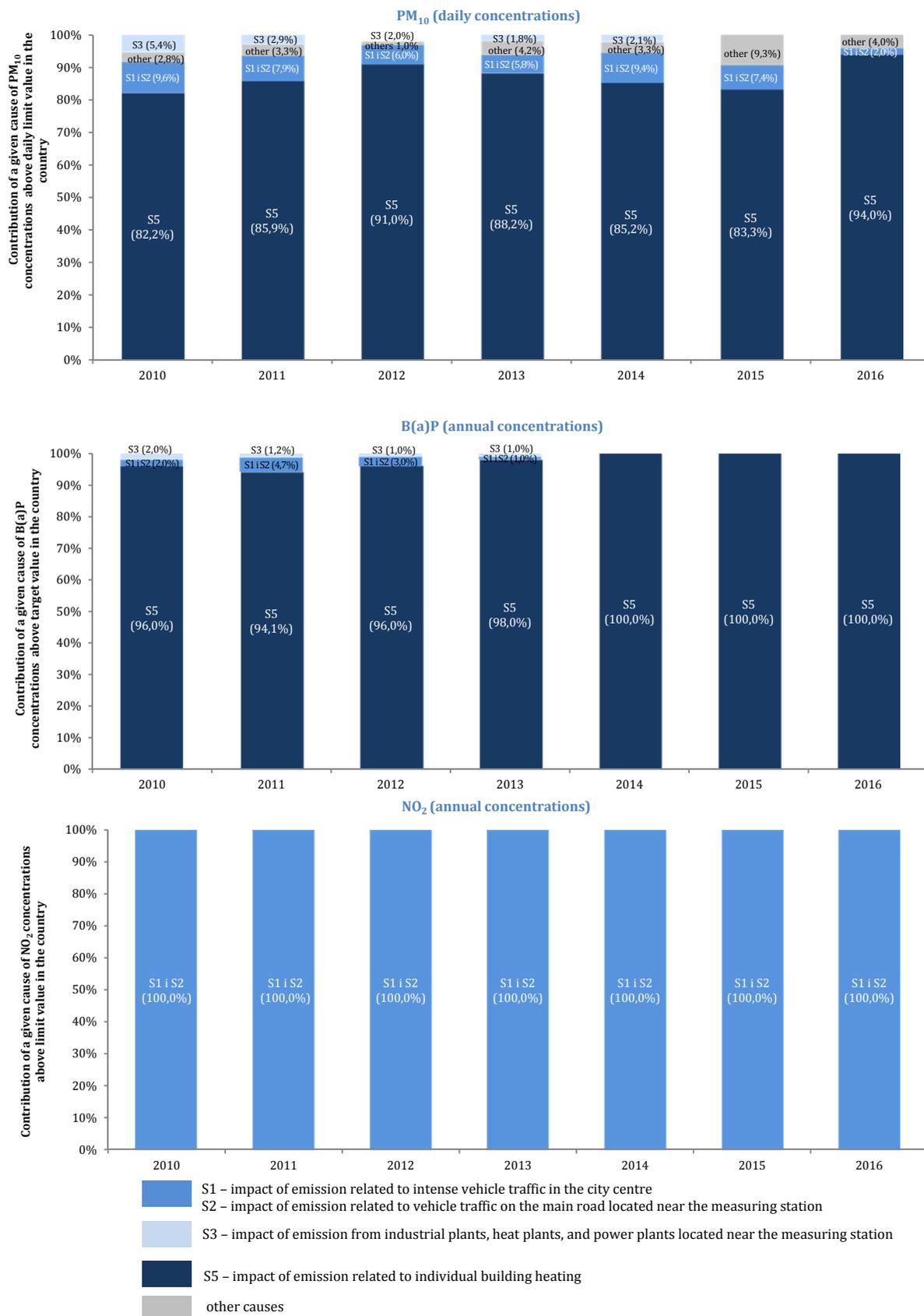
At national level the biggest sources of particulate matter (PM_{10} and $PM_{2.5}$) and PAH (e.g. B(a)P) emission were caused by burning processes outside the industry – respectively 45%, 48% and 88% emission of those substances in total in 2016, among which the dominant role was linked to household burning of solid fuels. Whereas, in the case of nitrogen oxides (NO_x) the dominating emission source was industrial sector (38% of total emission in 2016) and road transportation (32%). Various ways in which air pollution from different sources is spreading determine their influence on observed exceedances of normative values. Therefore, the air quality in a given zone concerning concentration of particulate matter and B(a)P was influenced mainly by local sources operating in commercial and residential sector and alluvial emission, and in the case of NO_2 mainly by local transportation sources.

The main reason of exceeding the normative values was emission of air pollutants from commercial and residential sector and in the case of NO_2 emission from transportation sector

MAIN FINDINGS

Chart 3

Causes of exceedances of normative values for PM_{10} , B(a)P and NO_2 in the period of time between 2010 and 2016 in the country



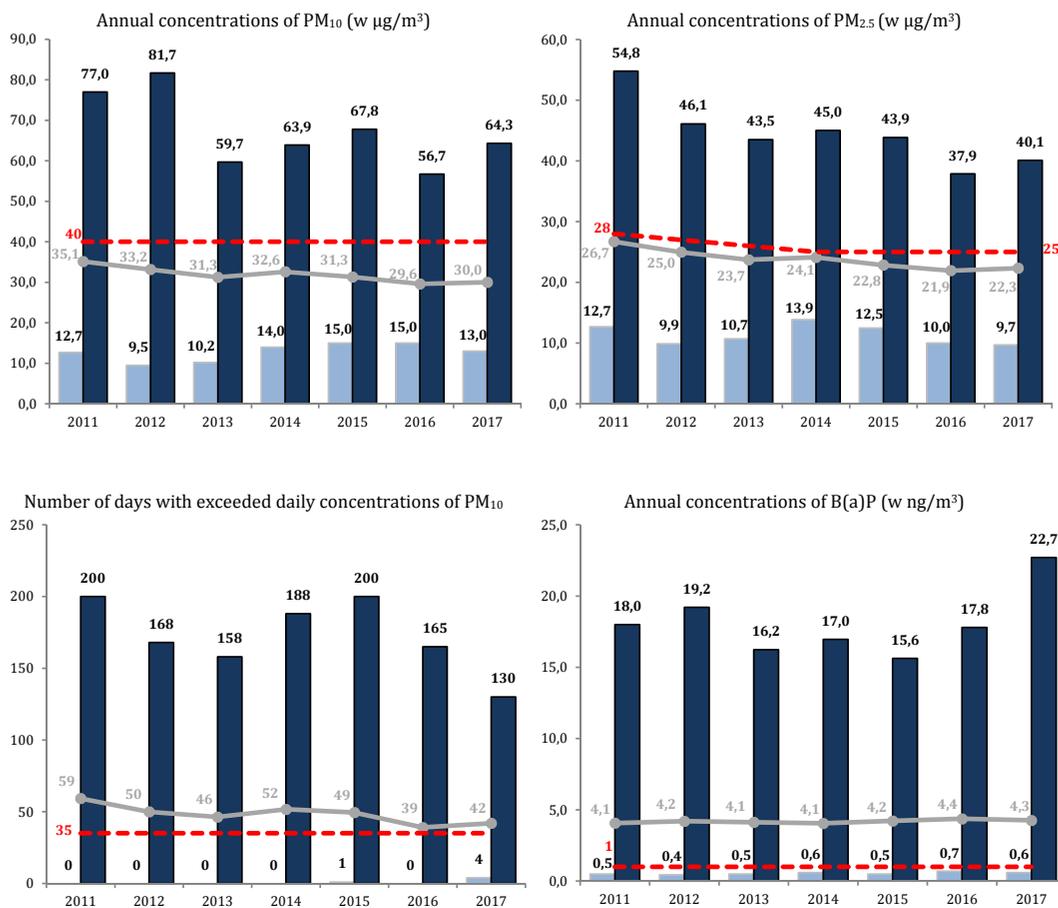
Source: Prepared by NIK on the basis of CIEP data.

MAIN FINDINGS

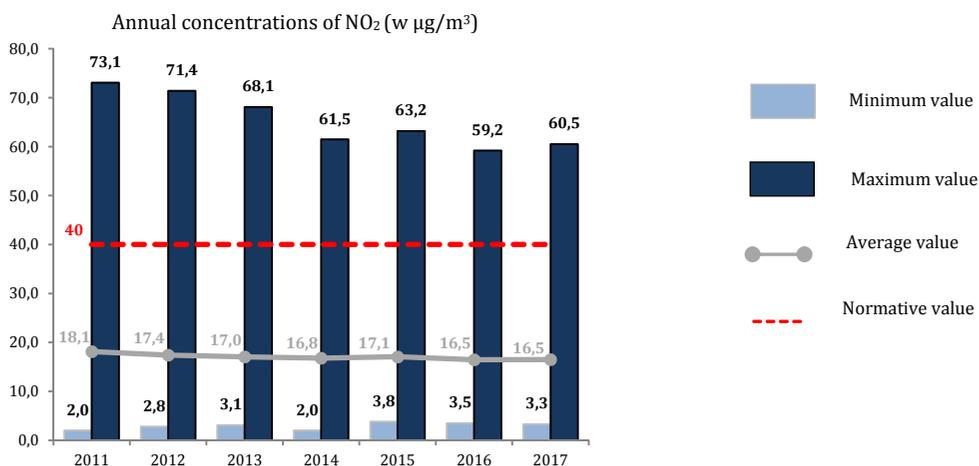
Poland has had problems with air pollution for many years. Both in the period of time under the previous audit performed by NIK (P/14/086) and later in the years 2014–2017 the air quality considerably differed from standards and levels whose maintenance reduces negative impact of pollution to human health and environment. What is important is not only the fact that exceedances of the normative values had continuous character (appeared continuously – the previous and present NIK's audits spanned over 10 years), but the audits also revealed extremely high levels of those exceedances. In the years 2014–2017 annual concentrations of $PM_{2,5}$, PM_{10} and NO_2 reached the levels of respectively 180%, 170% and 158% of values accepted for those substances. Too high daily concentrations of PM_{10} occurred in some areas for even more than half a year (200 days), and for annual concentrations of B(a)P cases ranging from a dozen times up to twentyfold exceedance of normative value were noted (2 270% target value). Poland's problems with providing appropriate air quality were noticed by the EU. In the decision of 22nd February 2018 Court of Justice of European Union stated that Poland infringed the EU law in the area of air quality.

