STATE OF AIR QUALITY IN POLAND

EUROPEAN CLEAN AIR CENTRE

KANTAR

Frank Bold

THIS PUBLICATION HAS BEEN PREPARED BY THE CONSORTIUM:

EUROPEAN CLEAN AIR CENTRE – PROJECT LEAD

FRANK BOLD FOUNDATION

KANTAR

THE FUNDING FOR THIS PUBLICATION HAS BEEN PROVIDED BY THE CLEAN AIR FUND

CLEAN AIR FUND

THIS PUBLICATION IS ALSO AVAILABLE AT:

http://cleanaircentre.eu/

PUBLISHER: EUROPEAN CLEAN AIR CENTRE

INFOGRAPHICS: WAWRZYNIEC ŚWIĘCICKI
LAYOUT: KATARZYNA KALISZUK

POLAND, SEPTEMBER 2020

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This report provides a comprehensive overview on air quality in Poland, with information on main emission sources, social attitudes, legislation and health impacts. It has been prepared by a wide range of experts and includes information which has not been published elsewhere.

Poland has high concentrations of PM10, PM2.5 and benzo(a)pyrene (BaP). The majority of air pollution comes from low-stack emissions, i.e. heating of buildings with coal and wood in technologically outdated boilers. Although extensive progress in legislation covering low-stack sources has been achieved in recent years, much remains to be done when it comes to enforcement of this legislation and streamlining of financial programmes. Exceedances of NO_2 are low compared to those observed in Western European countries. Transport, while being the main source of NO_2, has a much lower share in particulate matter pollution and exerts a negligible impact on BaP emissions. Legislation on transport is largely missing as there are no regulations on low emission zones or dust particulate filter (DPF) tampering. Excise tax does not discourage the import of old, polluting cars. Industrial emissions are a significant problem in some cities and towns due to the lack of sufficient regulations regarding particular types of substances.

Air quality management has no single authority and is mainly performed at a national and regional level. Law relating to the development of Air Quality Plans (AQPs) has been recently amended, but an analysis of new draft AQPs reveals that these documents will not constitute a sufficiently effective tool for air quality improvement. Definitely better regulations are needed for municipalities to take action, with the most crucial element being instruments for low-stack inventories and control of antismog resolutions on the household level.

Campaigns for clean air are very visible and have been instrumental in improving air quality action in urban areas. Healthcare can play an important role in air quality improvement, but this sector lacks the capacity to undertake work on air pollution.

Financial programmes for low-stack emission abatement, although available, are in need of further reforms to be effective. The national Clean Air Programme, which provides subsidies for coal boiler replacement and thermal insulation of single family buildings, is currently undergoing such a reform. However, targeted programmes for energy poor households and multifamily buildings are still missing. Even the most effective programmes require proper promotion, which is currently lacking.

TABLE I

GENERAL RECOMMENDATIONS FOR FUTURE AIR QUALITY IMPROVEMENT

ELEMENT	ISSUE	ACTION
Emission sources	Only partially available data on local-level emission sources	Creation and implementation of the Central Registry of Emissions from Buildings; better air quality monitoring and modelling
Low-stack emission	Inefficient or lacking financial programmes for boiler replacement and thermal renovation	Improvement and streamlining of the national subsidy programme for boiler replacement and thermal renovation in single-family houses; development of a dedicated programme for the poor; development of a dedicated programme for multifamily buildings
Low-stack emission	Inefficient control mechanisms for enforcement of antismog resolutions	Introduction of such mechanisms, e.g. as a part of the Central Registry of Emissions from Buildings
Transport emission	Lack of sufficient legislation	Amendment of legislation on low emission zones; introduction of legislation penalizing DPF tampering; amendment of excise tax to cut old Diesel imports to Poland
Transport	Insufficient support to public transport development	Introduction of mechanisms supporting sustainable mobility in agglomerations in post-COVID conditions; development of instruments supporting public transport outside large cities
Industrial emission	Lack of sufficient legislation	Changes in legislation on emission permit proceedings Improving environmental inspection and control
Air quality management	Lack of coordination between different levels of management	Establishment of a central-level coordinating unit
Air quality plans	Low impact on measures implemented in municipalities	Further reform of legislation on AQPs. Improvement of AQP quality
Health Impact studies	Low capacity and knowledge gaps	Providing training and additional resources
Social attitudes towards AQ	Air quality campaigns insufficiently developed in smaller locations	Launching new campaigns aimed at small municipalitie

1 EMISSION SOURCES AND THEIR IMPACT ON AIR QUALITY

1.1 › SUMMARY

Source apportionment of air pollution is conducted in Poland at the national, regional and local level. Air quality measurements, emission inventories, modelling and mapping constitute the basis for these analyses. The guidelines for reporting emissions and data projections stipulated under the Economic Commission for Europe and European Union directives are generally observed in Poland.

Suspended particulates (PM10 and PM2.5) and polycyclic aromatic hydrocarbons (benzo(a)pyrene) are identified as the most significant air quality problem. It is for these pollutants that limit and target values are most often exceeded. **The main causes of exceedance are stationary combustion processes, i.e. mostly domestic heating installations (boilers, stoves and fireplaces burning coal and wood),** industrial processes and, in larger cities, transport.

Low-stack emission, mostly generated by solid-fuel domestic heating installations, is responsible for 44% of PM10 emission, 52% of PM2.5 emission and 91% of PAH emission. Road transport, on the other hand, is the main source of nitrogen oxides emission. Low-stack emission is also the main contributor to high PM10, PM2.5 and B[a]P concentrations, with the exception of traffic stations, where road transport may also play a significant role in PM10 pollution. During smog episodes low-stack emission is responsible for 50-80% of PM 10 concentrations, while transport for 10-30%, depending on the location and distance from main roads.

Proper source apportionment is a key element in planning air quality improvement measures. Both on the national, regional as well as local level the main source of high concentrations of the most problematic pollutants (particulate matter and benzo[a]pyrene) is low-stack emission from burning solid fuels (coal and biomass), mostly in household heating installations. Thus, it is necessary to further strengthen the measures aimed at low-stack emission abatement. One of the barriers to proper source apportionment is **the lack of emission inventories at the local or municipal level,** therefore, filling this substantial information gap in should constitute one of the priorities as far as air quality management measures are concerned.

1.2 › AIR QUALITY STANDARDS

Air quality limit values are directly transposed from the EU law (CAFE Directive, PAH Directive)[1]. According to the Air quality standards regulation[2] the following standards apply:

[1] 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 (hereinafter: CAFE Directive) and Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air (hereinafter: PAH Directive).

[2] Regulation of the Minister of Environment of 24 August 2012 on the levels of certain substances in ambient air (rozporządzenie w sprawie poziomów niektórych substancji w powietrzu, hereinafter: Air quality standards regulation).

TABLE 1.1

AIR QUALITY STANDARDS IN POLAND

NAME OF THE SUBSTANCE	AVERAGING PERIOD	LIMIT VALUE IN µg/m³	ALLOWED NUMBER OF EXCEEDANCES IN A CALENDAR YEAR
Benzene	calendar year	5	–
Nitrogen dioxide	one hour	200	18
	calendar year	40	–
Sulphur dioxide	one hour	350	24
	24 hours	125	3
Lead	calendar year	05	–
PM2.5	calendar year	20[3]	–
PM10	24 hours	50	35
	calendar year	40	–
Carbon monoxide	8 hours	10 000	–

Additionally, the Regulation also sets **target values** for certain pollutants including some heavy metals (arsenic – 1 ng/m³ yearly mean; cadmium – 1 ng/m³ yearly mean) as well as benzo(a)pyrene (1 ng/m³ yearly mean). The latter is particularly important in the Polish context, as the **target value for benzo[a]pyrene is exceeded in almost all air quality zones,** and the exceedances are particularly high (tenfold and more) in many cities, towns and even small villages, where burning solid fuels remains the main source of household heating.

The regulation also establishes **information and alert thresholds,** some of which are transposed from the EU law and some are set independently – namely the PM10 thresholds, which after a long campaign of the Polish Smog Alert and other NGOs as well as support from the European Clean Air Centre were significantly lowered in 2019.

[3] 25 µg/m³ until 31 December 2019.

TABLE 1.2

INFORMATION AND ALERT THRESHOLDS FOR AIR POLLUTANTS IN POLAND

NAME OF THE SUBSTANCE	AVERAGING PERIOD	INFORMATION THRESHOLD IN µg/m³	ALERT THRESHOLD µg/m³
Nitrogen dioxide	one hour	–	400
Sulphur dioxide	one hour	–	500
Ozone	one hour	180	240
PM10[4]	24 hours	100	150

Moreover, there is an additional **Reference values regulation**[5]**, establishing reference values for a much broader scope of substances (over 160),** including the hourly mean reference value for PM10 (280 µg/m³), as well as the hourly mean reference value for benzo(a)pyrene (12 ng/m³)[6]. These reference values are not considered to be binding environmental standards under the Polish environmental law, however, they are important in the context of industrial emissions. The operation of any installation should not cause exceeding of reference values outside the industry's premises and the reference values should be taken into account when setting the conditions of operation of installations in emission permits.

1.3 › AIR QUALITY MONITORING IN POLAND

As required by the CAFE Directive, for the purpose of air quality monitoring and management, Poland is divided into zones. Under the Polish law there are three types of zones:
1 » agglomerations, with a population greater than 250 000;
2 » cities, with a population greater than 100 000;
3 » voivodships, excluding cities and agglomerations[7].

There are 46 zones in total: 12 agglomerations, 18 cities and 16 large, voivodship zones.

[4] Until October 2019 the information and alert thresholds for PM10 were as high as 200 µg/m³ and 300 µg/m³.
[5] Regulation of the Minister of Environment of 26 January 2010 on reference values of certain substances in ambient air (rozporządzenie w sprawie wartości odniesienia dla niektórych substancji w powietrzu, hereinafter: Reference values regulation).
[6] Which means that in the most polluted Polish cities like Rybnik the yearly mean of b(a)p concentration is higher than the hourly mean reference value.
[7] Regulation of the Minister of Environment of 2 August 2012 on air quality assessment zones (rozporządzenie w sprawie stref, w ktorych dokonuje się oceny jakości powietrza).

Air quality monitoring is carried out by the Chief Inspectorate for Environmental Protection[8] (CIEP) – a central administrative body based in Warsaw, supervised by the Minister of Climate. Before 1 January 2019 air quality monitoring was more decentralised, as it was coordinated separately for each voivodship by the voivodship inspectorates for environmental protection.

Air quality is assessed based on the actual measurements at measuring stations, mathematical modelling as well as methods combining measurements and mathematical modelling. Legal provisions governing the number and location of measuring stations are transposed from the CAFE Directive and, despite some minor discrepancies, they are mostly in line with the EU law. According to the data provided by the Chief Inspectorate for Environmental Protection, there are currently 2017 sampling points in Poland, 55% of which are automatic, providing the public with up-to-date data.

Significant regional differences in the number of sampling points and stations do not always reflect the size and population of each voivodship. The density of the measuring station network differs significantly on the city and agglomeration level as well – e.g. the Trójmiasto metropolitan area (Gdańsk, Gdynia, Sopot) has 11 measuring stations, while the area-wise similar Kraków has 8 stations, the same number as the twice more populous Warsaw.

1.3.1 › ANNUAL AIR QUALITY ASSESSMENT

Each year, by 30 April, the Chief Inspectorate for Environmental Protection publishes air quality assessments for each voivodship. Assessments are published on the Chief Inspectorate's website and are available to the public[9].

AIR QUALITY DATA FOR POLAND FOR 2018

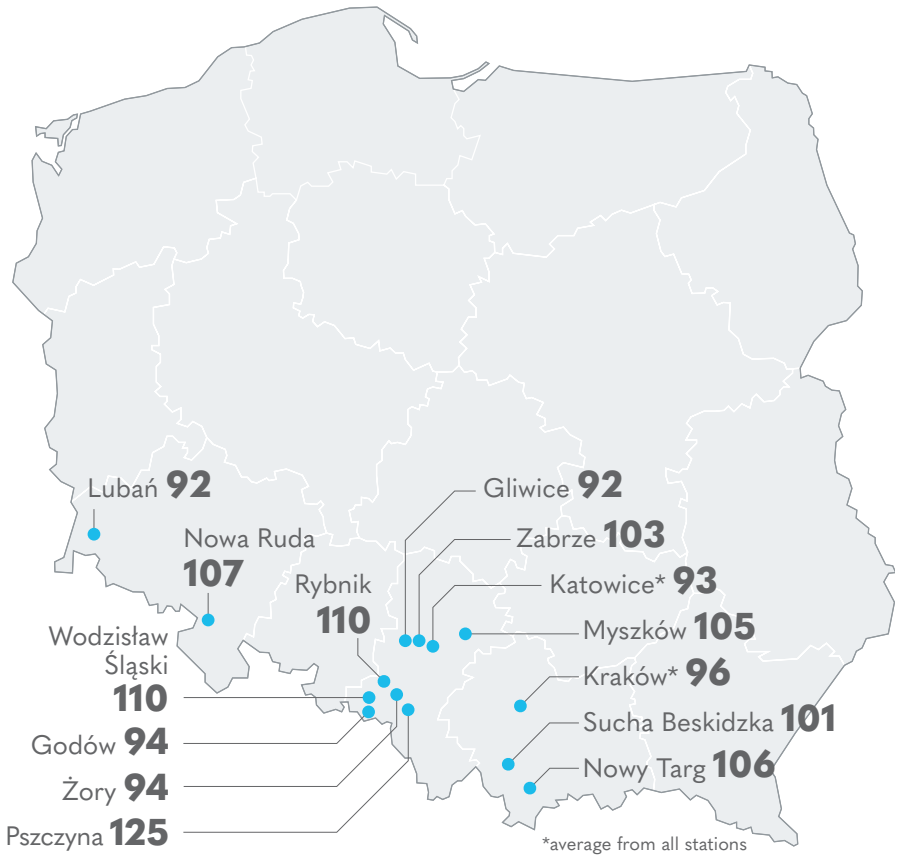
PM10: only 7 out of 46 zones fulfilled the air quality requirements for both annual and daily concentrations, i.e. annual concentration lower than 40 µg/m^3 and less than 35 days with daily concentration exceeding 50 µg/m^3. The main problem occurred with meeting the daily concentrations parameter – here only 7 zones managed to stay within the 35 day limit. The situation was much better in the case of annual concentrations, where as many as 37 zones were in line with the annual limit value of 40 µg/m^3 and only 9 exceeded it. Most exceedances were noted at urban background stations. Many locations with the largest number of days with high PM10 concentrations are not large cities but rather smaller towns, where the share of solid-fuel-based heating is more substantial due to the lack of district heating or gas distribution networks. Another group of stations with the highest number of exceedances are traffic stations in larger cities. Silesia is the region where the greatest number of exceedances was noted. **The data shows that in Poland high concentration episodes are the most serious issue when it comes to PM10 pollution.**

[8] http://www.gios.gov.pl/en/

[9] Assessments for 2019 can be accessed here: https://powietrze.gios.gov.pl/pjp/publications/card/19100#