Exceedances of normative values for PM_{10} , $PM_{2,5}$, B(a)P and NO_2 occurring continuously, along with large scale of those exceedances, reveal lack of efficiency of the existing actions taken by public bodies in the area of air protection

Chart 4
Level of air pollution in the country in terms of selected substances



MAIN FINDINGS



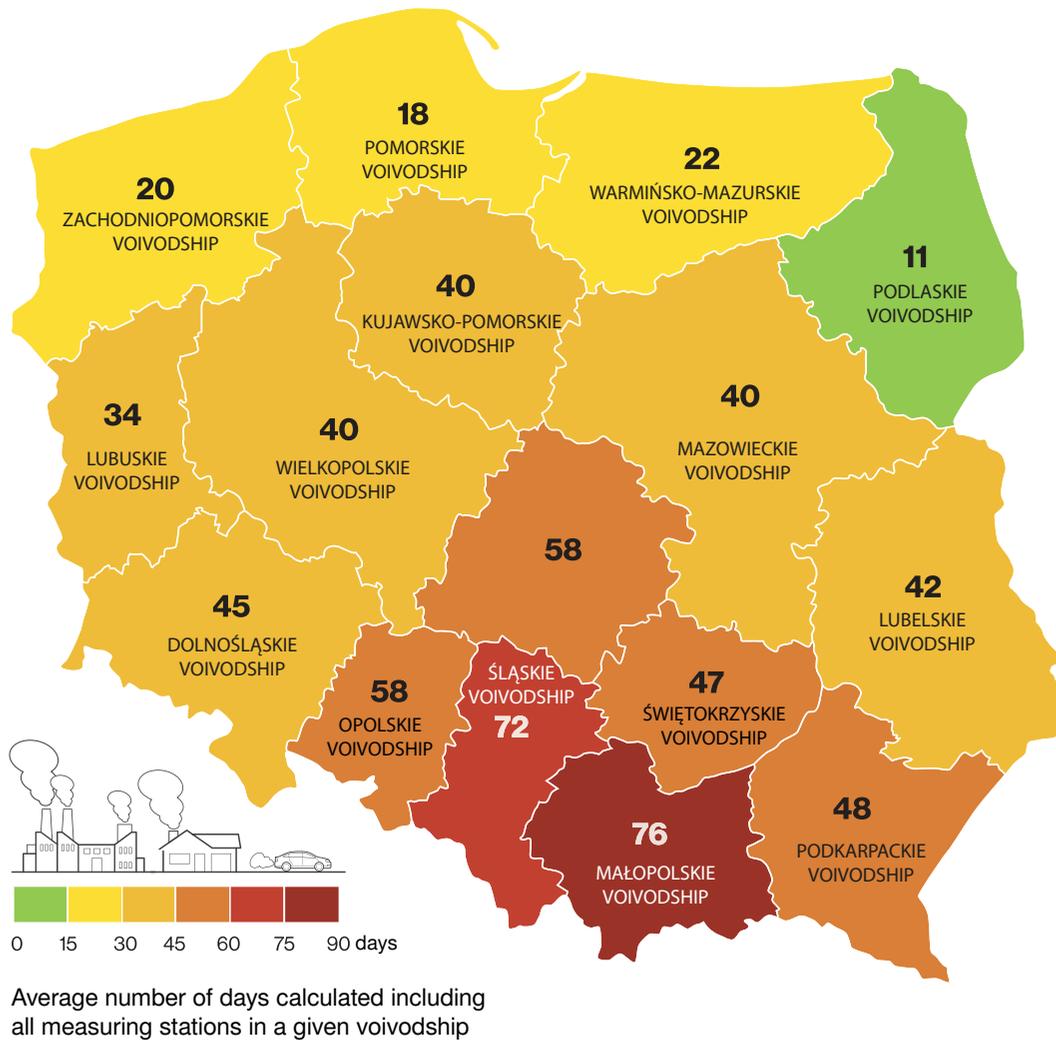
Source: Prepared by NIK on the basis of CIEP data.

It has to be noted that the normative values set out by EU (applicable also in Poland) are still much higher than the values recommended by WHO for health protection from adverse effect of air pollution. Maximum annual concentrations of PM₁₀ and PM_{2.5} recorded during the audited period were three or four times higher than the values recommended for those substances by WHO. The most drastic situation can be observed in the case of such comparison for B(a)P, because annual concentration of this substance in Poland reached a concentration almost 200 times higher than that specified by WHO. It is also noteworthy that the quality of air in Poland varies greatly according to season (the highest concentrations are recorded in the winter season – increased burning of solid fuels for heating purposes in the commercial and residential sector) and region (generally, the worst air quality can be observed in the south of Poland, which is particularly related to distinct meteorological and geographical conditions).

MAIN FINDINGS

Figure 8

Differentiation of air quality in the country in 2017 considering the number of days with concentrations above daily limit



Source: Prepared by NIK on the basis on CIEP data.

MAIN FINDINGS

Particulate matter pollutions emitted beyond the borders of Poland are transmitted to the area of the country but most of the time they do not influence exceedance of the normative values

Available data sources reveal that the problem of transboundary air pollution refers also to Poland. The biggest influence of the particulate matter emission (PM_{10} and $PM_{2.5}$) from abroad was observed in the western and southern voivodships. Most of the time, this phenomenon did not influence the exceedance of the normative values, with the exception of areas situated in Śląskie voivodship where the influx of pollution from Czech Republic, apart from state sources, may have contributed to creation of high level of concentrations of particulate matter, which were higher the accepted values. This confirms that the unsatisfactory air quality in Poland is mainly shaped by Poland-based emission sources and that solving the problem of inadequate air quality is primarily connected to reduction of emissions of air pollutants from local sources.

Solutions significantly reducing air pollutants emissions were introduced only in reference to industrial sources

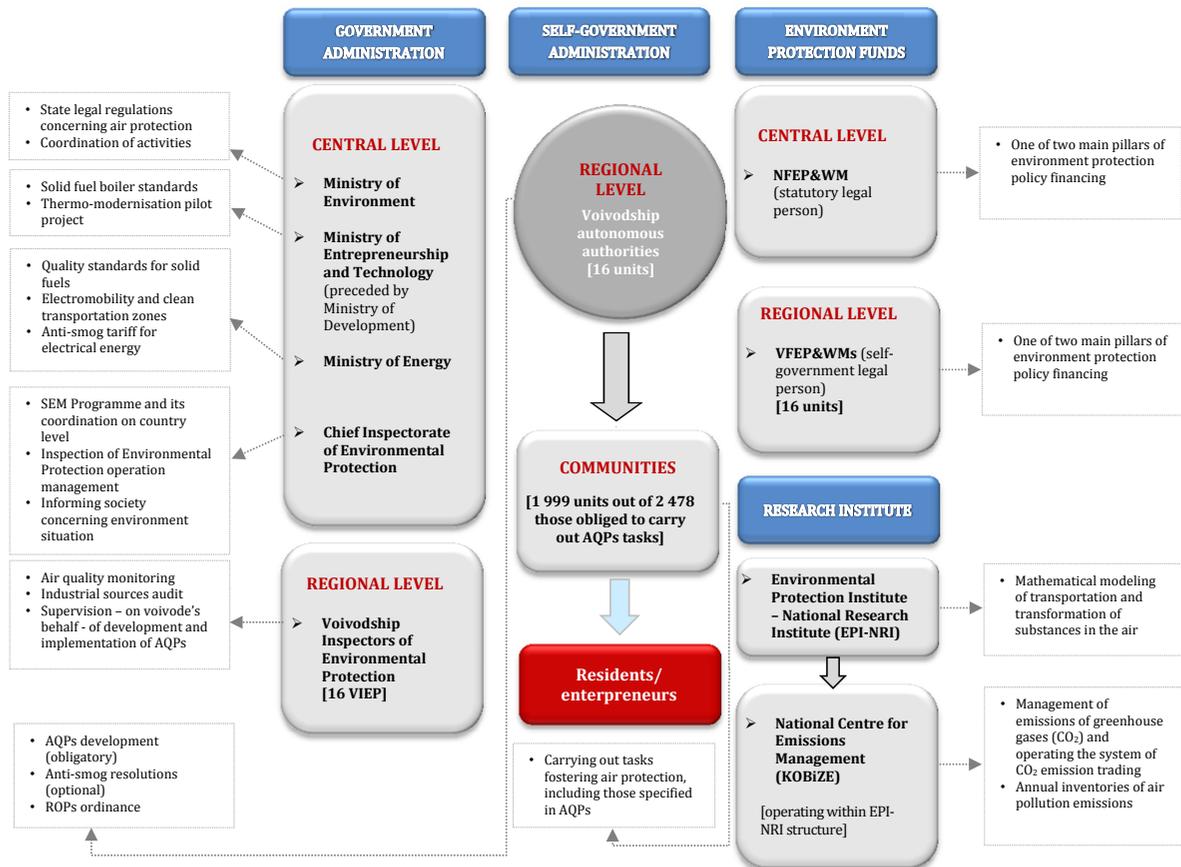
Analyses drawn up, both on the country and regional level, reveal that emission from industrial sources was the third, with regard to significance (after emission from commercial and residential, and transportation sectors) factor influencing the air quality in the country. Lack of consistency and proper direction of activities in the field of air protection was revealed e.g. by the fact that only with regard to this sphere (industrial activity) mechanisms resulting in considerable lowering of air pollution emission were introduced (it results mainly from transposition of EU regulations). Nevertheless, without considerable reduction of emissions from the other sources – which largely influence air quality, it shall not guarantee achieving required standards.

Overly complex air protection system, together with lack of consistency of the solutions introduced and insufficient coordination of activities between different agents were the reasons for lack of expected improvement in air quality

Air protection system in Poland is very complex. It requires interactions between numerous participants on various administration levels, who may shape the idea of the activities which are necessary to improve air quality in different ways. For instance, four different groups of units are responsible for the most important tasks in the air protection system at the regional level. Entities independent of each other plan (voivodship autonomous authorities), execute (communities), provide financing of remedial actions (VFEP&WMs and NFEP&WM) and also audit their implementation (VIEPs).

MAIN FINDINGS

Figure 9
Simplified overview of the air protection system in Poland



Source: Prepared by NIK.