FIGURE 1.1

LOCATIONS WITH THE LARGEST NUMBER OF DAYS WITH PM10 CONCENTRATIONS EXCEEDING THE DAILY LIMIT VALUE



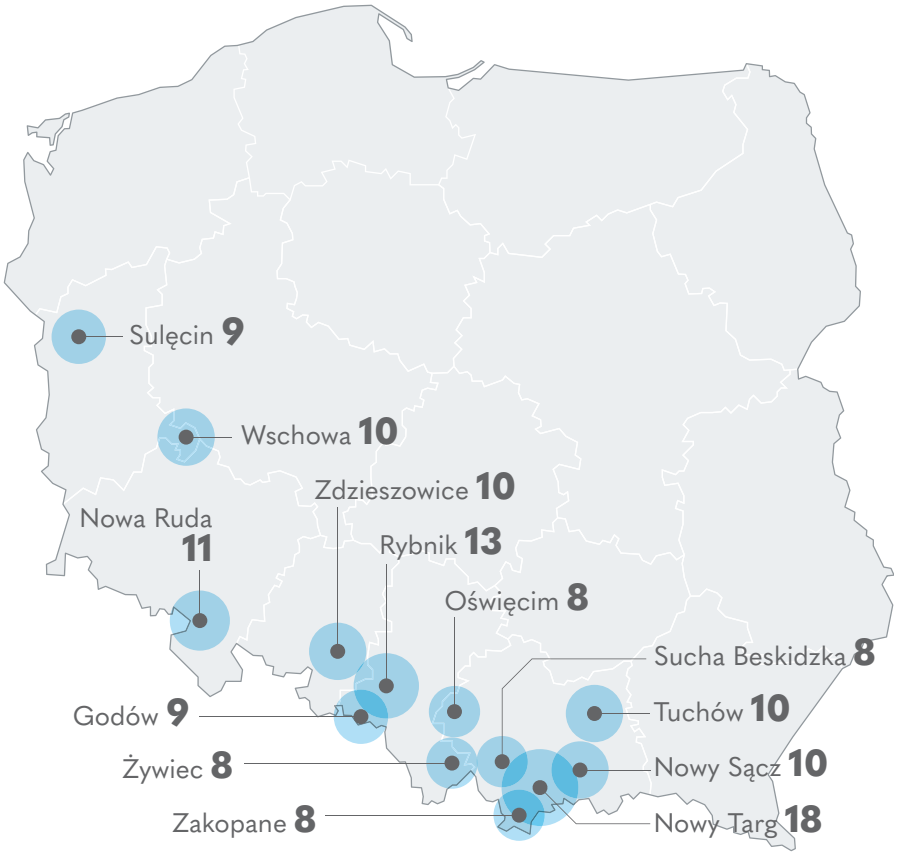
SOURCE: ANNUAL AIR QUALITY ASSESSMENT REPORTS. CHIEF INSPECTORATE OF ENVIRONMENTAL PROTECTION

PM2.5: 14 zones out of 46 did not meet the limit value of 25 µg/m³ (in 2020 the limit value was lowered to 20 µg/m³). As in the case of PM10, most of the stations with the highest PM2.5 concentrations are located in the Małopolskie and Silesia regions. Similarly these are frequently smaller towns and cities, due to a large number of household heating sources burning coal and wood.

Benzo[a]pyrene: The most exceedances, in terms of number and value, were seen for polycyclic aromatic hydrocarbons, namely benzo[a]pyrene, which is measured as an indicator of PAH concentration. **As many as 44 of 46 zones exceeded the target value of 1 ng/m³. The scale of the exceedance was in many cases extremely high.** For example, Nowy Targ noted a concentration amounting to 1730% of the norm. The lowest out of the top 10 concentrations, in Sulęcin, reached 850% of the norm. None of the top 10 locations are large cities. These high concentrations clearly show that, together with PM, BaP is the most crucial problem of air quality in Poland.

FIGURE 1.2

LOCATIONS WITH THE HIGHEST ANNUAL CONCENTRATIONS OF BENZO[A]PYRENE [ng/m^3]



SOURCE:
ANNUAL AIR QUALITY ASSESSMENT REPORTS. CHIEF INSPECTORATE OF ENVIRONMENTAL PROTECTION

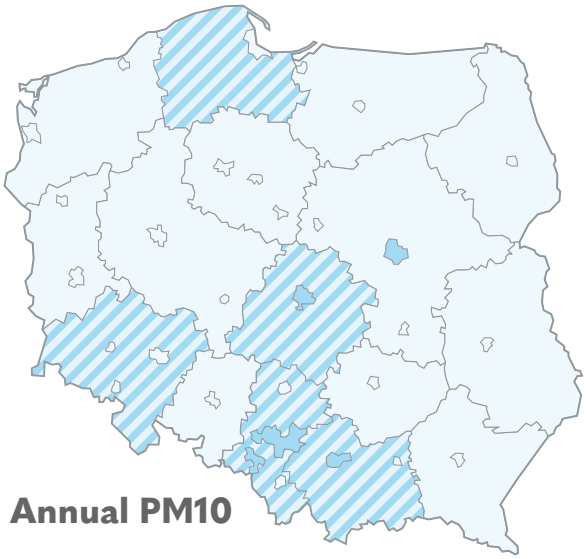
NO_2: Only 5 measurement stations noted exceedances, with all of them being traffic stations located in large agglomerations: 2 in Kraków and 1 in Katowice, Warsaw and Wroclaw respectively. None of the stations exceeded the limit of hourly concentrations for that pollutant. Out of the top 10 highest concentrations of NO_2 only 5 were exceedances. **This shows that NO_2 pollution may be a relatively less significant problem when set against other pollutants such as particulate matter and benzo(a)pyrene.**

The maps below show the spatial distribution of the zones with exceedances. Light blue areas indicate zones in line with the limit/target value. Dark blue areas indicate agglomerations and cities breaching the limit/target value, while striped areas indicate voivodship zones breaching the limit value. In the case of a single measurement station noting a result exceeding the limit value, the entire zone is indicated as breaching the limit/target value.

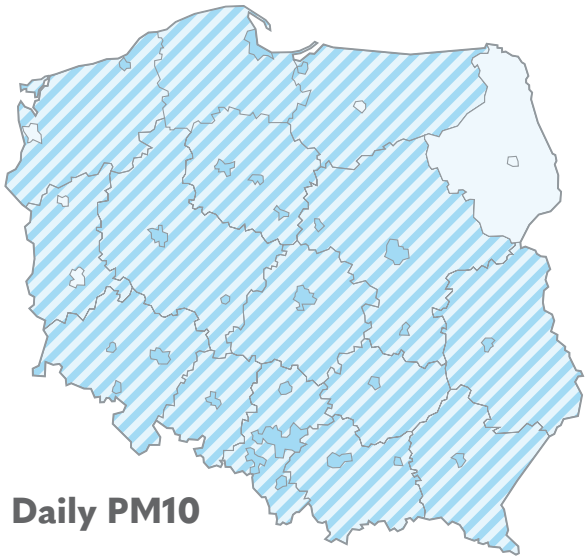
FIGURE 1.3

CLASSIFICATION OF AIR QUALITY ASSESSMENT ZONES WITH RESPECT TO ANNUAL PM10, DAILY PM10, PM2.5, BAP AND NO_2 CONCENTRATIONS IN 2018

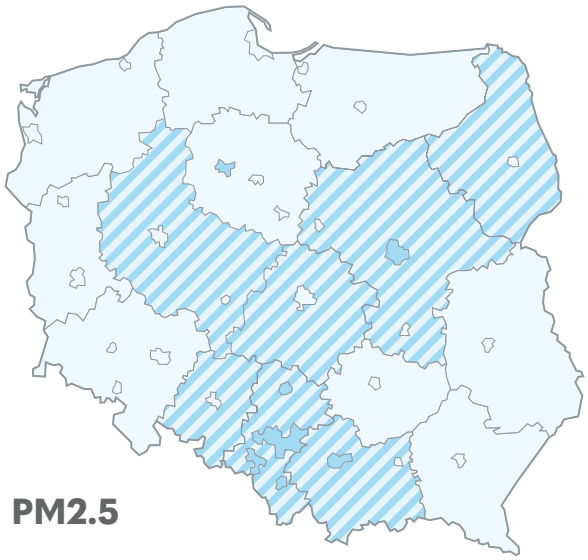
SOURCE:
ANNUAL AIR QUALITY ASSESSMENT REPORTS. CHIEF INSPECTORATE OF ENVIRONMENTAL PROTECTION



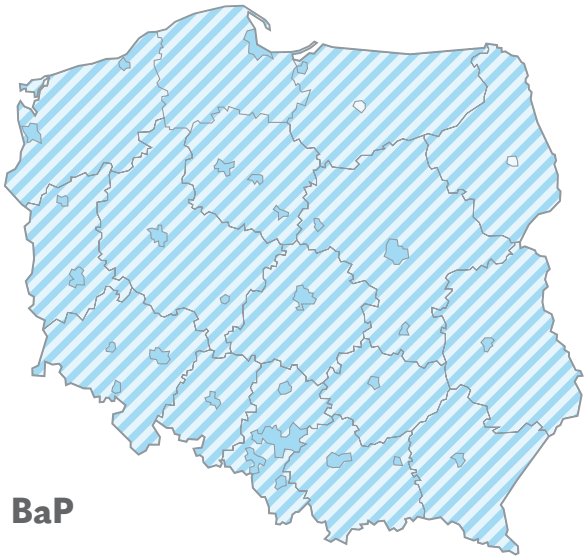
Annual PM10



Daily PM10



PM2.5



BaP

NO_2

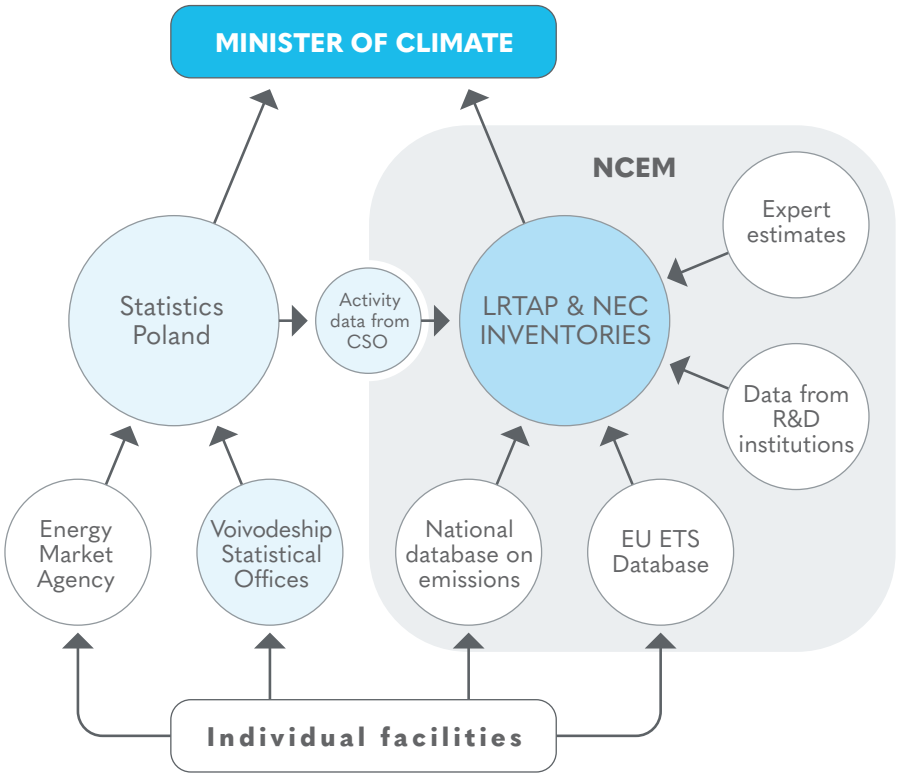
1.4 EMISSION OF AIR POLLUTANTS

On the national level data regarding **emissions of air pollutants is collected by the National Centre for Emissions Management (NCEM).** The NCEM operates the National System for Emission Balancing and Projecting, including the National Database on Emissions of Greenhouse Gases and Other Substances. The NCEM operates within the structure of the Institute of Environmental Protection – National Research Institute in Warsaw[10].

Emission data can be found in the Informative Inventory Report (IIR), which presents the results of emission inventories, including descriptions of methods, data sources, the performance of QA/QC activities, a key categories analysis and a trend analysis[11]. The reports are developed by the Emission Inventory and Reporting Unit[12], located in the, NCEM, which develops inventory reports and is also responsible for the final quality control and quality assurance (QA/QC) of the submitted data. To prepare the emission inventory, the NCEM collaborates with a number of institutions as well as individual experts. Among the collaborating institutions there are: Statistics Poland, the Energy Market Agency, the Institute of Technology and Life Sciences and the National Research Institute of Animal Production. **The emission estimates are based on methodologies elaborated by the EMEP/EEA.** Wherever necessary and possible, domestic methodologies and emission factors have been developed to reflect country-specific conditions.

FIGURE 1.4

AIR EMISSION INVENTORY SYSTEM IN POLAND



[10] https://www.kobize.pl/en/article/national-database-on-greenhouse-gases-and-other-substances-emissions/id/1232/general-information

[11] The IIR fulfils the reporting obligations of the UNECE Convention on Long-Range Transboundary Air Pollution (CLRTAP), the Directive of the European Parliament and Council (EU) 2016/2284 of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants and national statistics.

[12] Zespół Inwentaryzacji i Raportowania Emisji.

The table below shows the top 3 emission sources for main air pollutants in Poland in 2018[13]. **Low-stack emission constitutes the main source of particulate matter pollution and the dominating source of PAH pollution. Transport, on the other hand, is the main source of NOx pollution.** Industry is the second largest source of

TABLE 1.3

TOP EMISSION SOURCES FOR RESPECTIVE POLLUTANTS IN POLAND, 2018

PM10	
Low-stack emission: mainly small heating appliances for coal and wood	44%
Industrial processes and product use	14%
Agriculture	12%
PM2.5	
Low-stack emission: mainly small heating appliances for coal and wood	52%
Manufacturing industries	17%
Transport	10%
POLYCYCLIC AROMATIC HYDROCARBONS	
Low-stack emission: mainly small heating appliances for coal and wood	91%
Industrial processes and product use	4%
Waste	2%
NITROGEN OXIDES	
Transport	39%
Low-stack emission: mainly small heating appliances for coal and wood	22%
Energy industries	21%

[13] MoC 2020: Poland's Informative Inventory Report 2020. Submission under the UNECE CLRTAP and NEC Directive. Air pollutant emissions in Poland 1990–2018. Ministry of Climate, Warsaw 2019.

PM emission, while transport is the third largest one.
On the regional level, emission sources are assessed under Air Quality Plans and updated, along with the plans, on a three-year basis. The actual shares of specific emission sources in a particular region may differ from those of the entire country. For example, in Małopolska, one of the most polluted regions in Poland, the share of low-stack emission is much greater than the one indicated by the statistics for the entire country. The table below presents the top 3 emission sources for each pollutant in Małopolska[14].

TABLE 1.4

TOP EMISSION SOURCES FOR RESPECTIVE POLLUTANTS IN MAŁOPOLSKA, 2018

PM10	
Low-stack emission: mainly small heating appliances for coal and wood	78%
Transport	5%
Industry and energy generation	3%
PM2.5	
Low-stack emission: mainly small heating appliances for coal and wood	88%
Transport	4%
Industry and energy generation	3%
POLYCYCLIC AROMATIC HYDROCARBONS	
Low-stack emission: mainly small heating appliances for coal and wood	97%
Industry and energy generation	3%
NITROGEN DIOXIDE	
Transport	44%
Low-stack emission: mainly small heating appliances for coal and wood	14%
Energy industries	14%

[14] Draft Air Quality Programme for the Małopolska Region, presented for consultation in April 2020, available at: https://powietrze.malopolska.pl/wp-content/uploads/2020/03/Projekt_POP2020_Zalacznik_2_Uzasadnienie.pdf

1.5 SOURCE APPORTIONMENT: IMPACT OF EMISSION SOURCES ON AIR QUALITY

SOURCE APPORTIONMENT ON THE NATIONAL LEVEL

On the national level a very general assessment of the impact of respective emission sources on air quality is provided by the Chief Inspection for Environmental Protection. The analysis identifies sources which are the main contributors to concentrations of respective pollutants on the national level.

The main reasons for exceedances of limit and target values for the analysed pollutants in 2018 were the following[15]:

PM10 ANNUAL LIMIT VALUE

- **Main cause**
  - 89% Low-stack emission
  - 11% Transport
- **Secondary cause**
  - 60% Transport
  - 20% Inflow from other zones in Poland
  - 20% Low-stack emission

PM10 DAILY LIMIT VALUE

- **Main cause**
  - 100% Low-stack emission
- **Secondary cause**
  - 43% Transport
  - 20% Industrial and power plants
  - 21% Transport
  - 10% International transboundary inflow
  - 23% Inflow from other zones in Poland
  - 11% International transboundary inflow

PM2.5 ANNUAL LIMIT VALUE

- **Main cause**
  - 100% Low-stack emission
- **Secondary cause**
  - 49% Transport
  - 29% Inflow from other zones in Poland
  - 11% International transboundary inflow
  - 11% Industrial and power plants

B[a]P ANNUAL TARGET VALUE

- **Main cause**
  - 100% Low-stack emission
- **Secondary cause**
  - 32% Industrial and power plants
  - 32% Inflow from other zones in Poland

For every pollutant presented above the main reason of exceedance is low-stack emission from household heating installations, i.e. outdated coal and biomass boilers, stoves and fireplaces. In the case of NOx, the main reason is not listed since concentrations above permissible levels are noted by traffic monitoring stations, where transport is obviously the main cause of exceedance.

SOURCE APPORTIONMENT ON THE REGIONAL LEVEL

Much more detailed information on the impact of specific emission sources can be obtained from Air Quality Plans, prepared for respective air quality zones. The data presented below comes from a draft of the Air Quality

[15] Ocena jakości powietrza w strefach w Polsce za rok 2018. Zbiorczy raport krajowy z rocznej oceny jakości powietrza w strefach wykonanej przez GIOŚ według zasad określonych w art. 89 ustawy-Prawo ochrony środowiska. Główny Inspektorat Ochrony Środowiska, Warsaw 2019.

[16] Draft Air Quality Programme for the Małopolska Region, presented for consultation in April 2020, available at: https://powietrze.malopolska.pl/wp-content/uploads/2020/03/Projekt_POP2020_Zalacznik_2_Uzasadnienie.pdf

Plan for Małopolska[16]. As stated above, Małopolska is one of the most polluted regions in Poland. The estimates were prepared on the basis of the model of emission dispersion, taking into account inventory data, with actual data for certain municipalities and estimates for others.

The tables below present data on contribution of different sources to the concentrations of respective pollutants. Top 3 sources are presented. The tables present data for Kraków (a traffic station and an urban background station), Skawina (the suburbs of Kraków), Nowy Targ (a small town in the mountain area) and Oświęcim (a town near the coal mining region of Silesia).

The share of the national background in PM10 concentrations is significant at all presented locations, with the largest one in Oświęcim, a town located near Silesia. **There are significant differences with respect to the contribution of the local road transport and the local low-stack emission.** In the case of Kraków, these two sources have comparable shares in the results obtained at the transport and the urban background station. In the locations outside Kraków the dominating role of the local low-stack emission is clear. Here, the share of the local

TABLE 1.5

SOURCE APPORTIONMENT FOR SELECTED LOCATIONS IN MAŁOPOLSKA – TOP 3 CONTRIBUTORS TO PM10

	THE LARGEST CONTRIBUTOR	THE SECOND LARGEST CONTRIBUTOR	THE THIRD CONTRIBUTOR
KRAKÓW – transport station	Local road transport – 35%	Local low-stack emission sources – 29%	National background – 18%
KRAKÓW – urban background station	Local low-stack emission sources – 32%	Local road transport – 24%	National background – 22%
SKAWINA – suburbs of Kraków	Local low-stack emission sources – 48%	National background – 23%	Local road transport – 9%
NOWY TARG – mountains	Local low-stack emission sources – 58%	National background – 19%	Local road transport – 14%
OŚWIĘCIM – near Silesia	Local low-stack emission sources – 46%	National background – 31%	Local road transport – 10%

transport is much lower than in Kraków, which should not be surprising as the towns in question are much smaller and also Kraków has eliminated a large share of its low-stack emission sources, preparing for the introduction of a coal and wood ban in September 2019.

In the case of PM2.5, **the largest contributor to PM2.5 annual concentrations is, by far, the local low-stack emission (ranging from 68% in the mountainous Nowy Targ to 41% in Kraków). This claim remains true even for results from traffic oriented stations.** The second largest source for all five presented stations is the national background (from 35% in Oświęcim to 19% in Nowy Targ). Such a large share of the national background in PM10 and PM2.5 concentrations shows that **nationwide air quality improvement measures are needed to reduce local pollution.**

In the case of benzo[a]pyrene, the local low-stack emission is the dominating contributor, ranging from 60% in Kraków to 94% in Nowy Targ. In Kraków, the inflow from the region is another significant contributor and it amounts to 20%.

ANALYSIS OF SMOG EPISODES

The assessment of the impact of individual emission sources also plays an important role in **analysing episodes of high concentrations.** In such situations, apart from local emission sources, factors such as meteorological conditions, land use and the inflow of pollution from other areas may exert a significant impact on concentration levels. Therefore, the spatial range and time of the episode are also taken into account. In Poland, the CIEP carries out such analyses periodically[17].

The source apportionment analysis of a high concentration episode which took place on **2-7 November 2015** can serve as an example here[18]. The analysis of the impact exerted by particular categories of **emission sources on PM10 concentration shows the greatest importance of household sources, which are primarily associated with individual heating systems based on solid fuels (50-80%). During the episode in question, the share of transport sources was much lower, remaining within 10-30%,** and it occurred in the vicinity

[17] https://powietrze.gios.gov.pl/pjp/publications/card/2051?lang=en

[18] CIEP 2017: Analiza wybranych epizodów wysokich stężeń pyłu PM10 z lat 2013-2016 Etap II. Epizody z lat 2015-2016 . Główny Inspektorat Ochrony Środowiska, Warszawa 2017.

2 LOW-STACK EMISSION

of major routes (expressways and motorways). In the Warsaw agglomeration transport had the highest impact, estimated within the range of 30-50%. The impact of large point sources (industry and energy production) on PM10 concentrations was insignificant and did not exceed 10%.

2.1 › SUMMARY

Low-stack emission from domestic heating remains a key challenge for effective air quality policies in Poland. Elimination of low-stack pollution can only be achieved through combining regulatory and financial measures on the national, regional and local level. The modernisation challenge aimed at solving the low-stack emission problem will be tremendous, given that **more than 4 million Polish households still rely on coal and wood for heating.** The overall cost of this energy transformation may exceed PLN 150 billion (EUR 36 billion).

As a result of strong public pressure, in the past few years important reforms have been initiated – regional authorities have implemented anti-smog laws mandating the replacement of non-compliant boilers and stoves, the government adopted emission standards for marketed solid fuel boilers and established a national programme for boiler replacement and thermal retrofits of single family buildings. These reforms, however, have not been finalised yet. Depending on the determination of the policy makers, **solving the problem of low-stack emission may take several years, which may extend into several decades if policy makers decide to postpone further the needed reforms.**

This chapter describes the key regulatory reforms which have been undertaken and those which are still needed to successfully address the low-stack emission problem. It also elaborates on the financial support schemes introduced to encourage Polish households to replace "smokers" (i.e. old-type, inefficient boilers) and to retrofit their homes. Finally, the present chapter includes a commentary on key barriers halting the progress of modernising Polish buildings.

2.2 › LOW-STACK EMISSION SOURCES

As presented in the previous section, low-stack emission from small combustion appliances constitutes the major source of air pollution with PM and PAHs in Poland. These appliances cover a wide range of products (boilers and room heaters) with thermal capacity up to 1 MW. **The most problematic group in terms of overall emission, however, includes solid fuel boilers with the nominal capacity ranging between 7 and 25 kW.** These appliances combust wood, coal or a combination of both fuels. According to the estimates of the Institute of Environmental Economics, **in 2017 more than 4.4 million single family buildings (SFBs) were equipped with such appliances[19]. Solid fuels are the most popular source of domestic heating in Polish SFBs (82% use solid fuels as a primary source of heating).**

In multifamily buildings solid fuels are less frequent. In some areas, however, tile stoves are still used for heating

[19] Energy Efficiency in Poland, 2017 Review, Institute of Environmental Economics, Krakow 2018.

FIGURE 2.1

THE STRUCTURE OF HEATING SOURCES IN SINGLE FAMILY BUILDINGS AND ESTIMATED AMOUNTS OF DIFFERENT TYPES OF HEATING SOURCES

SOURCE: ENERGY EFFICIENCY IN POLAND, 2017 REVIEW, INSTITUTE OF ENVIRONMENTAL ECONOMICS, KRAKÓW 2018

and in some locations they form a primary source of air pollution (e.g. historic city centres in towns of the Lower Silesia voivodship).

In order to solve the problem of low-stack pollution it is necessary to replace millions of solid fuel appliances in the entire country. This requires undertaking a huge modernisation effort involving not only heat source replacement but also thermal retrofitting. Such a process can be triggered only by an appropriate combination of regulatory and financial incentives. The total investment needed to replace non-compliant solid fuel boilers and to undertake full thermal retrofits for SFBs across the country is estimated to be PLN 154.1 billion (EUR 36.3 billion)[20].

For many decades coal (and wood in certain areas) has remained the most affordable option for domestic heating. Polish households were reluctant to convert to other fuels (mainly natural gas) due to economic reasons. At the same time, they lacked incentives to invest in energy efficiency measures, which required significant capital expenditures. The studies of the Institute of Environmental Economics show that as many **as 70% of SFBs are in a poor energy condition and as many as 38% do not have any wall insulation[21].** With heat prices remaining at a socially acceptable level and a continued availability of poor quality coal as well as cheap boilers emitting significant amounts of air pollutants, policy makers were for many years reluctant to undertake necessary but unpopular reforms to solve the problem of low-stack emission.

In 2012 the situation started to change thanks to strong public pressure. The first determined action was introduced in Małopolska – one of the most heavily polluted regions in the entire EU. Air quality became a recognised problem, not only on the local or regional level, but also nationally. Policy makers started to adopt necessary regulations and to mobilise budgets for support programmes encouraging boiler replacement and energy saving in households. These reforms have been launched, but they have yet to be finalised. As millions of Polish buildings still use solid-fuel burning "smokers", the road to clean air in Poland is very long. Depending on the level

[20] Fighting smog: energy efficiency and anti-smog in single family buildings. The World Bank. May 2018.

[21] Energy Efficiency in Poland, 2017 Review, Institute of Environmental Economics, Krakow 2018.

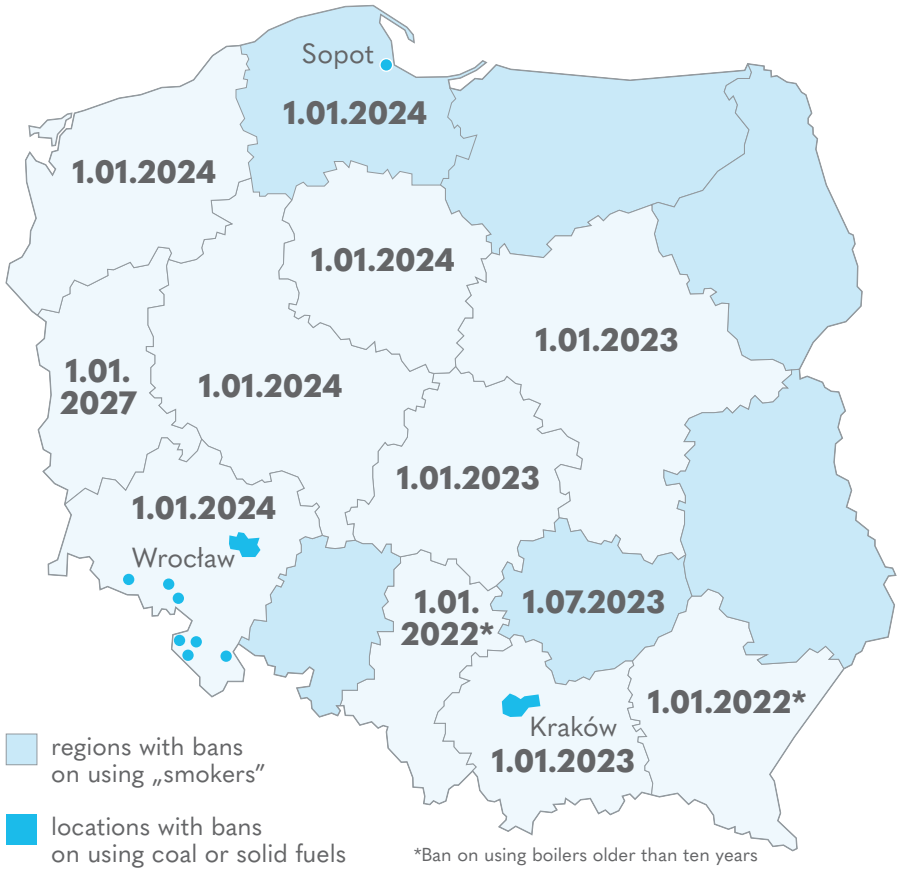
of determination of policy makers the process of low-stack emission abatement may take several or even more than ten years.

2.3 › ANTI-SMOG RESOLUTIONS

The so-called "anti-smog resolutions" remain the strongest legal instrument available in Poland to tackle low-stack emission. Polish Environmental Protection Law allows the voivodship (regional) government to adopt **acts of local law imposing limitations and bans on using small combustion devices (boilers and stoves).** Regional authorities have considerable amount of freedom in choosing appropriate measures. They may also issue different resolutions for different parts of the region. Currently 12 out of 16 Polish voivodships adopted anti-smog resolutions, some of them adopted more than one, with stricter regulations for e.g. large cities and/or health resorts. Most of them allow burning solid fuels, both fossil and biomass, for domestic heating, but impose certain requirements for boilers and stoves, that is meeting specific emission standards (e.g. eco-design requirements)[22]. Each resolution sets a different date of entry into force, in most cases entry into force is gradual. Thus, the inhabitants of such areas are obliged by law to replace boilers which are non-compliant with the anti-smog resolutions.

FIGURE 2.2

ENTRY DATES OF ANTI-SMOG RESOLUTIONS IN REGIONS – BANS ON USING BOILERS OTHER THAN CLASS 5 OR ECODESIGN AND BANS ON USING COAL OR SOLID FUELS



[22] Anti-smog resolutions do not apply to larger installations the operation of which requires a notification or a permit. These include i.a. boilers with a thermal input equal to or greater than 1MW, as well as installations used in restaurants designed to serve at least 500 customers per day (e.g. popular wood burning pizza ovens).