Such positioning of the tasks makes the activities of all the system participants incredibly difficult to coordinate. And, whilst, in the period of time under the previous NIK's audit (P/14/086) many mechanisms enabling full assessment of the system's functionalities were not implemented, currently adopted or designed solutions show the need for reinforcing coordination and providing consistency of the activities on all administration levels.

The biggest deficiencies limiting the efficiency of the system include, for instance, lack of integration of different entities' activities, which according to NIK led to the fact that factual or planned manner of implementing some mechanism (e.g. regarding solid fuel standards or clean transport zones introduction) shall not, in an expected way, contribute to air quality improvement. What should also be mentioned is the lack of consistent methodology when developing AQPs and not applying in those documents proper mechanisms enabling efficient management of air quality improvement process in the voivodship scale. Also, the activities taken to provide consistency and continuity of financing tasks related to reducing low emission, which is the main reason for inadequate air quality in the country, were insufficient in the audited period of time. For instance, in the audited time period (3,5 years) NFEP&WM dedicated 153,4 million PLN³ for replac-

³ Polish currency.

ing individual heating sources for solid fuels (within KAWKA Programme) at a national level, whereas only in Małopolskie, Mazowieckie and Śląskie voivodships the needs in this regard were estimated for 14,2 billion PLN. Collected data reveal that external costs caused by air pollution⁴ on the area of the abovementioned voivodships come to 10,0 billion PLN annually. And it was only in June 2018 that NFEP&WM and VFEP&WMs signed an agreement concerning common and uniformed for the whole country financial offer for activities related to thermo-modernisation and heating sources replacement for single-family constructions, which makes the amount of assets involved more realistic in comparison to the needs in this regard (it was anticipated that assets in the amount of 103,0 billion PLN in the forms of donations and loans shall be allocated in the years 2018–2029 for such tasks).

It shall be necessary to verify adopted course of action in regard to financial support of processes concerning thermo-modernisation and replacement of heating sources in single-family buildings taking into consideration achievable results of the actions planned

According to NIK, all of the evidence collected in the course of the present audit, especially in the context of anticipated use of such considerable public resources (103,0 billion PLN) points out the need to verify the adopted course of action taking into consideration achievable results of the actions planned. What should become a starting point for such considerations are the EU policy assumptions regarding environmental protection, expecting i.a. significant air quality improvement until 2020, which would approximate air's quality to the levels recommended by WHO⁵, and the second of the specific objectives specified in NPAP, i.e. attaining air quality consistent with WHO recommendations in Poland until 2030. Meanwhile, none of the audited AQPs assume reaching in the final year of its execution the target value for B(a)P, which in the EU, including Poland is more than eight times higher comparing to WHO recommendations. What the programmes, however, predict is the achievement of limit values for PM₁₀ and PM_{2,5} in the final year (which are twice as high as WHO's indications), taking into account that such possibilities go in line with full implementation of anti-smog resolutions adopted by regional self-government. However, NIK pointed out that presently applied solutions are not able to provide efficient supervision of implementing requirements arising from that resolutions due to insufficient inspection possibilities of community services (low level of audits in some communities, high costs of examining samples from solid-fuel boilers). It has to be emphasized that such requirements are in force only in some voivodships, while the air pollution is a nationwide problem (exceeded normative values in the audited period of time for PM₁₀ were recorded in at least ¾ of zones, in the case of B(a)P in more than 90% of zones where air quality assessment takes place). NIK has also pointed out that solutions at central level adopted in the course of the present audit or being currently designed shall be insufficient for significant air quality improvement and attaining expected results arising from implementing

⁴ External costs are the costs incurred in relation to air pollution and include e.g. economic losses, medical care costs (both on the side of healthcare providers and patients), employers cost related to employees' absence and doctors' leaves.

⁵ Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet'.

anti-smog resolutions. Regulations adopted in 2017 concerning requirements for solid fuel boilers apply only to new boilers; the old equipment known for high parameters of pollution emission into the air will remain to be used. What is more important, however, is that in order for the regulations to really contribute to improvement of air quality they have to be accompanied by e.g. relevant regulations concerning quality standards for solid fuels approved for sale. Meanwhile, the regulation project prepared by Minister of Energy concerning quality standards for solid fuels does not specify fuels of such quality which would provide parameters of pollution emission for Class 5 boilers and meet EcoDesign⁶ requirements, which is the standard adopted in anti-smog resolutions analyzed by NIK during the audit. Analysis of five possible scenarios of implementing anti-smog resolution for Małopolska voivodship clearly indicates that only adopting standards for Class 5 boilers may enable achieving annual limit values for PM₁₀ and PM_{2.5} concentrations and in the case of B(a)P normative value shall not be maintained in many cases, though the exceedances of the target value shall be relatively low in this variant. According to NIK, taking into account the abovementioned conditions, the possibility of attaining WHO recommended air quality in Poland with respect to PM₁₀, PM_{2.5} and most of all B(a)P is not supported by currently executed or anticipated remedial actions. In NIK's opinion, such conditions shall arise only in the case of a radical change in the way of providing household heating, especially by adequate limitations in using solid fuels in the commercial and residential sector and by increased use of municipal heating networks and gas grids or other less emitting heating sources. That, in turn, requires taking strategic decisions concerning the future functioning of hard coal mining, including predicted profitability of this sector as well as external costs caused by air pollution, which is caused mainly by using solid fuels in household heating in Poland. According to NIK, the present situation authorizes performing a thorough analysis in the abovementioned scope. For one thing, there is a financial support programme for processes supposed to provide improvement of air quality by using more than 100 billion PLN of public resources, but as the audit results show there is no certainty that such actions will allow attaining the expected air quality improvement. On the other hand, what needs to be taken into account are the findings of the previous NIK's audit concerning functioning of hard coal mining industry in the years 2007–2015 against the assumptions of governmental programme (P/15/074). From the report on that audit⁷ it was pointed out that in the years 2007–2015 an unsolved problem of mining companies was: low extraction efficiency, overstaffing, ineffective payroll system, which translates into high fixed costs of the business activity and high vulnerability to fluctuations in demand and coal costs. It was also set out that activities

⁶ As pointed out in the expert evaluation ordered by Ministry of Environment the proposal of quality standards for solid fuels does not include values of quality parameters for standard fuel for Class 5 boilers, which is described in PN-EN 303-5:2012 norm, because such values are not maintained by a majority of domestic and imported fuels.

⁷ NIK's report concerning functioning of hard coal mining in the period between 2007 and 2015 against governmental programme assumptions (Ref. no. 209/2016/P/ 15/ 074/ LKA), published in June 2017.

MAIN FINDINGS

executed in that time did not contribute to providing profitability and competitiveness on the national and foreign market of leading producers (with total or dominant public participation). And the total amount of the public support for the mining sector in the years 2007–2015 (approx. 65,7 billion PLN) was even slightly higher than the total amount of public-law payments executed by mining entities at that time (approx. 64,5 billion PLN).

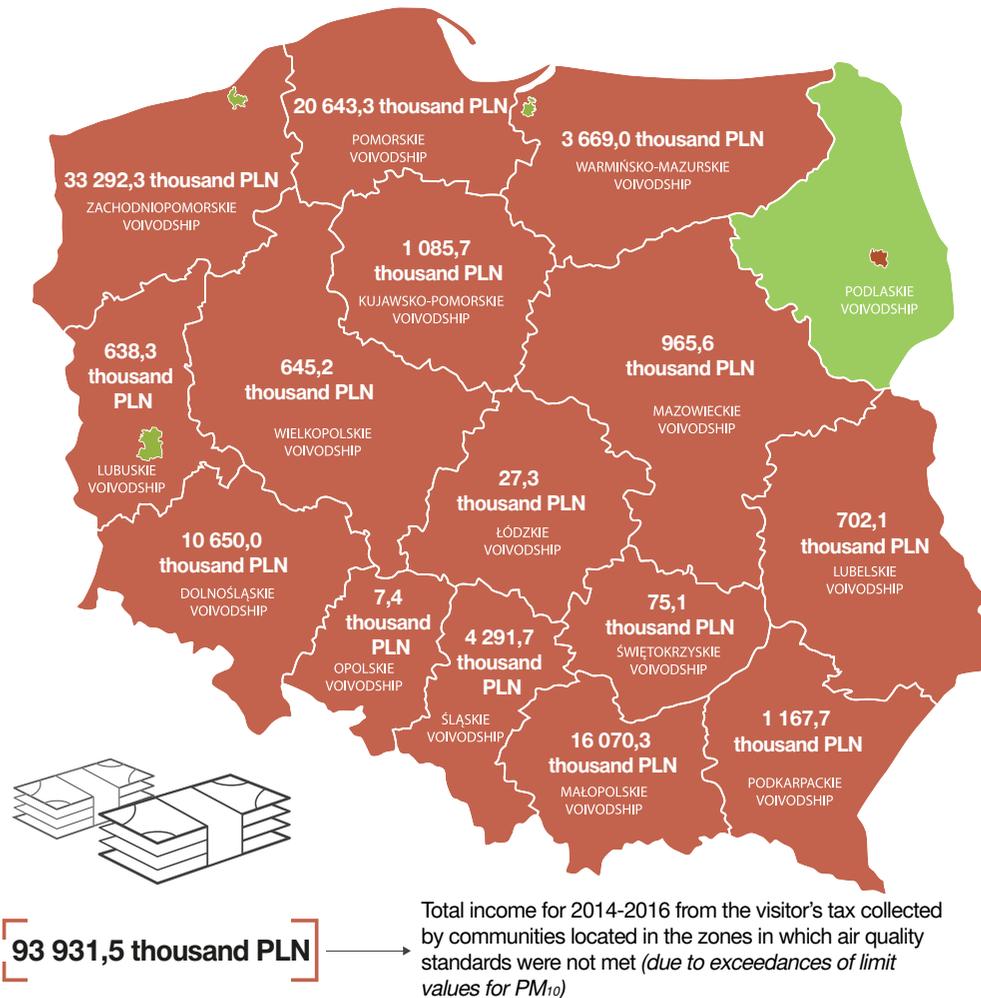
Actions taken by Minister of Environment in the field of air protection were assessed negatively

NIK evaluated the activities of Minister of Environment negatively, because in the period of time under audit he did not take adequate actions concerning adjusting of air protection policy or providing proper functioning of air protection system, that would correspond to the scale of the problem. Minister of Environment was an unreliable national coordinator for activities executed for air protection and monitored the whole process insufficiently. Documents and explanations submitted in the course of the audit did not allow to conclude that the actions taken by Minister of Environment in the years 2014–2017 (the first half of the year) shall have significant influence on future air quality improvement in the country. Such conclusion arises particularly from:

- Lack of complex problem analysis in the field of air protection taking into account key information for proper planning of remedial actions (amount of expenses for air protection, external costs related to inadequate air quality);
- Not performing analysis of efficiency of the remedial actions undertaken at regional level;
- Not providing mechanisms (legal frames) to apply consistent standards for AQPs development and not specifying the necessity to include elements enabling the assessment of relevance and efficiency of undertaken remedial actions in AQPs;
- Insufficient activities to provide consistency and continuity of financing sources for activities related to low emission reduction;
- Executing the recommendations from previous NIK's audit related to air protection in a way which did not provide sufficient results. Particularly not commencing efficient cooperation with Minister of Health concerning carrying out air quality measurements in spa communities within SEM or developing other alternative solutions;
- Lack of problem analysis concerning visitor's tax, despite this issue being directly related to air quality – existing legal dualism results in various rules concerning applying regulations in this regard, whilst in the years 2014–2016 the communities not maintaining air quality standards obtained total revenues from the visitor's tax in the amount of 94 million PLN (94,7% of total revenue from that title collected nationwide).