The scale of investments necessary to comply with anti-smog resolutions is unprecedented. Only in the two most heavily polluted regions in Poland (Małopolska and Silesia) anti-smog resolutions require the replacement of 750,000 of non-compliant solid fuel appliances (in Małopolska the anti-smog resolution comes into force on 1 January 2023 and in Silesia on 1 January 2022)[23]. To reach compliance with those resolutions the pace of heat source replacement would need to accelerate significantly to reach more than 100,000 installations per year. To put this fact into perspective, only around 6,000 grant applications for heat source replacement are submitted each month under the national Clean Air Program in entire Poland[24]. In 2020, between mid-May and mid-July, 1,233 applications were submitted in Małopolska and 2,057 in the Silesia region.

THE KRAKÓW ANTI-SMOG RESOLUTION

The Kraków anti-smog resolution adopted in 2013 by the Parliament of the Małopolska region (Sejmik) was a ground-breaking regulation for air quality improvement policies in Poland. **The law, which came into force on 1 September 2019, banned using coal and wood in domestic heating appliances in Kraków.** Its impact, however, extends much beyond the local level. The Kraków resolution has paved the way for adopting anti-smog laws in other regions, triggering the process of eliminating low-stack emission sources.
The road to introducing this regulation was very long. The initial regulation was challenged at the administrative court, which annulled this law. The provisions of the national legislation (Environmental Protection Act – EPA) turned out to be faulty, making the introduction of such regulations illegal. Therefore, it became necessary to introduce amendments to the EPA, which happened thanks to advocacy from regional authorities and anti-smog organisations. This process has paved the way for other regions adopting anti-smog laws (so far, 12 out of 16 regions have adopted anti-smog resolutions). It also elevated the low-stack emission problem from the local and regional to the national level and started wide discussions in the national media and among key political parties.
Currently, anti-smog regulations are forcing the replacement of several millions of "smokers" installed in Polish homes. The energy transformation of Polish buildings will not be an easy process, as millions of households still rely on coal and wood combustion for heating. Its success will depend on political commitment as well as on availability of well-designed support measures such as tax credit or the Clean Air Priority Programme, which subsidise boiler replacement and thermal retrofits of buildings.

It is worth noting that anti-smog resolutions can be adopted only by voivodship (regional) governments. Municipalities cannot adopt such regulations independently and their requests for introduction of stricter regulations addressed to regional governments are not legally binding. In 2019 the City Council of Rybnik sent a formal request to the Śląskie voivodship's government asking for a stricter anti-smog resolution due to very high levels of pollution. However, the regional authorities rejected this request, even though it had the support of the local community.

[23] Institute of Environmental Economics calculations for the World Bank revealed that 470 thousand of single-family buildings in Silesia are heated with solid fuels and the majority of them were relying on non-compliant heat sources. See: Fighting Smog: Energy Efficient an Anti-smog in Single Family Buildings. The World Bank. May 2018.

[24] This number does not correspond, however, with the actual number of boilers being replaced in Polish households. This hypothesis is based on the volumes of gas boiler sales reported by the Association of Producers and Importers of Heating Appliances. The sales increased significantly in the past few years: 172,000 items in 2016, 225,000 in 2017, 282,000 in 2018 and 304,500 in 2019. This increase results from introducing anti-smog resolutions as well as from lower sales of solid fuel boilers due to imposing emission standards for new boilers (see below).

2.4 › EMISSION STANDARDS FOR SMALL BOILERS

In August 2017 the government adopted a long-awaited **solid fuel boilers regulation, imposing energy efficiency and emission standards for small solid fuel boilers (under 500 kW) available on the market[25]. It is an important and powerful regulation, which has triggered significant changes on the market of domestic heating appliances.** Before that date the Polish market had been flooded with small-combustion appliances whose producers were not obliged to meet any standards for PM emissions. More than 150,000 solid fuel boilers were installed in Polish buildings each year (and "smokers" constituted a vast majority of sales)[26]. The new regulation introduced an emission standard for PM at 40 mg/m^3 for automatically fed boilers and 60 mg/m3 for manually fed boilers. Emissions from typical "smokers" are 5 to 10 times higher.

As a result of the introduction of emission standards the vast majority of the producers decided to obey the new laws and most of them have already changed their production patterns, i.e. by making a transition from coal to pellet boilers or even to heat pumps. Two important trends are observed here: **the overall drop in sales of solid fuel boilers and a sharp decrease of sales of coal boilers.** In 2019 the sales of solid fuel boilers dropped to circa 125,000 per year, reaching their minimum in the past decade. The largest decrease was noticed for manually-fed coal boilers (80%) and for automatic coal boilers (30%). At the same time, the sales of wood pellet boilers increased by 30%, as for producers of solid fuel boilers it was the most convenient shift in the production pattern to undertake[27].

Despite the new regulations, non-compliant boilers are still available on the Polish market. Some producers bypass the existing laws using different legal loopholes and many "smokers" are delivered through informal economy channels. It is extremely difficult to assess the scale of informal economy, but the monitoring of internet sales performed by the Polish Smog Alert and the Ministry of Development suggests that thousands of new "smokers" are still being installed in Polish buildings. This creates perverse incentives to producers who already comply with legal provisions, as they may be encouraged to find ways of by-passing the law in order to be able to compete with grey market producers.

It is only this year that the Customers Protection Office and the Trade Inspection have launched the controls on the market of solid fuel boilers. Despite these institutions' will to establish effective control measures, there remain certain barriers which halt successful controls and favour informal economy players. In order to address them, it is necessary to introduce legal changes for market control and surveillance (both in the Polish legal framework as well as in the European Union acquis)[28]. To ensure long-term sustainability of market trends, i.e. the transformation to clean heat technologies, permanent monitoring of this market is crucial and state intervention in case of malpractice is indispensable.

[25] Regulation of the Minister of Development of 1 August 2017 introducing requirements for solid fuel boilers (rozporządzenie w sprawie wymagań dla kotłów na paliwo stałe).

[26] A recent report of the Association of Producers and Importers of Heating Appliances (Market of Domestic Heating Appliances in 2019) shows that sales of solid fuel heating amounted to 200,000 items per year in 2011 and have been gradually dropping to the current 125,000 items. The largest decrease has been observed since the adoption of boiler emission standards.

[27] Rynek urządzeń grzewczych w Polsce w 2019 roku. Association of the Producers and Importers of Heating Appliances, Warsaw, April 2020.

[28] When working on emission standards, the Polish Smog Alert and Frank Bold Foundation indicated gaps in EU eco-design regulations which allow producers to bypass legislation with ease, namely the exclusion of certain heating appliances from the Commission Regulation (EU) 2015/1189 on eco-design requirements for solid fuel boilers.

Another unregulated segment of the market are room heaters, including highly popular fireplaces. According to the information provided by producers of such appliances, the annual sales in Poland may exceed even 100,000 items. Eco-design regulations imposing obligatory emission standards come into force only on 1 January 2022 and, as in the case of solid fuel boilers, they may not be sufficient to properly address the problem of low-stack emission. Therefore, a prompt introduction to the Polish regulatory framework of obligatory emission and efficiency standards for room heaters is much needed. Without such standards, there is a risk of the declining PM emissions from solid fuel boilers being compensated, to some extent, by increased emissions from more and more popular fireplaces.

FIREPLACES

In certain locations fireplaces have already become the major source of exceedances of PM daily standards. In February 2020 the authorities of Podkowa Leśna (a wealthy, suburban neighbourhood located nearby the capital city of Warsaw), in cooperation with the local Smog Alert, commissioned an expert analysis to investigate the contribution of local biomass burning to PM2.5 pollution during winter smog episodes. The measurements conducted by the Institute of Physical Chemistry of the Polish Academy of Science together with the national Institute of Environmental Protection revealed that on smoggy days 58% to 72% of PM2.5 pollution originates from biomass burning. This is mostly connected with a recreational use of fireplaces, which are very popular among wealthy people. Although the national legislation allows to impose restrictions on using fireplaces in cases when they are not a primary source of heating, regional and local authorities are extremely reluctant to introduce such restrictions. The Municipal Council of Podkowa Leśna sent a request to the regional parliament (sejmik) **to impose a ban on recreational use of fireplaces on the days when PM10 pollution exceeds 50 µg/m^3. It is a pioneer case in addressing this source of pollution.**
Moreover, some air quality plans contain proposals to ban recreational use of fireplaces when smog alert is announced, i.e. when PM10 pollution exceeds 100-150 µg/m^3.
The difficulty with addressing the problem of pollution from fireplaces comes from a deeply-rooted belief that burning wood is an environmentally-neutral behaviour, unlike coal burning. Producers of fireplaces and biomass boilers put significant effort and resources to promote biomass as a climate-friendly solution contributing to meeting the EU climate goals.

2.5 › CONTROLLING EMISSIONS FROM SMALL COMBUSTION APPLIANCES

Antismog resolutions will remain unenforced if control mechanisms are not established as a part of national regulatory framework. Although Krakow's experience proves that such laws can be effectively controlled by municipal authorities (via controls done by municipal police), this is an exception rather than the rule. First of all, 80 percent of municipalities in Poland do not have municipal police. Moreover, most of the municipal authorities are extremely reluctant to carry out such controls, arguing that this is not their statutory responsibility. Second, controlling a solid fuel ban such as the one in Krakow is easier than controlling emission standards of appliances, as the latter requires more expert knowledge and leaves more room for cheating.

The enforcement system must be redesigned. **The fundamental change is to establish the system that would rely more on regular controls of domestic heating appliances rather than ad-hoc controls by municipal**

authorities/municipal police. Although ad-hoc controls are very important (in particular to penalize illegal practices such as waste burning) it is not the best suited approach to enforcing anti-smog resolutions, as the latter requires a more systematic approach.

It is worth explaining that annual checks of heating appliances to ensure their safe operation are mandatory for gas boilers but they are not required for solid fuel appliances. Although the construction law requires obligatory annual checks of smoke ducts (chimneys), most of Polish households (more than 80% of SFBs) do not commission such checks. Moreover, users of solid fuel boilers neglect obligations to regularly clean chimneys. This situation results in more than 11 thousand fires annually caused by improperly maintained solid fuel appliances.

In effect millions of 'smokers' installed in Polish homes remain anonymous. Neither authorities that are in charge of safety checks (sub-regional construction inspectorates) nor authorities responsible for compliance with anti-smog resolutions (marshal offices and municipalities) have information which households do not comply with legal provisions nor willingness to penalize such cases.

Although in most of the regions air quality plans oblige local governments to prepare the 'inventories of emission sources', such inventories do not work in practice. Municipalities possess neither resources nor legal delegation to carry out such tasks. In consequence, **information on existing heat sources is extremely limited and becomes quickly outdated.** Furthermore, it is not centrally collected and comparisons between municipalities and regions are impossible.

This situation will change with the implementation of the new system that is being designed by the Ministry of Development i.e. **Central Database of Buildings' Emissions.** The new system provides for:
» Obligatory registration of all heating appliances including solid fuel boilers, fireplaces, gas boilers, etc.
» Establishment of a national database of all small combustion appliances. The database will be filled in during the self-registration process (obligatory registration) but also during annual checks of heating appliances. It will give the authorities information on compliance with anti-smog resolutions and compliance with the provisions on safety checks.

Creation of this database requires significant legislative and organizational effort. Currently the legislative process is in progress

2.6 » QUALITY STANDARDS FOR SOLID FUELS

Coal quality standards constitute an essential element of anti-smog policies. Polish households burn approximately 14,000,000 tons of coal each year, i.e .87% of total coal use by households in the European Union[29]. Thanks to its low price, low-grade coal has been very popular in domestic use. Moreover, the energy sector (heat and power plants) has had a more stringent approach towards the quality of the coal purchased for energy production than of that intended for use in households. **For many years the lowest grade coal has been directed towards household use.**

The urgent need to define legally binding quality standards for coal used in domestic heating had been discus-

[29] Ciepłownictwo w Polsce 2019, Forum Energii, 2020.

sed for almost two decades until such provisions were finally adopted in 2018 by the Polish Parliament and the government. The laws consisted of the amendment of **the quality of fuels act[30] as well as several executive regulations** issued by the Minister of Energy.

According to the law, selling any amount of coal requires that **a quality certificate** for this coal is provided. The said certificate is to specify the coal's properties such as its calorific value, ash content, humidity, grain size, etc. The sale of coal intended for small installations[31] is subject to special conditions. Most importantly, it is forbidden to sell unsorted coal, coal sludge, fuels containing less than 85% of hard coal, lignite and coal not complying with the quality requirements set in the regulation on quality standards for solid fuels[32]. These rules do not apply to selling solid fuels intended for use in installations with a thermal input of 1 MW or higher. However, buyers are still required to present an official certificate confirming that they operate a medium or large combustion installation.

On 1 July 2020 additional restrictions banning sale of low quality coal dust came into force. A violation of the rules pertaining to sale of coal is subject to fines as high as PLN 1,000,000 or imprisonment for up to 5 years.

Despite the fact that **the quality norms adopted in 2018 were not stringent enough to address the low-stack emission problem effectively, limiting access to the lowest grade and lowest price coal is a factor which influences household decisions to transition to other heating options such as gas, heat pumps, pellet.**

Anti-smog organisations are calling upon the government to revise the quality standards and follow experts' recommendations[33]. Such a revision should take place by September 2020. It is not certain whether or when the government will decide to undertake such a revision, despite the fact that it is legally obliged to do so.

Another growing problem is a lack of quality standards for wood pellets. It is particularly worrying, given the sharp increase in the sales of biomass boilers (approximately 80,000 pellet boilers sold in 2019, which corresponds to 60-65% of the total sales of solid fuel boilers) and a growing popularity of this fuel in Polish households. It is still frequently found that pellet contains plastic waste or MDF slabs left over from furniture production. The use of pellet will grow in the coming years and therefore it is crucial for air quality policies to introduce obligatory standards for pellet fuel. Such postulates have been submitted to the government by the Polish Smog Alert, the Polish Pellet Council and a few marshal offices (regional authorities).

2.7 › FINANCIAL AID PROGRAMMES

The pace of buildings' energy transition depends not only on the regulations restricting the use of certain fuels and appliances, such as anti-smog resolutions and emission standards for new heating appliances, but also on the availability of financial support programs. In 2012 the Institute of Environmental Economics started advoca-

[30] Act on Fuel Quality Monitoring and Controll of 25 August 2006 with latter ammendments (Ustawa o systemie monitorowania i kontrolowania jakości paliw z dnia 25 Sierpnia 2006).

[31] With a thermal input lower than 1 MW.

[32] Regulation of the Minister of Energy of 27 September 2019 on quality requirements for solid fuels (rozporządzenie w sprawie wymagań jakościowych dla paliw stałych).

[33] Such an expertise including proposed coal quality parameters was commissioned by the Ministry of Entrepreneurship and Development in 2018. The parameters adopted by the Ministry of Energy were far from the ones indicated in this expertise.

cy for launching a national programme subsidising heat source replacement and energy retrofits of single family buildings (SFBs). The IEE was the first organisation in Poland to undertake active efforts to create programmes aimed at transforming SFBs. This advocacy contributed to the establishment of two important programmes by the National Fund for Environmental Protection and Water Management (NF) – KAWKA, a pilot programme financing coal boiler replacements, and RYŚ, a programme supporting energy efficiency investments in SFBs. These programmes were cancelled by the new government after parliamentary elections in October 2015.

The new government decided to continue providing similar support through creating a new programme, **Clean Air Priority Programme (CAPP),** which was launched in September 2018. **The CAPP, with the indicative budget of PLN 103,000,000,000 (approximately EUR 24,000,000,000), aims at retrofitting 3,000,000 SFBs by 2030 through supporting the replacement of "smokers" and improving energy efficiency.** This programme is operated by the National Fund for Environmental Protection and Water Management (NF). Recently, a new version of the programme, called CAPP 2.0., was launched by the NF. **The CAPP 2.0. contains a number of simplifications allowing beneficiaries easier and faster access to subsidies, including simplified application procedures, a shortened time of grant application processing, web access to applications, etc.).** Both NF programmes, i.e. the previous KAWKA and the current CAPP, allow coal-to-coal conversion (i.e. replacement of "smokers" with eco-design boilers). It should be noted, however, that **under the CAPP most of the conversions are to gas boilers (47% of beneficiaries) and only 20% to new coal boilers.** Simultaneously, significant increases have been observed in the segment of heat pumps, with such retrofits currently amounting to 9% of heat source replacements. **The new CAPP 2.0. offers higher heat pump subsidies, making this technology more attractive to beneficiaries.** Additionally, the new programme will provide financial incentives to encourage replacing old appliances with biomass boilers reaching a more stringent emission standard than the one indicated by eco-design requirements (i.e. 20 instead of 40 mg/m^3). Giving up funding of coal boilers has been a very sensitive issue and neither the previous nor the current management of the NF have decided to do so. The issue remains open as the European Commission, which is willing to support the CAPP with EU funds, emphasises its objections to co-finance a programme which allows coal funding.

An additional instrument which supports energy efficiency investments in SFBs is the income tax credit which came into force on 1 January 2019. It allows to deduct from taxable income up to PLN 53,000 of the investments in energy efficiency measures, heat source replacement or PVs. Through this scheme in 2019 taxpayers deducted circa PLN 3,000,000,000 from their incomes.

Some regions and municipal authorities have also created their own schemes supporting boiler replacement. With the establishment of the national CAPP, however, these schemes are being systematically phased out.

The scale of the current support schemes, in comparison with the needs, is insufficient. The past KAWKA programme, which operated between 2013 and 2017, **financed only 23,000 new heat sources** in the entire country, out of which 49% are located in one city – Kraków. **So far 151,000 applications have been submitted to the CAPP** (from September 2018 until July 2020)[34].

Moreover, CAPP focuses only on investments in SFB while low-stack emission sources in multifamily buildings (MFB) do not have support from central programmes (previously such intervention was covered by KAWKA programme). Polish Smog Alert has been advocating for establishing a national programme to help local governments in eliminating emission sources from MFBs.

[34] This number includes support to 33,000 newly constructed SFBs as CAPP allowed such funding by the end of 2019.

3 TRANSPORT EMISSION

3.1 SUMMARY

Transport is the main source of NO_2 pollution, however, public and decision-makers' awareness of this issue remains low. The number of cars per 1,000 residents in Polish cities is much higher than in many cities in Western Europe. Simultaneously, the average age of a car in Poland is very high – over 13 years. Poland is also experiencing an uncontrolled influx of old cars from Western Europe – with around 1,000,000 old cars, 12 years old on average, being imported to Poland annually.

Poland lacks proper legislation which would enable reducing the volume of transport-related emissions. The necessary legislative changes include:
» introducing provisions enabling the creation of low emission zones based on Euro standards;
» introducing changes to excise tax to minimise the import of old cars, in particular Diesels;
» tightening the existing provisions on DPF tampering and raising emission standards which need to be met during the annual roadworthiness test.

In addition, local authorities should be less hesitant to designate paid parking zones and raise parking fees, establish bus lanes on most congested streets or create new bike lanes, even at the cost of reducing the space available for car traffic. The latest research shows that public acceptance for such solutions is high.

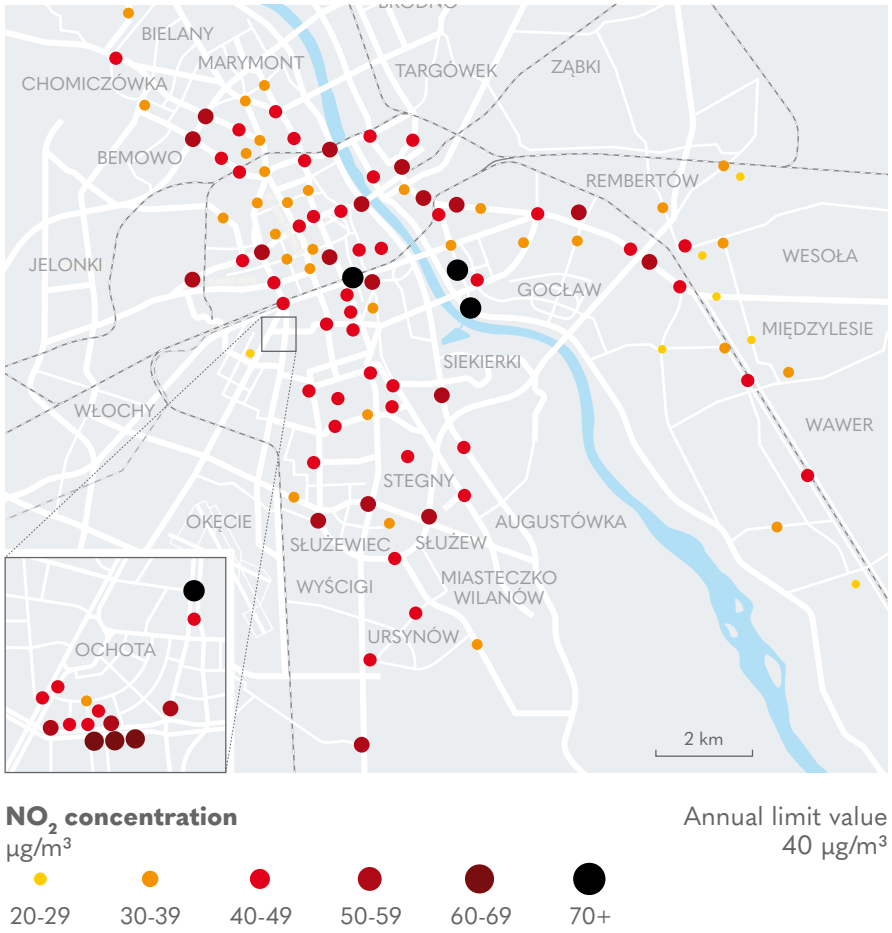
3.2 TRAFFIC-RELATED POLLUTION AND ITS CAUSES

Official measurements identify the problem of excessive NO_2 concentrations at only five traffic stations in the country. However, the research into NO_2 concentrations, conducted by the Polish Smog Alert in October and November of 2019, reveals that the limit values for this pollutant are exceeded in many areas of the analysed cities[35]. **In Kraków, 80% of the 91 investigated locations revealed exceedances of NO_2 limit values. In Warsaw, where 121 locations were covered, 70% stations noted exceedances.** The main source of NO_2 emissions is car traffic (see Chapter 1).

[35] Pomiary stężeń dwutlenku azotu za pomocą próbników pasywnych na terenie Krakowa i Warszawy, Krakow Smog Alert, Warsaw without Smog, 2020, available at: https://polskialarmsmogowy.pl/polski-alarm-smogowy/aktualnosci/szczegoly,pierwsze-takie-badania-w-polsce-niemal-wszedzie-przekroczono-normy-zanieczyszczen-generowanych-przez-samochody,1518.html

FIGURE 3.1

RESULTS OF NO_2 SAMPLING CAMPAIGN IN WARSAW, OCTOBER 2019



SOURCE: MEASUREMENT CAMPAIGN BY POLISH SMOG ALERT GROUPS

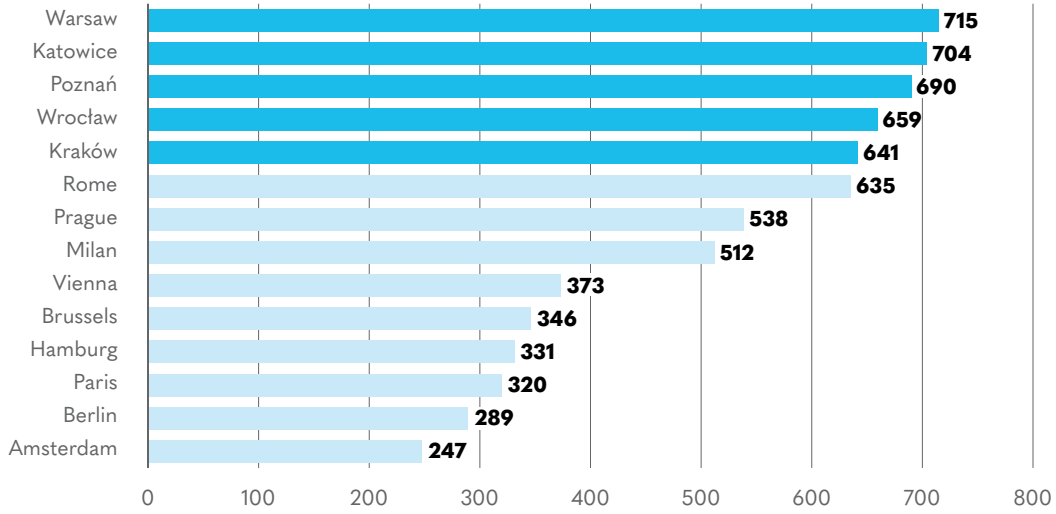
The problem of traffic-related emissions remains largely underestimated or even unidentified. Local and national air quality improvement measures tend to focus on low-stack emission rather than curbing traffic pollution. Traffic reduction measures are introduced to cope with problems such as traffic jams rather than to improve air quality. Although recently the awareness of traffic-related air pollution has been slowly rising among NGO activists, local politicians, public officers and the general public, transport is still perceived to be a source of particulate matters emission – the awareness of NOx emissions is low and it is limited to a narrow group of specialists.

The data on vehicle fleet show that Polish cities face problems with excessive number of vehicles as well as their old age. According to Eurostat data[36], in 2016 **Poland ranked 6th among the EU member states when it comes to the number of vehicles registered per 1,000 inhabitants,** coming before such automotive giants as Germany, the United Kingdom or France and leaving the European Union's average far behind. The same holds true for Polish cities. As presented in the graph below, the number of cars per 1,000 inhabitants is much larger than in many other cities in Western Europe.

[36] Eurostat 2016.

FIGURE 3.2

NUMBER OF CARS PER 1000 INHABITANTS IN SELECTED CITIES



In terms of air pollution, it is not only the number but also the age of cars that matters. **In 2019 about 1,000,000 second-hand cars were imported to Poland. The average age of a car brought to Poland amounts to 12 years[37].** According to the European Automobile Manufacturers' Association (ACEA,) in 2018 only 30% of cars on Polish roads were 10 years old or newer and only one car out of ten was approximately 4 years old. According to the data provided by insurance companies, the average age of cars on Polish roads exceeds 13 years[38].

3.3 › ASSESSMENT OF MEASURES AIMED AT REDUCING TRAFFIC-RELATED POLLUTION IN POLAND

3.3.1 › CLEAN TRANSPORT ZONES

Polish legislation does not provide local governments with a right to introduce typical Low Emission Zones, such as those found in Brussels, Berlin, Paris or Barcelona, with entry regulations based on Euro norms for vehicles. It only allows for establishing a type of Zero Emission Zones, which in Poland are referred to as **clean transport zones[39].** However, the main goal of this regulation is to promote electric vehicles, rather than tackle air pollution. Clean transport zones differ significantly from the low-emission zones (LEZ) created in many European countries.

Only an electric, hydrogen-powered or a natural gas vehicle can enter a clean transport zone. Such zones can be established exclusively in a municipality with more than 100,000 inhabitants, and only within the city centre area designated as such in the local land use plans. At the same time, the Electromobility Act provides many exemptions from the rules governing clean transport zones. Most importantly, citizens living within a clean transport zone and

[37] Data of the Samar Automobile Market Research Institute.

[38] European Automobile Manufacturers' Association, 2018.

[39] Act of 11 January 2018 on electromobility and alternative fuels (ustawa o elektromobilności I paliwach alternatywnych, hereinafter: Electromobility act).

driving a passenger car with a mass lower than 3.5 t are allowed to freely enter the zone without any limitations. This provision alone significantly weakens the impact of clean transport zones, as their inhabitants are responsible for generating a large part of emissions. Furthermore, the municipal council may incorporate exemptions from entry regulations other than those set in the Electromobility Act. In addition, the municipality council may also allow, for up to 3 years, the entry of vehicles other than those specified in the above-mentioned exemption catalogue, provided that a certain fee is paid. The maximum fee is stipulated in the Electromobility Act and is in fact very low, too low to deter drivers from entering clean transport zones.

Therefore, clean transport zones, in their current form, do not support introducing car access restrictions in cities with the aim of curbing transport emissions. An urgent reform of these provisions is needed so that municipalities obtain a right to designate low emission zones, similar to the ones functioning in Western Europe. It is worth noting that there is widespread social acceptance of urban access restrictions for cars with high emissions of pollutants. According to the latest research conducted by the Polish Smog Alert, as many as 67% of the respondents express support for such a measure, while only 28% are against[40].

KRAKÓW'S CLEAN TRANSPORT ZONE

Kraków is the only city in Poland to create a clean transport zone. The zone was established by the Kraków City Council's resolution of 19 December 2018 for a trial period of six months, within a relatively small section of a historic district of Kazimierz – an area very popular among tourists, rich in bars, restaurants and museums. The resolution provided several exemptions in addition to those set out in the Electromobility act, including an exemption for taxis and entrepreneurs whose premises are located within the zone. Moreover, supply vehicles were allowed to enter the zone freely within specific time periods in the morning and afternoon.

The creation of the zone was widely criticised. Its opponents argued that it was extremely harmful for business activity, even though no clear data proving such statements was presented, while the supporters of traffic restrictions argued that the zone did not cover a big enough area and that it granted too many exemptions to ensure any significant reduction of transport-related emission of pollutants.

In March 2019 the City Council, after a very chaotic session, amended the clean transport zone resolution adding many new exemptions, including an exemption for all customers and contractors of entrepreneurs operating within the zone between 9:00 a.m. and 5:00 p.m. on weekdays. This provision deprived the zone of any noticeable impact on traffic and air pollution. The clean transport zone was finally abolished in September 2019, as it no longer served any function. However, in its place the city created a zone of limited traffic, which is a better suited solution for restraining car traffic.