Figure 10

The amount of visitor's tax collected in the period of time between 2014 and 2016 within voivodships in all localities which did not fulfil minimum climatic conditions as stipulated by currently binding legal regulation



Source: Prepared by NIK on the basis of budget data base of local self-governments (BeSTi@) and CIEP information.

NIK evaluated the actions taken by Minister of Energy and having influence on air protection as insufficient and inadequate to the scale of the problem. Also, the actions did not execute the expectations concerning the assigned tasks within so-called *Clean Air* programme on a satisfactory level. The above evaluation results from both sluggishness in performing activities aiming at bringing into force quality standards for solid fuels, and from adopting – in the projects sent to the Standing Committee of the Council of Ministers – accepted parameters for solid fuels, which do not sufficiently secure the citizens and natural environment from negative influence of air pollution. The way of executing the following two tasks arising from *Clean Air* programme and consisting in preparing legal regulations concerning i.a. introducing limitations in road transportation in the city and providing considerably lower rates for electrical energy consumption in periods of time with its limited demand, due to imperfections in the adopted solutions – in NIK's opinion – it shall not play a significant role in increasing efficiency of such actions towards improving air quality. Analysis carried

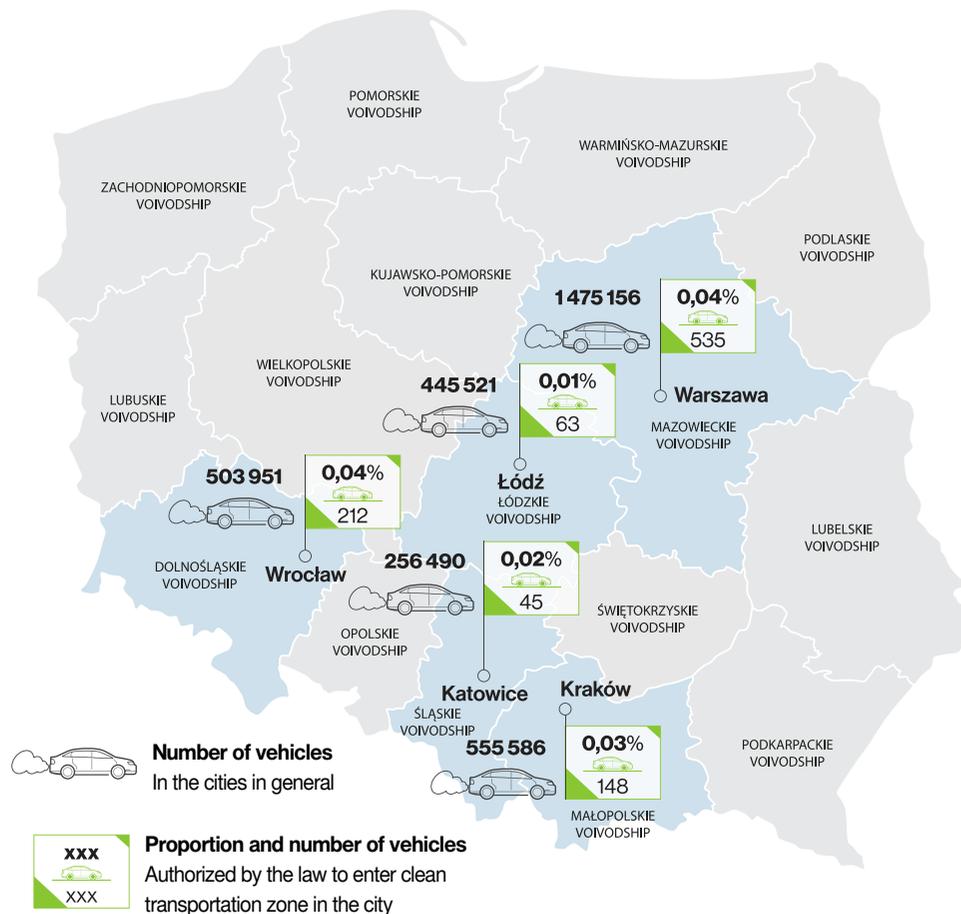
Actions taken by Minister of Energy in the field of air protection were insufficient and inadequate to the scale of the problem related to unsatisfactory air quality

MAIN FINDINGS

out by NIK⁸ revealed that if the zones of clean transportation were created in big cities, only 0,03% of all registered engine vehicle users would be entitled to enter those zones under direct provisions of the act regulating such issues.

Figure 11

General number of engine vehicles registered in Warszawa, Krakow, Katowice, Wrocław and Łódź, according to 2016 status and proportion and number of vehicles entitled to enter clean transportation zone under direct provisions of Electromobility and Alternative Fuel Act



Source: prepared by NIK on the basis of Central Vehicles Registry data, forwarded by Ministry of Digitization.

On the other hand, an example of comparison of electrical heating costs showed that yearly costs of such heating using introduced anti-smog tariff could be even 20% higher than in the case of tariffs already present on the market. In the course of NIK's audit it was admitted by the Ministry of Energy representative that the anti-smog tariff guarantees lower heating costs than G12 tariff if the receiver uses the electrical energy for heating only at night (8 hours). Whereas, available sources indicate that the majority of existing electrical heating appliances in Poland operate within 10–16 hours a day. Moreover, in the prescribed period (until the end of 2017) Min-

⁸ Shown by the example of five selected cities, including four cities with exceeded annual limit value for NO₂, mainly due to emission from transportation sector (Łódź, Katowice, Kraków, Warszawa, Wrocław).

MAIN FINDINGS

ister of Energy – together with other ministries – did not develop assumptions of complex public policy aiming at protecting vulnerable social groups from *energy poverty*.

NIK positively evaluated actions taken by Minister of Development and Finances, and later by Minister of Entrepreneurship and Technology which are fostering improvement of air quality in Poland, and which include issuance of the regulation in 2017 concerning requirements for solid fuel boilers. NIK also pointed out that the need for introducing such regulations resulted from much earlier analyses and that the present regulation constitutes one of a few indispensable elements determining improvement of air quality by eliminating the possibility of selling old, low efficiency heating equipment for solid fuels, and that its autonomous influence shall be insufficient to obtain required air quality throughout the whole country.

All five autonomous authorities of voivodships audited managed to develop and specify AQPs for zones (and agglomerations) where exceedances of normative PM₁₀, PM_{2.5}, B(a)P or NO₂ were recorded. However, due to overly general legal regulations related to the rules of developing those documents the AQPs adopted had various constructions, also in the case of estimating important parameters for air protection, and consequently their usefulness in the process of management of air quality improvement within a voivodship was diversified. According to NIK, the best solutions concerning AQP's construction were applied in Małopolskie and Śląskie voivodships. Whereas, AQPs prepared by Dolnośląskie voivodship was moderately useful, and the most difficult to implement and supervise were AQPs of Mazowieckie and Łódzkie voivodships. It has to be noted that validity periods of AQPs adopted in different voivodships (7–14 years) – in the light of EU Court of Justice decision of 22nd February 2018 – show improper transposition of some requirements of AAQ Directive. Binding regulations did not specify methodology of determining the volume of emission for given substances and given type of sources, including ways of collecting input data for emission sources inventory (spatial resolution, area units), and also rules for calculating ecological effects being results of remedial actions taken. Audit conclusions confirmed that, in fact, different AQPs were prepared using different input data and different methodology of determining the emission volume and target results i.e. required ecological effects. It created a barrier in performed analyses of results achieved by executing remedial actions and prevented the possibility of comparing relevant parameters between different regions within a country. What needs to be highlights is that the regulations concerning AQPs development never required including in these programmes elements enabling evaluation of efficiency of the remedial actions taken or specifying the level of their execution. Most of all, it did not provide proper orientation of remedial actions or performing tasks on such a level which would enable achieving required air quality. It also prevented efficient supervision in the form of an VIEPs audit concerning execution of AQPs specified tasks, and also created a significant barrier with regard to possible sanctions if the tasks were not executed.