The Kraków's clean transport zone was created on a wrong premise that its aim was to reduce traffic on a local level. It was never meant to achieve the true goal of such an instrument – a large scale reduction of car-related pollution. **It proved that Poland needs legislation aimed specifically at creating fully functional low emission zones and establishing emission standards for petrol and Diesel cars rather than relying on granting access only to electric and hydrogen vehicles.**

[40] Transport-related behaviour of Polish cities' inhabitants – a report from social research conducted among the inhabitants of five biggest cities in Poland, Polish Smog Alert, Kraków 2020, available at: https://www.polishsmogalert.org/wp-content/uploads/2020/06/Raport-transportowy-v7-ENGLISH.pdf

3.3.2 › TECHNICAL REQUIREMENTS AND DUST PARTICULATE FILTER (DPF) TAMPERING

Polish provisions setting out technical requirements for vehicles are not in line with European emission standards – in case of Diesel engine cars they only provide requirements regarding smoke opacity. All cars are subject to an obligatory annual roadworthiness test, with the exception of newly-registered vehicles[41]. Such a test includes an emission test as well as a check of the exhaust system. However, the emission test in the case of Diesel engine cars covers only smoke opacity, while specific PM and NOx emissions are not measured. **Currently, the requirements are so lenient that vehicles with removed DPFs are able to meet them** (this refers to the light absorption coefficient measured with an opacimeter).

A common issue among the owners of Diesel engine cars in Poland is the removal of DPFs. The results of on-the-spot roadside inspections carried out by the police clearly show that the number of vehicles with a defective exhaust system or a highly polluting engine is large in Poland. During a range of random inspections carried out in 2019, nearly 8,000 registration certificates were cancelled by the police due to the poor technical condition of the vehicle – only in one week of December 2019, police officers cancelled over 2,000 registration certificates near Warsaw (every fifth checked vehicle). At the same time, **garages offering Diesel particulate filters (DPFs) removal continue to operate with impunity.**

In order to address the abovementioned issues, it is **necessary to impose stricter exhaust emission requirements** which must be met in order to pass the obligatory periodic roadworthiness test. Exhaust emissions should be checked by authorised vehicle inspection stations during the obligatory periodic test and failure to comply with this obligation should be punishable. The results of the exhaust emissions tests should be recorded and retained. **Regulations ensuring that mechanics will no longer be able to legally remove DPFs or any other emission-reducing devices should also be introduced.**

CASE AGAINST ADVERTISING DPF REMOVAL

Recently, the Frank Bold Foundation won a landmark civil case pertaining to removal of dust particle filters from Diesel cars. Removing DPFs is a common practice in Poland, especially in the case of old, imported vehicles, as it is a considerably less costly option than a DPF replacement or regeneration. Even though driving a car with a removed DPF is forbidden by law, it is rarely detected and there is no legal sanction for car mechanics who provide such services. DPF removal is widely available and advertised, especially on-line. According to the Polish environmental law, it is forbidden to advertise or promote goods and services which defy the principles of environmental protection and sustainable development. Environmental organisations, such as Frank Bold, are entitled to ask the court to issue an injunction order to stop such advertising promotion. In 2020 Frank Bold won the first such case ever handled by a Polish court against a car mechanic offering removal of DPF filters. The court ordered the defendant to cease any advertising and other forms of promotion of such services as well as to cover the costs of the proceedings.

[41] New vehicles undergo the first test after 3 years from the date of registration and a second test after the next 2 years. All vehicles older than 5 years are subject to annual testing.

3.3.3 INFLOW OF OLD DIESEL CARS FROM WESTERN EUROPE

About 1,000,000 second-hand cars are imported to Poland every year, with 60 % of them being Diesel cars. The average age of a second-hand Diesel car imported to Poland is 12 years. Many such vehicles are exported from Western European countries precisely because low emission zones prohibiting access of older Diesel vehicles have been introduced there.

In order to curb the inflow of highly polluting cars, the government should adopt appropriate tax regulations to discourage Polish citizens from importing old cars from other countries and to encourage them to choose newer models which cause less pollution. Therefore, **excise duty regulations must be changed.** Currently, the amount of **excise duty depends solely on the engine capacity. In order to stop the uncontrolled influx of old Diesel cars to Poland, excise duty rates should be based on the vehicle's age, its emission performance (in accordance with Euro emission standards) and the type of fuel it uses.** Such solutions have been adopted by many EU countries: Austria, Belgium, Croatia, Cyprus, Finland, France, Greece, Spain, Netherlands, Ireland, Latvia, Malta, Portugal, Romania, Slovenia and Hungary.

3.3.4 PARKING POLICIES

One of the strongest tools to reduce congestion in Polish cities, and indirectly limit traffic-related pollution, is the possibility of introducing paid parking zones within city limits. Towards the end of 2018 this measure was rather weak, as the highest fee allowed by law would be only PLN 3 (EUR 0.75) per hour. In smaller cities, such as Kielce, Radom or Opole, this fee was even lower: PLN 2 (EUR 0.5). Such low parking fees resulted in increased congestion. As indicated by the estimates provided by the Kraków University of Technology and Warsaw Road Authority, even 30% of traffic in city centres was generated by cars in search of a parking space.

In 2019 the central government finally allowed to increase parking fees. Kraków increased the parking fee to PLN 6 (EUR 1.5) per hour, followed by Poznań, which increased the fee to PLN 7 (EUR 1.75) per hour. These are, however, the only cities to have changed their approach to parking fees in a more decisive way.

Apart from the fees, another significant factor is the size of paid parking zones. Almost every large city has a paid parking zone, however, few of these zones exceed a quarter of a square mile in area. The main purpose of those small zones is to tackle the deficiency of parking spaces in the core of the city. Only Gdańsk, Warsaw, Kraków, Wrocław, Szczecin and Poznań have designated paid parking zones that are large enough to effectively discourage drivers from entering the city limits or city centres. **The largest paid parking zones are found in Kraków (25% of the city area) and Warsaw (20%),** both of them are being constantly extended – Kraków expanded its paid parking zone in 2019 and 2020, while Warsaw plans to widen its zone in 2021 and 2022.

3.3.5 BUS LANES

Most large Polish cities have designated bus lanes. However, it is important to have a closer look at their location, as it is pivotal to their effectiveness. For example, in Rzeszów separate bus lanes are designated only on downtown streets to ensure the flow of buses between interchange bus stations, while in other parts of the city buses ride along with cars and can be held up by heavy traffic. The city of Kielce possesses 21 km of bus lanes. This does not, however, have much impact on the reliability and punctuality of the city transport, as the bus lanes are

designated in the suburbs and not in the city centre. As a result, congestion in the city centre leads to lowering the average travel velocity of buses. Kraków, a much larger city, has 31 km of bus lanes, but they are designed much more efficiently than in the cases mentioned previously. City engineers are focusing on streets where buses lose most time in the general traffic. For 25 years, they have been systematically introducing bus lanes to improve the punctuality of public transport – both buses and trams. In consequence, the amount of time needed to travel across the city centre has not increased even though the number of cars on the streets has risen almost four times since 1995.

3.3.6 › BICYCLE INFRASTRUCTURE

A very positive aspect of urban transport policy in Poland is **development of bike infrastructure and rising popularity of bikes as a means of daily travels through cities.** The first city to invest widely in bike infrastructure was Gdańsk, which between 2007 and 2012 developed more than 200 km of bike roads, connected in a coherent system. As a result, 8% of journeys through the city nowadays is made by bike (very often as a means to access the suburban railway system). Wrocław also invested in bike roads and lanes, all in all the city boasts 250 km of bike roads and lanes. Warsaw and Krakow have been developing their bike lane systems for a much longer time and they are still far from completion, even though Warsaw has more than 600 km of bike roads and Krakow more than 200 km. **It is not only infrastructure but also the growth of public awareness of bike effectiveness in daily journeys that plays a highly important role.** In Opole the number of travels in the city by bike has risen from almost 4% to 11% of all travels between 2014 and 2019. In Bydgoszcz between 2010 and 2015 city officials observed the rise from almost zero to 5%. Kraków in 2013 noted 2%, in 2019 it was estimated to be 8%.

What is worth noting, city **commuters assess bikes very positively.** In a survey prepared for Polish Smog Alert, the inhabitants of largest cities declared bike as a truly reliable vehicle to travel daily – **46% of respondents assessed bike travel as an effective way of moving around the city.** Only 20% of the respondents declared the same with respect to private car usage[42]. During Covid-19 pandemic, the authorities of Krakow and Poznań decided to take small steps to further popularize biking as a way of travelling. Poznań has reopened its old bike policy documents and declared building new infrastructure. Krakow once again narrowed some of its streets to give space to bicycles.

[42] Transport-related behaviour of Polish cities' inhabitants – report from social research conducted among inhabitants of five biggest cities in Poland, Polish Smog Alert, Krakow 2020.

4 INDUSTRIAL EMISSIONS

4.1 › SUMMARY

The legal framework governing industrial emissions is very extensive and largely in line with the EU requirements. Emission of main pollutants, such as: dust particles, sulphur dioxide, nitrogen oxides from large industrial installations had been significantly reduced prior to and shortly after the Polish accession to the EU. However, major problems still exist, especially concerning medium sized industrial plants, operated on the basis of emission permits and notifications. Moreover, there is a lack of sufficient regulations regarding particular types of emissions like volatile organic compounds. **The main problems identified in the area of industrial emissions are:**
• severely limited access to emission permit proceedings,
• inefficient environmental inspection and control over real-life emissions.

Solving the first problem is relatively easy and would only require slight changes in the current law, however, significant resistance is to be expected on the side of operators of medium sized industrial installations. The second problem demands a much more detailed analysis which should cover not only legal, but also financial and organisational aspects. One of the main issues that need to be assessed carefully is whether to build a system of very extensive and thorough supervision over the operation of industrial plants or to focus on very severe sanctions for even a slightest violation of the environmental law to act as a deterring factor. Examples from other EU and non-EU states may be of use here, however the specifics of the Polish legal culture should also be taken into account.

4.2 › OVERVIEW OF LEGISLATION REGARDING INDUSTRIAL EMISSIONS

Until recently, industrial emission was the only source of air pollution covered by a specifically designed legal framework. The scope, variety and complexity of industrial emissions legislation is far too broad to be described in detail in this overview.

The environmental protection law stipulates general rules of operation of installations, which in particular apply to operators of industrial plants. Most importantly, **operation of installations must not cause exceeding of the environmental standards, including air quality limit values, outside the plant's premises**, unless an industrial zone has been created.

The general rule of environmental law is that operation of any installation causing emission of pollutants to ambient air requires a permit – either an integrated permit (Integrated Pollution Prevention and Control permit, hereinafter IPPC permit) or a **permit** for emission of gases and dusts to ambient air (hereinafter emission permit). This rule applies to industrial as well as non-industrial installations. Certain types of smaller installations are exempted from this obligation, however, they may be subject to a compulsory notification to provincial mayor. If such exemption is not explicitly set in the law, the general obligation to obtain a permit applies even for the smallest of installations. This is the case with installations burning lignite (brown coal), as the law provides exemption only for small combustion sources burning hard coal, biomass, liquid and gaseous fuels. Even a very small boiler or a stove used for burning lignite requires an emission permit to operate (the lack of such a permit constitutes a criminal as well as an administrative offence).

EIA PROCEEDINGS FOR NEW INDUSTRIAL PLANTS

As required by the EU law[43], construction of a new industrial plant is allowed only after an EIA (environmental impact assessment) is carried out. Under the Polish law, EIA ends with issuing a decision on environmental conditions of the project allowing the acquisition of further permits necessary for execution of the project. Air pollution caused by a planned project is a significant part of the EIA. Moreover, the cumulative impact (including other existing installations) should also be described. The EIA procedure allows for a broad public participation (i.e. public consultations and active participation of environmental organisations). The Polish EIA act has been significantly amended in recent years, acknowledging the European Commission's observations. However, several issues regarding compliance with the EU law still exist, including the following:

» Environmental decisions are often granted an immediate enforceability clause, allowing the investors to act upon them (i.e. obtain further permits), even if there are ongoing appeal proceedings before authorities of second instance, meaning that decisions are not final yet;

» The Amendment of the EIA act which entered into force on 1 January 2018 narrowed down the definition of a party to the proceedings, excluding many possible stakeholders such as citizens who may be affected by negative impacts of the project;

EMISSION LIMIT VALUES

Emission limit values are set for certain types of installations, combustion plants and waste incineration devices in a regulation issued by the Minister of Environment of 1 March 2018. The values are in line with the EU requirements where they apply. Large industrial installations are additionally obliged to comply with BAT (Best Available Techniques) conclusions (see below). If there are no emission limit values nor BAT conclusions, emission limits for industrial installations should be established in relevant permits to ensure, that they do not cause exceedances of air quality standards.

LARGE INDUSTRIAL INSTALLATIONS – IPPC PERMITS

Operation of large industrial plants, listed in the IED Directive, is regulated by the most stringent norms, transposing the IED Directive. Running a large industrial installation requires an IPPC permit which covers emissions to air, water, soil as well as generation of waste. Operators of large installations are obliged to comply with BAT conclusions, if they were issued for a given type of industry.

IPPC permit proceedings for new installations and in case of a significant change[44] of installation include public participation. Environmental organisations are allowed to join the proceedings as parties. The same rules apply if an exemption from limit values set in the BAT conclusions is granted. IPPC permits are issued for an unlimited period of time, however, they are examined (and amended if necessary) every 5 years, as well as when new BAT conclusions are issued.

MEDIUM-SIZED INSTALLATIONS[45] – EMISSION PERMITS AND OBLIGATORY NOTIFICATIONS

Smaller installations which do not meet the IPPC thresholds require a regular emission permit. BAT conclusions do not apply to such installations. Emission permits are issued for a set amount of time, no longer than 10 years.

[43] Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment (hereinafter: EIA Directive).

[44] The definition of 'significant change' is not precise and sometimes legal disputes arise as to whether the specific change of permit concerns a 'significant' or an 'insignificant' change.

[45] Not to be confused with medium combustion plants (MCPs) which is an EU law term used for combustion plants with a rated thermal input equal or higher than 1 MW and lower than 50 MW.

One of the most striking issues is the **complete lack of public participation in the procedure of issuing the permit.** Environmental organisations are excluded from the proceedings, as are the concerned members of the public – even owners of properties directly neighbouring the installation. There are no public consultations. **In almost all cases the investor is the sole stakeholder in the procedure.**

Even smaller installations (e.g. combustion plants burning hard coal with a rated thermal input lower than 5 MW) are exempted from the general obligation of obtaining a permit[46]. They may be subject to obligatory notification[47] to the administrative authority (provincial mayor). If the authority considers it necessary it may issue an administrative decision setting forth conditions of operation of the installation (similar to a permit, but narrower in scope). In case of MCPs exempted from emission permit obtaining such a decision is obligatory.

Poland has a compensation mechanism for industrial emission. Compensation is a unique legal instrument as it is not transposed from any specific EU Directive. However, it does fulfil the general principles of the EU environmental law and similar provisions may be found in many other member states. According to the Environmental protection law, if an emission permit or IPPC permit is issued for an area where air quality standards are breached, the emission of a substance the levels of which are exceeded may be allowed only if the operator ensures sufficient reduction of emissions from other sources. Moreover, the total reduction of emission volume has to be at least 30% greater than the emission allowed in the requested permit. Therefore, in theory, issuing such a permit should lead to a reduction of the total volume of emissions, thus improving the air quality in the area. The reduction may be achieved through the operator's own installations, other industrial plants in the area as well as through reduction of low-stack emission by decommissioning individual solid fuel boilers and stoves used for household heating.

However, there are two significant problems posed by this legal instrument. Firstly, the **operators are only obliged to compensate emissions of substances for which legally binding air quality standards have been set. Therefore, there is no compensation for many harmful substances,** like volatile organic compounds and polycyclic aromatic hydrocarbons. Secondly, in many cases operators compensate their emissions with installations that would be decommissioned anyway, e.g. old type boilers and stoves that have to be replaced under the regional anti-smog laws.

MONITORING AND CONTROL OF INDUSTRIAL INSTALLATIONS

Monitoring of environmental impacts, including air pollution, from industrial sources is the obligation of installation operators (self-monitoring). They are required to report emissions caused by their installations to voivodship marshals, as well as to calculate and pay environmental fees. In the case of large installations continuous, real time measurements of main pollutants are usually obligatory. Such a self-monitoring system is in line with "the polluter pays" principle and may be highly effective on condition that there are effective supervising authorities capable of imposing strict sanctions. **Unfortunately, in Poland this supervision is highly dysfunctional, which translates into dysfunctionality of the self-monitoring system.**

[46] Regulation of the Minister of Environment of 2 July 2010 on cases in which emission of gases and dusts to ambient air from installation does not require a permit (rozporządzenie w sprawie przypadków, w których wprowadzanie gazów lub pyłów do powietrza z instalacji nie wymaga pozwolenia).

[47] Regulation of the Minister of Environment of 2 July 2010 on types of installations the operation of which requires a notification (rozporządzenie w sprawie rodzajów instalacji, których eksploatacja wymaga zgłoszenia).

Controlling environmental impact of industrial installations is essentially a task of the **voivodship environmental inspection.** For many years the inspection has been commonly considered to be a highly inefficient and deeply underfunded administrative body. In August 2018, after a series of intentionally caused fires in hazardous waste disposal facilities, a significant amendment of the act on environmental inspection came into force, substantially increasing its powers. The inspection is now entitled to perform investigative operations and has much more freedom in performing unannounced audits of industrial installations. The goal was to transform the inspection into a type of an environmental police. However, after almost 2 years it became obvious that changes introduced in 2018 were not enough – **the inspection remains underfunded and understaffed, it is reluctant to impose more severe sanctions and unwilling to cooperate with members of the public.**

The environmental inspection often refuses to carry out necessary measurements due to the lack of appropriate equipment. Moreover, the inspection is usually unwilling to perform unannounced audits, warning the industrial operators before commencing any controlling activities and therefore giving them time to prepare and temporarily cease any unlawful activities.

One of the most important issues which should be addressed as quickly as possible is to identify the main problems and obstacles which prevent the environmental inspection from becoming a fully operational and efficient "environmental police".

SANCTIONS

Operators of industrial installations may be subject to administrative and penal sanctions. In most cases administrative sanctions are more severe and easier to enforce, especially if the operators are legal entities rather than natural persons. While a criminal offence may only be attributed to a natural person, administrative sanctions may apply to legal entities (e.g. companies).

Administrative sanctions may be divided into two categories. Firstly, a relevant administrative body may issue orders concerning operator's activities, e.g. it may withdraw or limit a permit or order cessation of activities. Secondly, pecuniary fines may be imposed on the operator.

In some cases one offence may result in imposing several sanctions. E.g. in the case of operating an installation without an obligatory emission permit, the following sanctions may apply:
1 » order of cessation of activities[48],
2 » the environmental fee which the operator would normally be obliged to pay is increased 5 times,
3 » operating installation without an obligatory permit is a petty offence, a fine of up to PLN 5,000 (EUR 1,250) may be imposed on each person found guilty (e.g. members of the management board, branch director etc.).

Unfortunately, environmental inspection often abstains from imposing more severe sanctions and keeps them as low as possible.

[48] Such order is obligatory if the installation requires an IPPC permit and discretional if the installation requires only an emission permit.

5 AIR QUALITY MANAGEMENT AND AIR QUALITY PLANS

5.1 SUMMARY

The following chapter presents the air quality management structure based on air quality plans. Regulations directly connected with low-stack emission, transport and industry have been described in chapters 2-4.

Due to the recently introduced changes in law and **ongoing amendments** of many air quality plans, it is too early to assess whether these changes are sufficient to significantly improve the overall quality of these documents. A lot depends on the final approach of the Minister of Climate to the drafts of air quality plans. However, based on the current drafts of air quality plans[49] available for public consultations, **there are reasons to believe that there will be no substantial improvement in terms of imposing effective air quality policies.** The only visible improvement is the fact that from now on all regions will use a more standardised form of air quality plans, which will make them easier to compare.

It is crucial to allow concerned members of the public as well as environmental organisations to initiate judicial review of adopted air quality plans. Due to the commencement of an infringement procedure by the European Commission some developments in this area may be expected in the second half of 2020. However, this would not be enough to solve the problem. Currently, administrative courts lack instruments that would allow them to properly consider the contents of air quality plans and to introduce specific corrective measures. A much deeper, systemic change of procedural law would be necessary, as described below in the part recommending changes in the judiciary.

5.2 ADMINISTRATIVE BODIES DEALING WITH AIR POLLUTION

Under the Polish law there is no single authority or one group of administrative authorities dealing with air pollution. Air quality management (i.e. adopting strategic documents establishing air quality policies and corrective measures) is performed mainly on two levels – national and regional (voivodship). Municipalities are mainly responsible for implementing policies established on the regional level. The most important actors are briefly described below.

GOVERNMENT MINISTERS

There are two separate departments of government for the environment and for climate. The Minister of Environment's powers focus mostly on forestry and nature protection, while the issues related to emissions, including air quality, are now the responsibility of the Minister of Climate. Additionally, the Minister of Economic Development has been also very active in the area of managing air quality.

NATIONAL AND VOIVODSHIP FUNDS FOR ENVIRONMENTAL PROTECTION

National and voivodship funds for environmental protection manage funds from environmental fees and fines, which are used for different subsidy schemes, e.g. to manage the Clean Air Programme which provides subsidies for replacement of solid-fuel boilers.

[49] As of 23 July 2020 we are waiting for the Minister of Climate to disclose his opinions on the draft of air quality plans.

ENVIRONMENTAL INSPECTION

The environmental inspection consists of the Chief Environmental Inspector and voivodship environmental inspectors. It is one of the most important administrative bodies in this area responsible for environmental monitoring, publishing reports on the state of the environment, inspecting medium and large installations, as well as conducting administrative (and, to a limited extent, also criminal) proceedings in case of infringement of the environmental law. In 2019 the environmental inspection was granted additional powers intended to turn it into an "environmental police". **However, due to the lack of sufficient funding and organisational disfunctions, the environmental inspection remains inefficient. Identifying the exact causes of this inefficiency and determining the necessary corrective measures is one of the most urgent issues that should be addressed in the area of environmental protection.**

NATIONAL CENTRE FOR EMISSION BALANCING

The National Centre for Emissions Management is an administrative body responsible for managing the Polish part of the European Union Emission Trading System (EU ETS). It also operates a national database collecting data on greenhouse gases and air pollutants emissions. All entrepreneurs are obliged to submit yearly emission reports. NCEM has been appointed to prepare a draft of the NAPCP (see the section on NEC Directive).

VOIVODSHIP AUTHORITIES

Voivodship (regional) parliaments and executive boards headed by voivodship marshals are responsible for drafting and adopting key acts of local law – air quality plans with short term action plans as well as "anti-smog resolutions". Voivodship marshals are also responsible for issuing integrated permits for the largest industrial installations.

PROVINCIAL AUTHORITIES

Provincial mayors (starosta) are responsible for issuing emission permits and integrated permits for medium and large industrial installations. They are also responsible for receiving notifications from operators of smaller installations and issuing decisions imposing duties and obligations on their operators (see Chapter 4).

MUNICIPAL AUTHORITIES

Municipal mayors are responsible for conducting environmental inspections in residential buildings and for execution of air quality plans.

5.3 › NATIONAL LEVEL
NATIONAL AIR QUALITY PLAN
NATIONAL AIR POLLUTION CONTROL PROGRAMME

According to the Environmental protection law[50], if an exceedance of an air quality limit or target value occurs across a significant part of the country and the measures taken by the local government bodies do not ensure the necessary reduction of emissions, the Minister of Climate may issue a **National Air Quality Plan**, which is

[50] Act of 27 April 2001 r. Environmental protection law (Prawo ochrony środowiska).

a strategic document setting out the objectives and directions of activities which should be included in regional air quality plans.

National Air Quality Plan until 2020 with an outlook until 2030 was published in September 2015. It lacks any strong corrective measures and has no legal force. **The document has not been amended since 2015 and, due to significant changes in law, has become completely obsolete.**

In 2019, fulfilling the obligations set by the NEC Directive[51], Poland adopted a **National Air Pollution Control Programme (NAPCP).** Legal provisions pertaining to the NAPCP have been transposed to the act on management of emissions of greenhouse gases and other substances. The adopted NAPCP is limited to a summary of existing air quality policies and legislation – **it does not contain any new measures and therefore has no real significance in preventing ambient air pollution.**

In June 2020 the European Commission published review reports prepared for all NAPCPs submitted by member states[52]. The report concerning the Polish NAPCP identifies several issues, including the fact that Poland failed to present any new "additional measures", as all measures presented in the Polish NAPCP have already been implemented. The Ministry of Climate was asked if, in the light of the recently published Review report, any amendments to the NAPCP were planned. In response, the Ministry stated that the Review report was being analysed and that no decisions had been made yet[53].

5.4 › REGIONAL LEVEL
VOIVODSHIP AIR QUALITY PLANS

From the legal perspective, voivodship air quality plans are the most important documents in air quality management. They are adopted as resolutions of voivodship parliaments. **Adopting an air quality plan is obligatory for each air quality zone where an exceedance of an air quality limit value or a target value has been observed,** according to the annual assessment of air quality published by the Chief Inspectorate for Environmental Protection.

Air quality plans should be amended every 3 years and should be adopted for a period no longer than 6 years. The plans should include corrective measures necessary to ensure that air quality limit values are met as soon as possible, no later than upon the finalisation of the plan (i.e. after 6 years). However, target values, and most importantly, the target value set for benzo(a)pyrene, are considered to be non-binding guidelines rather than strict thresholds. Air quality plans consist of a detailed description of each zone, including information on air quality, limit and target values exceedances, the main sources of emissions, the results of air quality measurements and modelling which gives a detailed picture of scale and causes of air pollution in each zone. Subsequently, the plan describes the necessary corrective measures.

Until now Polish air quality plans have contained almost no binding corrective measures and their overall quality was very low, therefore they had no real impact on the air quality. The only air quality plan containing clearly defined environmental objectives for municipalities (e.g. the annual reduction of PM emissions, the number of stoves and boilers to be replaced and the number of inspected households) was adopted in January 2017 for the Małopolska voivodship.

[51] Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC.

[52] Available here: https://ec.europa.eu/environment/air/reduction/NAPCP.htm

[53] As of June 2020.

CASE C-336/16: On 22 February 2018 the **CJEU issued a judgment ruling that Poland failed to fulfil its obligations under the CAFE Directive by failing to ensure compliance with PM 10 limit values in 35 zones (daily limit) and 9 zones (annual limit);** failing to incorporate appropriate measures in ambient air quality programmes and failing to properly implement a provision stipulating that air quality plans should set out appropriate measures, so that the exceedance period can be kept as short as possible.

To comply with the CJEU judgment in case C-336/16, a new regulation on air quality plans was adopted in mid-2019. All air quality plans adopted on the basis of the air quality assessment for 2018 onwards have to comply with the new rules. Most regions are currently working on new air quality plans which should be adopted by the end of September 2020. New air quality plans must be consulted with the Minister of Climate prior to their adoption. Until recently, there had been some striking differences in both the form and the content of air quality plans in different voivodships. More detailed provisions on the content of air quality plans together with obligatory consultations with the Minister of Climate should lead to a higher level of uniformity and improvement of the overall standard of air quality plans adopted in all regions. As of June 2020, many new air quality plans are still being drafted, after the first round of public consultations held in early spring. As mentioned above, **the current drafts show no significant improvements in terms of substance (i.e. they contain almost no efficient corrective measures or verifiable objectives), the only notable improvement is a more unified, standardised form.**

Each air quality plan must include a separate short term action plan allowing a quick reduction of pollution in case of a risk of exceeding a limit value, an information threshold or an alert threshold. Unfortunately, the existing short term action plans are inefficient. For example, although the law specifically allows to impose a ban on recreational[54] biomass burning, this measure is either omitted or introduced only if the alert threshold of PM10 (150 µg/m^3) is reached.

5.5 › ACCESS TO JUSTICE

In two landmark judgments: Janecek[55] and ClientEarth[56] the Court of Justice of the European Union established that the concerned individuals as well as environmental organisations should have a right to challenge faulty air quality plans, or the lack of such plans, to independent courts for a substantive review. Additionally, the CJEU underlined that the CAFE Directive imposes an obligation of result on member states. A mere adoption of air quality plan does not fulfil the Directive's obligation.

Under the current Polish law and jurisprudence, however, it is impossible for an individual or an environmental organisation to initiate a substantive review of an air quality plan before an administrative court. Polish law is currently in an obvious breach of these rules, which caused the European Commission to initiate an infringement procedure[57].

[54] I.e. not serving as a primary source of heating.

[55] C-237/07 Janecek v Freistaat Bayern: http://curia.europa.eu/juris/document/document.jsf;jsessionid= 95DACC53965890 62604F64F445E055D6?text=&docid=68148&pageIndex=0&doclang=EN&mode=lst&dir=&occ=first&part=1&cid=6232173.

[56] Case C-404/13 ClientEarth v The Secretary of State for the Environment, Food and Rural Affairs: http://curia.europa.eu/juris/document/document.jsf?text=&docid=159801&pageIndex=0&doclang=EN&mode=lst&dir=&occ=first&part=1&cid=6232173

[57] https://ec.europa.eu/commission/presscorner/detail/en/INF_20_859.

5.6 › AIR QUALITY STRATEGIC LITIGATION

In Poland there are currently two environmental organisations focusing on legal aspects of ambient air pollution and employing teams of professional lawyers: the ClientEarth Foundation based in Warsaw and the Frank Bold Foundation based in Kraków.

CIVIL LITIGATION

In 2015 Frank Bold lawyers representing a local anti-smog activist from Rybnik, one of the most polluted cities in Poland, submitted a lawsuit against the state, claiming damages for violation of claimant's personal rights due to air pollution caused by the state's failure to comply with the air quality limit values set by the EU law. The personal rights violated by air pollution include the right to health and life, the right to freedom of movement and the right to respect for one's private and family life and home[58]. After three years of trial the claim was dismissed by the District Court in Rybnik, however, an appeal was submitted. The appellate proceedings are still ongoing. In 2019 the claimant received very strong support from Polish Ombudsman, who officially joined the proceedings on the claimant's side. Subsequently, the court decided that a legal question which arose in the course of the case – whether the right to breathe clean air is a separate personal right protected under the Polish civil law. The Supreme Court's response, expected in late summer/autumn 2020, may be a landmark decision with a huge impact on all future environmental litigation.

After the Rybnik lawsuit had been submitted, several similar lawsuits were filed in other parts of the country. Most importantly, a number of well-known actors and celebrities started similar litigations in Warsaw. Several of them won after only a few months long trial. These were landmark victories, especially as the court agreed that the right to clean environment may be considered a separate, independent and enforceable personal right.