Actions taken by Minister of Development and Finances, and later by Minister of Entrepreneurship and Technology in the area influencing air quality were evaluated positively

All audited voivodship autonomous authorities fulfilled their duty to develop AQPs, but due to overly general legal regulations in this regard, only in some cases did the programmes allow efficient management of air quality improvement process in the voivodship scale

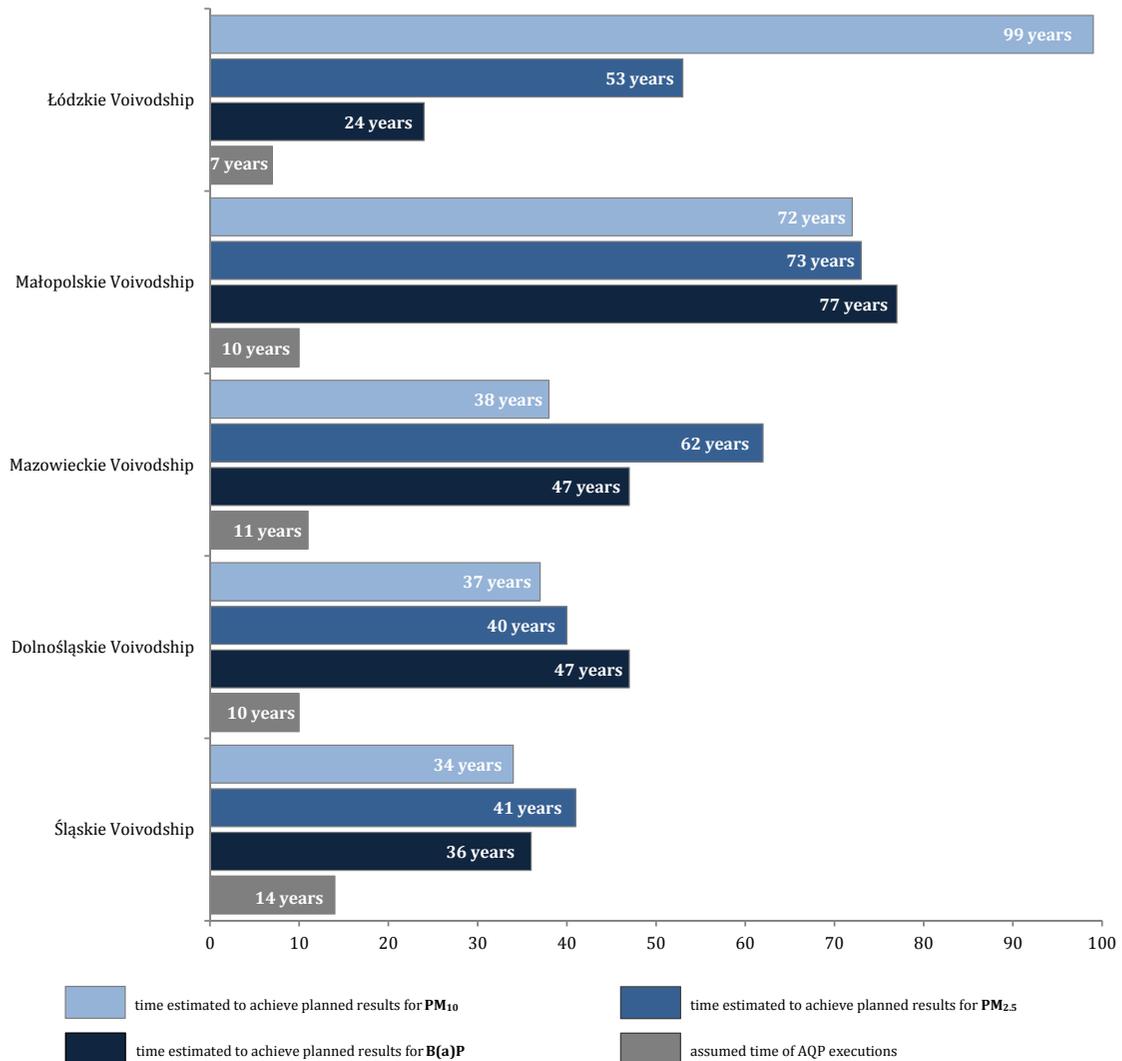
MAIN FINDINGS

Pace of executing remedial actions in the years 2014-2017 is insufficient to fully carry out AQPs assumptions in the prescribed time perspective; therefore it will not lead to expected improvement of air quality

Data collected concerning achieved ecological effects clearly shows that current pace of executing remedial actions (in the years 2014–2016) in different audited voivodships is far from sufficient to obtain required air quality within time perspective prescribed in AQPs currently in force. Basing on this information, it was estimated that achieving required level of emission reduction for PM_{10} , $PM_{2.5}$ and B(a)P from commercial and residential sector at a current pace of remedial actions may take between 24 to 99 years depending on the voivodship. None of the AQPs analyses assumed achieving target values for B(a)P. And, even though, such assumptions are compliant with binding regulations, according to NIK they reveal insufficient level of people and natural environment protection from adverse effects of air pollution, because B(a)P is a highly carcinogenic substance, and its concentration in Poland is on the highest levels in the EU.

Chart 5

Estimated time necessary for full execution of AQPs assumptions concerning reducing emission from commercial and residential sources (in a voivodship scale) at the present pace of executing remedial actions (for the period 2014–2016)



Source: Prepared by NIK on the basis of external expert opinion and data obtained during the audit.

MAIN FINDINGS

All audited voivodship autonomous authorities used their power arising from Article 96 of EPL Act and adopted so called anti-smog resolutions between 2016 and 2017, which specify standards of installations for fuel burning, as well as type and quality of fuels approved for use on the terrain of the whole or part of a given voivodship. Taking into account lack of state regulation in this regard before 2017, implementation of such resolution by local authorities should be considered as one absolutely favoring air quality improvement. Nevertheless, due to some imperfections (especially limited possibilities of auditing execution of anti-smog provisions throughout the whole voivodship) they do not constitute – in NIK’s opinion – the most efficient mechanism leading to air quality improvement. What is more, solutions stipulated in those regulations were not uniformed, which – according to NIK – cannot be rationally explained given the same main factors determining the air quality in different regions.

In comparison to the situation observed during the previous NIK’s audit (P/14/086) the air quality in the areas of audited voivodships slightly improved. Generally, the average air pollution indicators for particulate matter and B(a)P in the areas of audited voivodships, as calculates in the three-year period i.e. 2014–2016, decreased in comparison to average values from 2011–2013 period, with the exception of Dolnośląskie voivodship. It has to be taken into account that the above comparison was performed in the short-term perspective, and that the years 2015–2016 were relatively warmer than immediately preceding periods, and were marked by high dynamics of wind conditions, which did not encourage serious episodes of high concentration of particulate matter. Nevertheless, despite relative improvement of parameters concerning air quality in the period between 2014 and 2016 on the terrain of audited voivodships, air quality was still far from its normative levels, whose maintaining reduces negative influence of air pollution on human health. Almost half of the population (9,1 million) residing in those voivodships were exposed to above-normal daily concentration of PM_{10} , and more that 90% of residents (17,0 million) were exposed to overly high annual concentration of B(a)P.

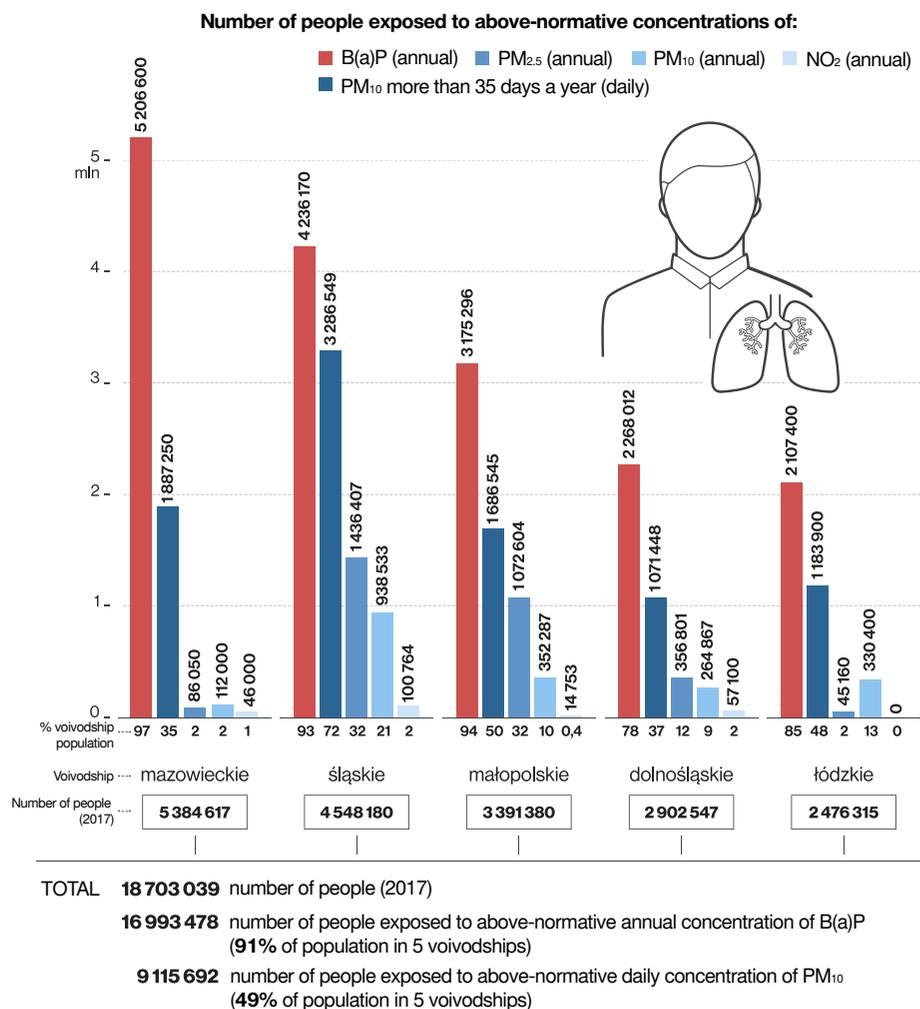
Audited voivodship autonomous authorities used their powers to adopt anti-smog resolutions, but they have limited possibilities of auditing their implementation

Slightly reduced average levels of air pollution on the area of most of the audited voivodships in the short-term perspective can be viewed as a positive aspect

MAIN FINDINGS

Figure 12

Number and proportion of persons exposed to above-normal concentrations of PM₁₀, PM_{2.5}, B(a)P and NO₂ in the areas of voivodships under NIK's audit



Source: Prepared by NIK.

Most audited communities had data sources insufficient to precisely plan remedial actions concerning reduction of low emission

Only four out of 13 audited communities (31%) carried out a careful inventory of commercial and residential emission sources. Such inventories are usually performed in the form of surveys carried out by external companies and ordered by regional and local authorities. According to NIK, efficient management of improvement of air quality process in the area of a community requires precise identification of the needs, especially related to low emission reduction, which is the main cause of unsatisfactory air quality in the country. Nevertheless, NIK does notice that obtaining data concerning commercial and residential emission sources in such a form is ineffective due to time consumption and high costs of such process, additionally it may not guarantee sufficient level of exhaustiveness (lack of possibility to carry out surveys among all heating appliances users, changes of the actual situation after the inventory has been carried out) and reliability of such data (presenting such data by heating appliances users is optional). The problem is important insofar as data concerning commercial and residential emission sources is essential not only for planning precisely the scale of remedial actions for given communities, but also at determining the amount of emission from such sources, which is necessary to develop emit-

MAIN FINDINGS

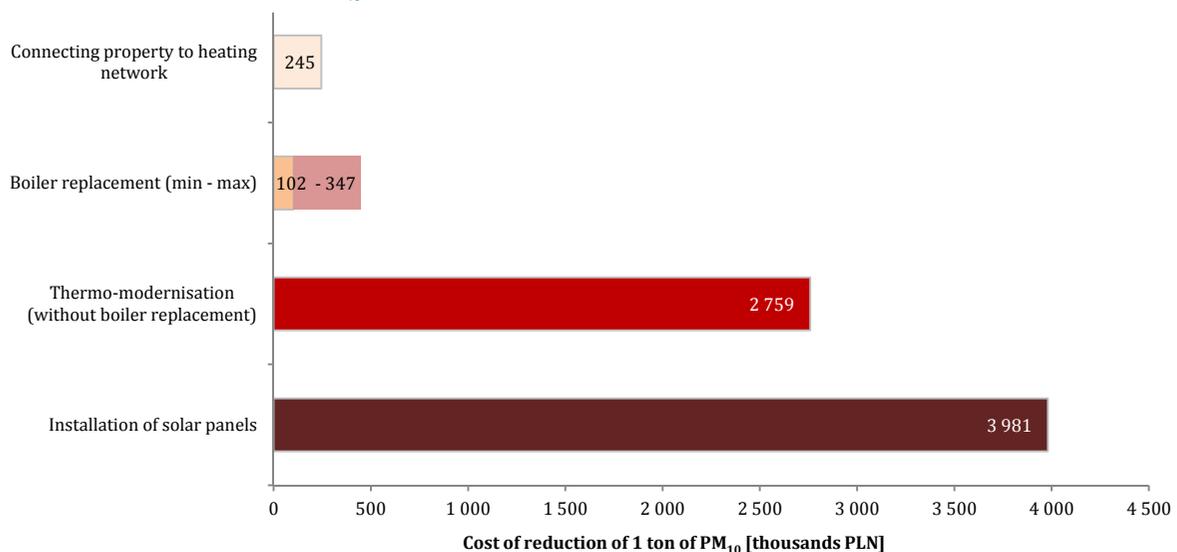
ting model for the purposes of different AQPs. It will also serve as basic data for Environmental Protection Institute – National Research Institute, which is necessary to accurate performance of tasks from the field of mathematical modelling of transport and transformation of substances in the air e.g. to make assessment of air quality.

Audited communities spent 815,3 million PLN (8% of all spending for tasks fostering air protection⁹) for activities influencing reduction of emission from commercial and residential sources, but not in every community were the remedial actions targeted at executing tasks with high ecological effect and economic effectiveness. Findings of P/16/065¹⁰ audit revealed that the highest efficiency in reducing PM₁₀ emission, taking into account the costs incurred, can be obtained by replacing solid fuel boiler or connecting the building to heating network. In the period between 2014 and 2016 programmes reducing low emission or other similar instruments enabling residents to obtain co-financing for replacing ineffective heating system powered by solid fuel to a more ecological solution were carried out by 7 out of 13 audited (54%). In the remaining cases activities concerning reducing emission from commercial and residential sources were concentrated in the abovementioned period of time on thermo-modernisation tasks and solar panels installation, and only between 2017 and 2018 was the implementation of activities facilitating obtaining co-financing for low efficient heating sources powered by solid fuels commenced.

Not all communities audited between 2014 and 2016 provided funding for disposal or replacement of ineffective household heating sources powered by solid fuels

Chart 6

Estimated costs of reduction of PM₁₀ emission from commercial and residential sources



Source: Report on findings of NIK's audit no. P/16/065 Elimination of low emission from house and community boilers in Śląskie voivodship (page 36).

⁹ Remaining expenses were mainly related to activities fostering reduction of emission from transportation sources (e.g. road construction and renovation, construction or development of tram lines, replacement of bus stock, development of bicycle lanes, construction of Park&Ride car parks, wet cleaning of streets) and complementary activities (e.g. running information and educational actions and campaigns).

¹⁰ NIK's report on audit findings concerning reduction of low emission from commercial and residential sector in Śląskie voivodship (Ref. no. 191/2016/P/16/065/LKA), published in January 2017.

MAIN FINDINGS

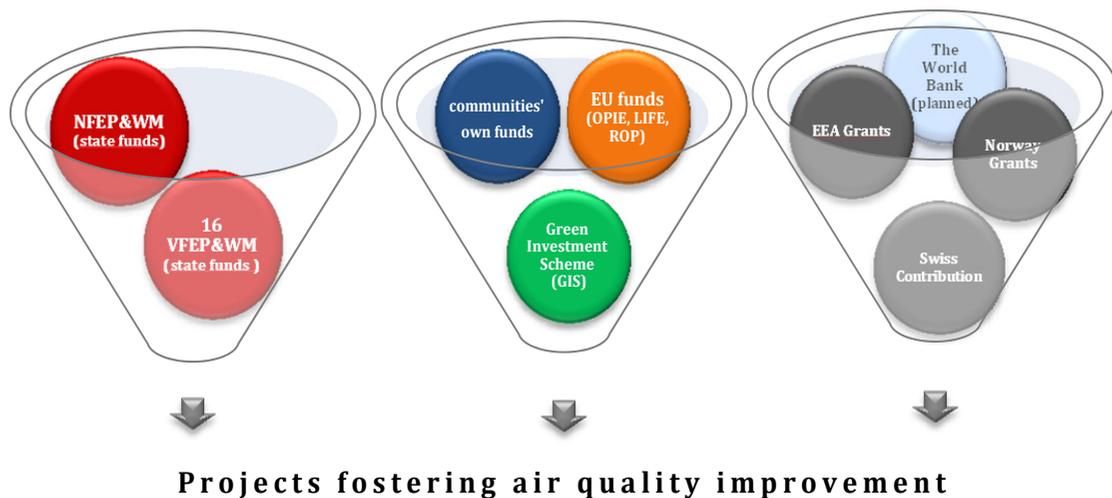
Scale and pace of remedial actions in the audited communities – with the exception of Kraków – are far insufficient to achieve expected improvement of air quality

Data collected in the course of audit on results required by AQPs currently in force (or necessary to achieve satisfactory air quality) and results actually achieved due to remedial actions aiming at reducing emission from commercial and residential sources clearly show that the present scale and pace of actions implemented in this regard by the audited communities (period between 2014 and 2016) – except Kraków – is totally insufficient to achieve expected improvement of air quality in the time perspective prescribed in given AQPs.

Scale of remedial actions concerning reduction of low emission, necessary to achieve required improvement of air quality was beyond financial capabilities of most audited communities

Due to large scale of exceeded normative values of some types of pollution the scope of remedial actions in some communities, necessary to achieve required air quality, in most cases was beyond their own financial capabilities. Therefore, almost all of them used external (diverse and dispersed) financing sources to cover parts of expenses related to activities leading to low emission reduction.

Figure 13
Financing sources of undertakings fostering air quality improvement



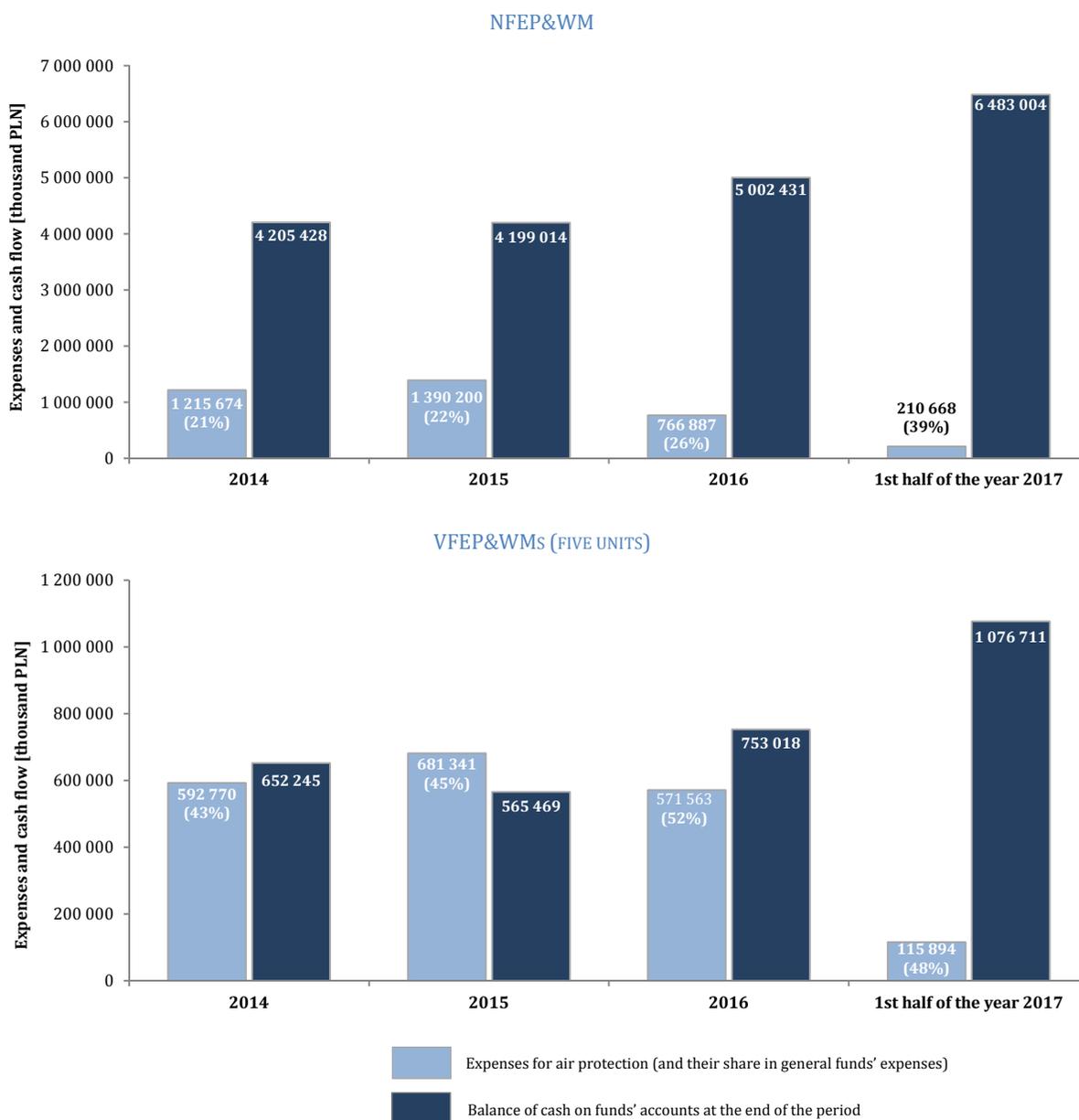
Source: Prepared by NIK..

Most of the audited communities pointed to complicated and time-consuming procedures of obtaining external funding, and audit results confirmed cases where external units refused granting financing for issues related to low emission reduction. It is, therefore, incomprehensible that environmental protection funds do not provide financial support for activities related to air protection in the amount adequate to investment needs in this regard, with simultaneous – persistent – high level of unused funds on those units' accounts. Financial balance at the end of the year for NFEP&WM and five VFEP&WMs (for the relevant voivodships under NIK's audit) in the period of 2014–2016 ranged between 4,8 billion PLN to 5,8 billion PLN.

MAIN FINDINGS

Chart 7

Amount of expenses for air protection and balance of cash on NFEP&WM and VFEP&WMs accounts in Łódź, Krakow, Katowice, Warszawa and Wrocław in the period of time between 2014 and 2017 (1st half of the year)



Source: Prepared by NIK on the basis of NFEP&WM and VFEP&WMs data.

NIK also noticed the problem of poor use of available resources by VFEP&WM in audit P/17/085¹¹ findings by pointing out e.g. that those units did not fully efficiently use accumulated financial resources and that the reason for that situation was low efficiency of board of the funds to get to potential beneficiaries as well as not adjusting the offer to the justified needs and financial possibilities of the beneficiaries.

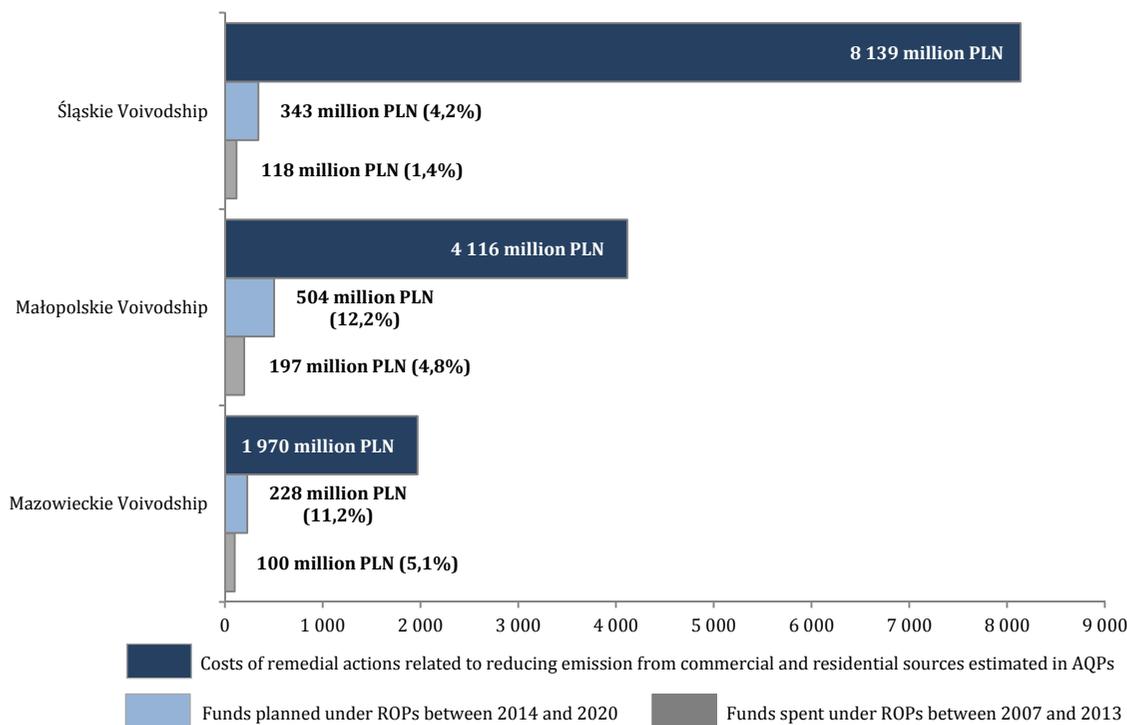
¹¹ NIK's report on audit findings concerning correctness of operation of voivodship air protection and water management funds (Ref. no. 202/2017/P/17/085/LLO), published in June 2018.

MAIN FINDINGS

At the same time, what has to be pointed out is limited financial resources available within ROPs against estimated scale of activities.

Chart 8

Availability of funds within ROPs for tasks related to reduction of emission from commercial and residential sources (replacement/disposal of heating sources) in the audited period as compared to needs in this regard estimated in AQPs, on the examples of Małopolskie, Mazowieckie and Śląskie voivodships



Source: Performed by NIK.

Finally, in June 2018 NFEP&WM and VFEP&WMs made an agreement concerning financial programme dedicated to air protection (thermo-modernisation and heating sources replacement) which poses a chance to provide funds in the amount approximating estimated needs.

Only one community implemented covering programme providing compensation for increased heating costs after removal of solid fuel boilers

Despite NPAP provisions, covering programmes providing compensation of higher heating costs resulting from using other than solid fuel energy sources were not widely used within communities. Such a solution, even before development of the abovementioned documents, was implemented by only one out of 13 audited units. Communities pointed to insufficient financial resources as a reason for not implementing this solution.

Information and educational activities concerning air pollution were conducted by all audited communities

Comparing to situation observed in the course of previous NIK's audit concerning air pollution (P/14/086), there has been an improvement in the scope of activities aiming at increasing residents' awareness of air pollution issues. Findings of the present NIK's audit indicated that all audited communities performed information and educational activities concerning this topic. Nevertheless, survey conducted in the 2nd quarter of 2018 by Centre for Public Opinion Research suggests that, even though air pollution is not an unknown problem anymore, there is still a need to continue and intensify educational and informational activities in this area. There is a

MAIN FINDINGS

noteworthy path of increasing residents' awareness concerning problems with air quality and possible remedial actions to be implemented by them, thus increasing AQP's efficiency, and that is a project executed since 2015 by local autonomous authorities of Małopolska Voivodship, which uses EU funds available within LIFE Programme. Within this programme there has been created a network of so-called eco-advisors in communities (60 persons) who were mainly responsible for implementation and supervision of communities' strategies of air protection, obtaining external financing for the above purpose, consulting, providing help and involving residents in participation in the process of replacing old heating sources.

Despite the fact that in the ad-hoc activities implemented in case of risk of occurrence or actual occurrence of exceedances of normative values of air pollution, it was advised to e.g. avoid long-term staying in the open air and stay inside buildings, however, no of the public bodies examined air quality inside the buildings with regard to PM₁₀, PM_{2.5} and B(a)P pollution. Meanwhile, results of experiment performed by VIEP in Kraków and ordered by NIK, along with measurements carried out as a result of Krakowski Alarm Smogowy¹² initiative clearly show that during so-called smog episodes the concentration of PM₁₀ and B(a)P inside buildings may exceed normative values determined for such substances in the ambient air. Therefore, air quality inside buildings may not guarantee full protection from adverse effects of ambient air pollution. At the same time, audit findings indicated that the problem of using air purifiers was never a subject of detailed analyses at the national level and that there is no sufficient information concerning efficiency of such appliances in reducing air pollution and reducing negative health effects related to such pollution.

Findings of different NIK's audit (P/17/077)¹³ reveal that communities have not been sufficiently using the policy of green areas management to support processes related to air quality improvement. Audited cities (audited also in the present audit), did efficiently manage the existing greenery in the city but – according to end of 2016 status – the terrain of green areas within the communities was not expanded in comparison to 2014 in seven out of nine audited cities, despite such predicted objective being present in community strategic documents. Participation of green areas belonging to audited communities in the total surface of the city, according to 2016 status, ranged from between 1,8% to 8,8%. In most cities there were more trees removed than planted on the community areas, and such losses were compensated by planting numerous bushes. In the audited cities 16,9% more trees were removed than planted in total.

Due to high level of concentration of some substances in the surrounding air its quality inside buildings may not guarantee full protection from adverse effects of ambient air pollution

Management of green areas was not a significant support for processes related to air quality improvement

¹² Non-governmental organization.

¹³ NIK's report on audit findings concerning municipal greenery management (Ref. no. 158/2017/P/17/077/LKR), published in January 2018.

MAIN FINDINGS

Permanent exceedances of normative values of NO₂ in communication measurement stations show inefficiency of solutions used for reducing emission from transportation sources

Exceedances of annual limit value for NO₂ have been observed in only four cities in Poland since 2013, but their scale was rather high (from 122% to 170% of accepted level). Data on air pollution with NO₂ from communication measurement stations show inefficiency of existing solutions and indicate the necessity to introduce, on the areas of its existence, activities reducing the amount of emission from road transportation to a much greater extent. However, according to NIK, solutions adopted in this regard in the Electromobility and Alternative Fuel Act were not constructed properly and bear risk of not using prescribed legal instruments. What is more, those solutions – in the view of increased tendency to tighten up emission requirements for vehicles entering the city in many countries – may not sufficiently secure the national market from the influx of cars not permitted to road traffic in those areas. The above situation is not getting better because of improper performance of duties concerning allowing the vehicles to road traffic. As a result NIK's audit (P/16/028)¹⁴ viewed negatively the activity of organs allowing vehicles to road traffic, stating e.g. that as a result of negligence many vehicles permitted to road traffic were not properly technically verified.

¹⁴ NIK's report on audit findings concerning allowing vehicles to road traffic (Ref. no. 184/2016/P/16/028/KIN), published in April 2017.

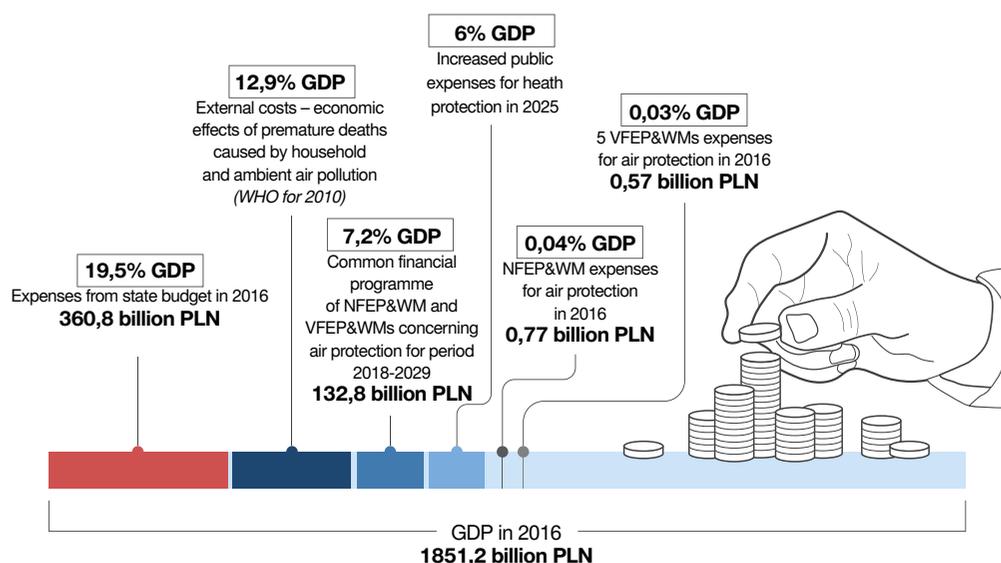
4. RECOMMENDATIONS

Air quality is determined by many factors from various fields – it is influenced by industrial activity, transportation, commercial and residential sector, agriculture, but it is also affected by conditions related to planning and land management, construction, including road infrastructure, energetic policy, coal extraction, and conditions independent of men – namely, geographical and meteorological ones. Thereby, air protection should also be planned bearing in mind all those areas of activity of both citizens and the country, as well as accompanying risks – which means that it goes beyond the competence of one ministry only. Large scale of activities necessary to improve air quality in Poland requires an in-depth analysis regarding efficiency and effectiveness of using planned public resources in the long-term perspective.

Both the findings of the previous NIK's audit (P/14/086) concerning air protection and the present one dramatically demonstrate that the actions taken so far were inadequate to the scale and importance of the problems related to unsatisfactory air quality in Poland. It is precisely shown by data in figure 14.

Figure 14

Comparison of selected expenses and costs against Gross Domestic Product for 2016



Source: Prepared by NIK.

Annual economic impact of exposure to air pollution in Poland, estimated by WHO, is twice as high as planned for 2025 increased level of national public expenses for health protection. In such a context, it is difficult to positively evaluate functioning of the air protection system, especially that the expenses of NFEP&WM and VFEP&WMs (relevant for the voivodships under audit) for air protection in 2016 were almost two hundred times lower than presented by WHO costs related to premature deaths caused by air pollution. Only in 2018 did the air protection funds sign agreements concerning financial programme dedicated to air protection, which creates a chance to provide funds in the amount similar to estimated needs. Never-

RECOMMENDATIONS

theless, analysis of the source materials gathered in the course of the audit reveals the need for re-verification of adopted course of action regarding financial support of processes concerning thermo-modernisation and heating sources replacement in single-family buildings, having in mind achievable results of the tasks planned, and taking into consideration the objectives of EU environmental policy and NPAP assumptions.

Having in mind the audit findings presented in current report, as well as information concerning executing conclusions arising from the audit, NIK therefore recommends the representatives of Council of Ministers to:

- Prime Minister**
1. Carry out an in-depth audit of adequacy, efficiency and effectiveness, including current activities and attained results, taking especially into consideration relevance of different tasks and consistency of solutions adopted on country, regional and local levels on the basis of NIK's audit findings concerning air protection. Such an audit should e.g. allow to verify current activities aiming at reducing emission of pollution from commercial and residential sector as regard to their efficiency compared to obtaining planned results of the tasks for which it is planned to allocate over 100 billion PLN from public resources.
 2. Provide complex and reliable coordination of activities planned and executed within air protection system, including enforcing that i.a.:
 - Minister of Energy – urgently develops such quality standards for solid fuels which shall really provide environment and citizen protection from air pollution,
 - Ministers of Environment and Energy – set up and implement solutions which are efficient and adequate to the state of automotive market in Poland (clean transportation zones, LEZ) concerning reduction of emission from transportation sources.
 3. Establish rules and procedures of systematic obtaining of complete and comprehensive data (currently dispersed, possessed by various ministries and public units) relevant for performing cost and benefit analysis of the necessary remedial process regarding air protection, including particularly the possibility of determining the costs incurred (including their financing sources), planned expenses (preferably divided by emission sources), and calculation of external costs caused by insufficient air quality. Establishing rules and procedures is necessary for efficient and reliable coordination of activities on the country level, and particularly for planning and rationally using public resources dedicated to air protection.
 4. Eliminate legal duality resulting from different rules of application of provisions concerning the possibility of collecting visitor's tax and leading to a situation when such a tax shall only be collected in places maintaining air quality standards – as stated in the relevant regulation of Council of Ministers in this regard.

RECOMMENDATIONS

1. Change the regulation of Minister of Environment of 11th September 2012 concerning air protection programmes and short-term action plans by:
 - Setting out an obligation to include in the AQPs elements enabling assessment of relevance, efficiency and effectiveness of undertaken remedial actions concerning reduction of emission from commercial and residential sources by e.g. determining adequate indicators, including those required for achieving ecological effects, as well as specifying intermediate periods and predicted results of the actions taken;
 - Setting out consistent standards of AQPs development, particularly specifying methodology of determining the amount of emission of different substances for given source type, including specifying ways of collecting input data for making inventory of emission sources, accuracy of input data accepted for inventory – spatial resolution, area units, and ways of calculating ecological effects achieved as a result of remedial actions taken.
 2. Establish cooperation with other entities and Prime Minister's Representative for issues related to *Clean Air* programme in order to develop proposals of legal solutions providing better than current possibilities to obtain input data for preparing inventory of emission sources from commercial and residential sector e.g. in the form of obligatory transfer of relevant data by users/owners of heating appliances powered by solid fuels.
 3. Undertake actions aiming at introducing into EPL Act provisions providing use of results of mathematical modelling of transportation and transformation of substances in the air (performed for the needs of preparing air quality assessment) and use of collected data in the course of such process also within creating emission models by external entities developing AQPs ordered by different voivodships.
 4. Carry out an up-to-date and systematic analysis of efficiency of remedial actions implemented on regional level and the degree of executing particular assumptions of AQPs.
 5. Establish cooperation with Minister of Health in order to solve the problem with carrying out measurement of air quality in some spa communities, which is necessary to obtain (confirm) the status of such communities.
-
1. Verify assumptions of the regulation project concerning quality standards for solid fuels, especially concerning proposed levels of ash, Sulphur and moisture content in order to provide actual protection of citizens and natural environment from air pollution influence.
 2. Specify in the regulation project concerning quality standards for solid fuels the maximum mass fraction of the tiniest coal fraction (table 5, 6 of regulation project) in order to eliminate fuels of the lowest quality, including slurries and flotoconcentrate, from sale.
 3. Cooperate closely with other ministries and Prime Minister's Representative for *Clean Air* programme issues in order to immediately develop objectives of complex public policy providing optimal protection of

Minister of Environment

Minister of Energy

RECOMMENDATIONS

vulnerable social groups from *energy poverty*, especially in the context of planned – by environmental protection funds – allocation of public funds (more than 100 billion PLN) for tasks related to thermo-modernisation and replacement of heating sources in single-family buildings.

4. Verify introduced anti-smog tariff for electrical energy for potential reduction of heating costs and minimalizing the difference in costs of such heating when using other energy sources.

Minister
of Entrepreneurship
and Technology

Take actions towards specifying in legal regulations the definition of solid fuel boiler and immediate completion of work on updating the regulation concerning requirements for solid fuel boilers aiming at including within those regulations boilers used for heat generation only for the purposes of providing domestic hot water and non-woody biomass boilers.

Minister of Health

1. Start cooperation with Minister of Environment in order to solve the problem of lack of measurements results concerning air quality in some spa communities and – with the lack of possibility of carrying out direct measurements in all spa communities by VIEPs – create alternative solution in this regard, e.g. allow the communities to perform their own measurements according to reference methods supervised by CIEP or using mathematical modelling performed within SEM to estimate levels of some substances in the air.
2. Commence activities aiming at providing measurements with respect to air quality inside the buildings and its pollution with particulate matter and B(a)P, as well as carry out analysis of costs and benefits of possible use of protective appliances in case of high concentrations of such substances (e.g. air purifiers), which might be a basis for recommendation for local self-government concerning relevance of buying such appliances, especially for educational establishments.
3. Consider the possibility of initiating medical research basing on national observations concerning negative influence of air pollution on human health and providing relevant funds for their performance, due to much higher concentrations of substances in the air that in other EU countries – especially B(a)P – and possible, more acute adverse effects resulting therefrom.

Parliament

At the same time, pursuant to Art. 7 section 1 point 5 of 23rd December 1994 Act on Supreme Audit Office, due to far from satisfactory – comparing to actual needs – efficiency of public authorities activity in the sphere of air protection, especially with reference to reducing low emission, which in Poland is the main cause of inadequate air quality, NIK addresses the Parliament with an application that the Parliament considers problems concerning creating air protection policy on the national level, which should include reduction in solid fuels use in commercial and residential sector.

According to NIK, actual possibilities of achieving considerable improvement in air quality and approximating its value to levels recommended by WHO can only be provided by changing the heating structure of households by relevant limitations – from central level – in using solid fuels in com-

RECOMMENDATIONS

mercial and residential sector. Such a process should, however, take place gradually, taking into account at least two of the stages mentioned below:

- **[immediately]** eliminating the possibility of using solid fuels in newly emerging buildings which are located within municipal heating networks and gas grids,
- **[in medium-term perspective, 5-10 years]** introducing an obligation to connect existing buildings to municipal heating networks and gas grids – if technically possible, and to provide actual execution of such requirement,
- **[in long-term perspective, 20-30 years]** introducing total or partial (e.g. in the regions mostly exposed to smog) limitations in solid fuel use in commercial and residential sector, together with simultaneous implementation of solutions providing support in the investment and compensation process for increased heating costs being the result of using *low emitting* heating sources.

Abovementioned process should be executed bearing in mind the necessity to develop in advance, and later implement the assumptions of complex public policy aiming at protection of vulnerable social groups from *energy poverty*, mentioned in the *Clean Air* programme.