ADMINISTRATIVE CASES

In 2015-2017 Frank Bold and ClientEarth initiated strategic litigation against air quality plans. Both cases ended with unfavourable judgments of the Supreme Administrative Court, who stated that under the Polish law it is impossible for a citizen living in a polluted area to demonstrate sufficient legal standing to challenge an air quality plan before the administrative court. The court refused to use a more favourable pro-EU interpretation of the national law. Subsequently, Frank Bold lawyers submitted a constitutional complaint against the relevant provisions of the national law (currently investigated by the Constitutional Court) whereas ClientEarth submitted a complaint to the European Commission, which resulted in opening an infringement procedure.

[58] Rights stemming from art. 8 of the European Convention of Human Rights. According to the case law of the European Court of Human Rights, air pollution may cause violation of rights granted by art. 8 of the Convention.

6 ECONOMIC AND HEALTH IMPACT STUDIES

6.1 › SUMMARY

The existing health Impact Assessment (HIA) and air pollution economic cost calculations for Poland are based on international studies. The conclusions of studies may vary as (1) different methodologies are used, (2) reports may be from different years, and (3) models and calculations require additional information, which may be of variable quality. **The EEA calculates that circa 44,000 premature deaths are attributable each year to air pollution. The WHO and the OECD valuated the external health cost of air pollution at USD 100 billion, which equals to 12.9% GDP.** An analysis prepared for the purposes of this report reveals that:

» Low-stack emission created USD 16-39 billion worth external health costs in 2018 in Poland;
» Adopting an ambitious air quality plan in the Małopolska region can save 1,800 lives and additionally reduce hospitalizations by 1,450 cases;
» Removal of solid fuel boilers in small mountain towns can reduce premature deaths during smog episodes by 6.3 % on average.

HIA could be promoted as a key tool in the management of air quality improvement measures at a regional and local level. There is a sufficient number of international reports presenting results at the national level, however, due to low capacity, HIAs are rarely carried out at a regional and local level.

6.2 › METHODOLOGY

The Health Impact Assessment (HIA) allows to quantify the number of air pollution effects, such as premature deaths, the need for hospitalization, work absence, etc. The economic impact analysis, also referred to as the external health cost analysis, uses the results from the HIA and assigns monetary value to them. The accuracy of the models depends on access to a high quality emission database.

Challenges:

» The emission database requires obtaining a lot of detailed information for each emission source. For example, the calculation of low-stack emission requires: the emission indicator per type of the boiler, the emission indicator for fuels, the energy consumption profile for a building with a specific type of insulation, etc.
» Air quality measurement and modelling – to provide information on health impacts, a proper source apportionment is required.
» Detailed information on the population is required to establish links with air pollution.
» Health effects calculations, such as the Concentration Response Functions (CRF), are extrapolated from existing international studies. Epidemiological studies conducted in Poland could produce more precise CRFs.

6.3 › EXAMPLES OF INTERNATIONAL HEALTH IMPACT ASSESSMENTS FOR POLAND

Health effects resulting from air pollution have been calculated for Poland within broader international studies. The three main reports cover Poland and were prepared using different methodologies:

» the World Health Organization (WHO),
» the Institute of Health Metrics and Evaluation (IHME),
» the European Environment Agency (EEA).

The two first agencies use similar methods and provide comparable results. **The number of premature deaths caused by air pollution in Poland (estimated for 2016), according to each organisation, is as follows:**

- **29,000 – WHO[59]**
- **25,000 – IHME[60]**
- **44,000 – EEA[61]**

The WHO and IHME statistics are much lower than the results presented by the EEA. The reason for this difference is two-fold. (1) The WHO and IHME take into account the level of air pollution included in the epidemiological study as a reference threshold. This means that if there are no studies available on populations living in an area with an annual PM2.5 concentration lower than 5 µg/m^3, then 5 is subtracted from every measurement. The EEA methodology includes every microgram of pollution in their analysis. (2) Methods describe causes of deaths due to air pollution differently. The EEA includes natural causes, whereas the IHME and WHO use only specific causes from the list of ICD10 codes (the medical classification list created by the WHO). This means that a case of a person dying of comorbidities and the main cause not being listed, it is still included in the EEA, but not in the WHO and IHME estimation.

6.4 EXAMPLES OF INTERNATIONAL ECONOMIC IMPACT ASSESSMENT FOR POLAND

The main values of external health cost for Poland come from three reports provided by the OECD (Organisation for Economic Cooperation and Development), the World Bank and the European Commission (EC). As they are presented as a value of money from a given year, they cannot be directly compared.

Two international indicators which valuate life differently are used for monetisation of health effects: the Value Of a Life Year (VOLY) and the Value of Statistical Life (VSL). The VOLY refers to the number of life years lost and is person-specific. For example, a person at the age of 50 will lose more life years than a person at the age of 90. By contrast, in the VSL a death of a 50-year-old and a 90-year old person is taken into account in the same manner. For Poland the values related to air pollution costs are the following:

- VOLY EUR 57,700 or VSL EUR 1,090,000 provided by the EC, 2005 price year average for EU[62]
- VSL USD 2,098,000 provided by the OECD, 2010 price year for Poland[63]
- VSL USD 2,646,000 provided by the World Bank 2011 price year for Poland[64]

All the indicators shown above relate to premature deaths, but they adopt different methodologies. In the case of the VSL, the value of external health costs is obtained through multiplying it by the number of premature deaths. The adoption of VOLY entails obtaining some additional information on the age structure of the population. Therefore, different values of economic cost of air pollution can be derived from one specific number of premature deaths.

[59] https://www.who.int/airpollution/data/en/

[60] https://vizhub.healthdata.org/gbd-compare/

[61] https://www.eea.europa.eu/publications/air-quality-in-europe-2019

[62] Mike Holland for European Commission. Cost-benefit Analysis of Final Policy Scenarios for the EU Clean Air Package. Version 2. Corresponding to IIASA TSAP Report 11, Version 2a, October 2014.

[63] Organization for Economic Cooperation and Development, The Cost of Air Pollution: Health Impacts of Road Transport, 2014.

[64] The World Bank and Institute for Health Metrics and Evaluation, The Cost of Air Pollution. Strengthening the Economic Case for Action, 2016.

There are three main assessments of cost of air pollution in Poland:

- **EUR 39,000,000,000 or EUR 120,000,000,000 according to EU for 2010[65]**
- **USD 61,600,000,000 according to OECD for 2013, which equals 6.99% of GDP[66]**
- **USD 101,800,000,000 for 2010 according to WHO, which equals 12.9% of GDP and is sum of:**
  - **USD 51,900,000,000 for ambient air pollution,**
  - **USD 49,900,000,000 for household air pollution[67]**

External health costs of air pollution in Poland vary from EUR 40,000,000,000 to USD 101,800,000,000 annually. However, at a closer look they are roughly similar. A lower EUR valuation equals USD 50,000,000,000 and the estimate of the WHO is composed of two parts, where ambient air is USD 51,900,000,000. The difference in the results is attributable to different manners of estimating health impacts of air pollution and valuating life in monetary terms.

6.5 › HEALTH IMPACT ASSESSMENT FOR 2018

6.5.1 › NATIONAL LEVEL

Unique calculations have been carried out for the purpose of the present report. The results have not been published anywhere else, nor has the impact of air pollution been calculated for 2018 by any international body. The calculations are based on the methodology described above and the following datasets were used:

- Copernicus modelling for PM2.5 annual concentration for 2018 for Europe[68]
- Population density from National Census in 2011 for Poland[69]
- Number of deaths from natural causes in 2018 in Poland[70]
- Concentration – response function from WHO[71]

Concentration of PM2.5 in Poland is presented in Figure 6.1.

[65] Mike Holland for European Commission, Cost-benefit Analysis of Final Policy Scenarios for the EU Clean Air Package. Version 2. Corresponding to IIASA TSAP Report 11, Version 2a, October 2014.

[66] World Bank and Institute for Health Metrics and Evaluation, The Cost of Air Pollution: Strengthening the Economic Case for Action, 2016.

[67] World Health Organization and Organization for Economic Cooperation and Development Economic cost of the health impact of air pollution in Europe: Clean air, health and wealth, 2015.

[68] https://atmosphere.copernicus.eu/

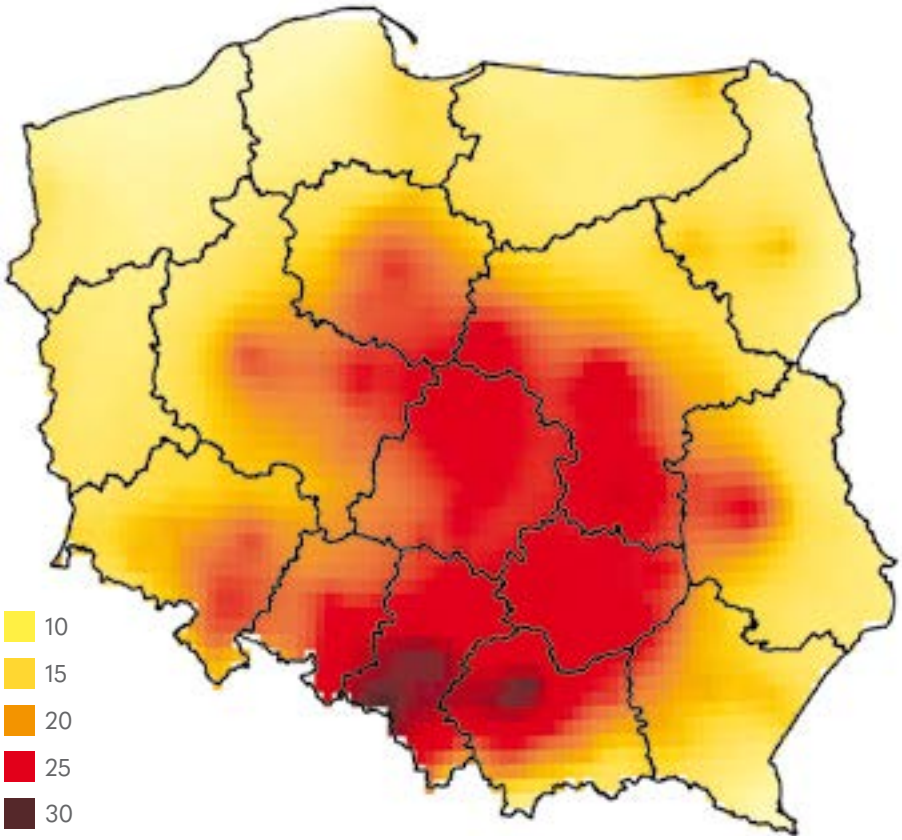
[69] https://geo.stat.gov.pl/inspire

[70] https://bdl.stat.gov.pl/BDL/start

[71] Health risks of air pollution in Europe – HRAPIE project Recommendations for concentration–response functions for cost–benefit analysis of particulate matter, ozone and nitrogen dioxide. World Health Organization, 2013.

FIGURE 6.1

CONCENTRATION OF ANNUAL PM2.5 IN 2018
[µg/m³]



It is worth noting that the lowest air pollution concentration calculated for Poland in 2018 is higher than the WHO recommendation for PM2.5 (10 ug/m³). **More than 50% of Poland's area has a concentration higher than 15 ug/m³, which constitutes 150% of the WHO recommendation threshold. For 10% of Poland, the WHO standard was exceeded at least twofold. Such a situation occurred in 10 of 16 regions.** It has to be stressed that 2018 was a relatively good year as far as the number and intensity of smog episodes is concerned.

FIGURE 6.2

POPULATION IN POLAND PER 1 KM²

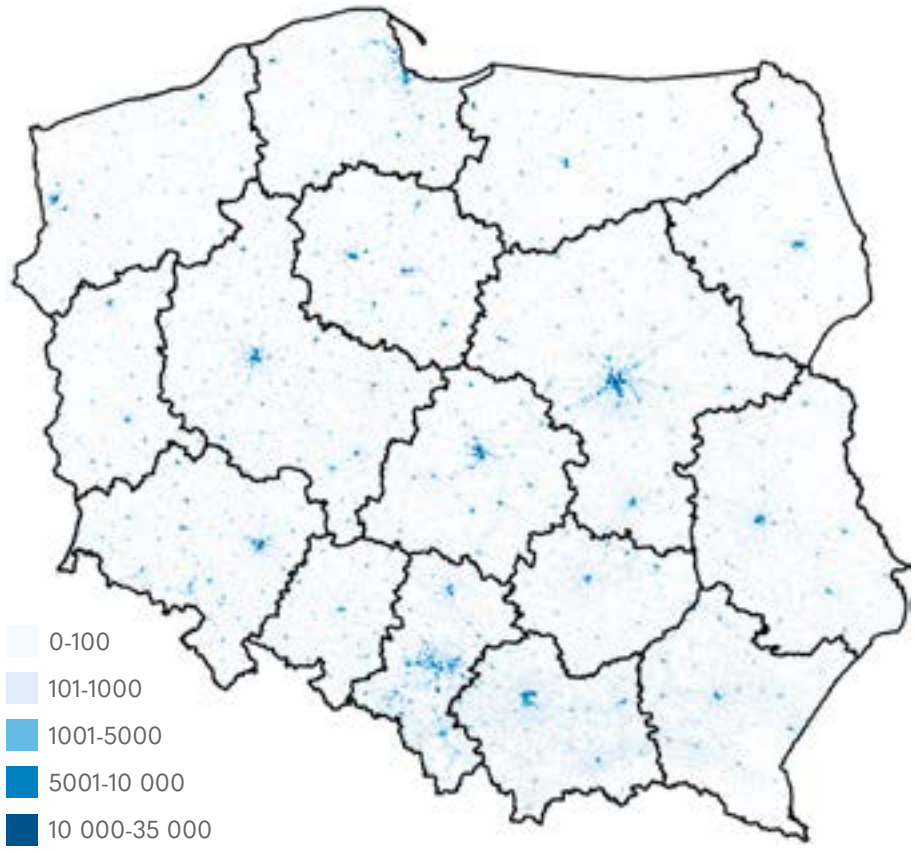


Figure 6.2 presents population exposed to air pollution. The most populated areas tend to also be the most polluted ones, with the exception of seaside cities. Therefore, air pollution is not a local issue but a countrywide one. In 2018 **almost 30% of the population was breathing air with a pollutant concentration amounting to over 200% of WHO standards.**

Total health impacts for Poland for 2018 have been calculated using the data presented in the Figure 6.1 and 6.2. Based on it, it was estimated that **41,694 premature deaths occurred in Poland due to PM2.5 pollution, which equals between EUR 45,000,000,000 and EUR 110,000,000,000 in cost.** This estimate is based on the national average. If local data were used, a variation of up to 10% would be possible. Since the first HIA, **the number of people whose death can be linked with air pollution in Poland has never dropped below 40,000** (according to the EEA method). **The external health cost remains constant as well.**

Applying the source apportionment of PM2.5 concentration on the national level allows to attribute external health costs to main emission sources. The shares of emissions[72] are not equal to concentration, especially when it comes to transboundary and national background emissions. A rough assessment is presented in Table 6.2.

[72] Mike Holland for European Commission, Cost-benefit Analysis of Final Policy Scenarios for the EU Clean Air Package. Version 2. Corresponding to IIASA TSAP Report 11, Version 2a, October 2014.

TABLE 6.1

ROUGH ESTIMATION OF EXTERNAL HEALTH COST OF AIR POLLUTION (PM2.5) GENERATED BY THE MAIN EMISSION SOURCES IN POLAND IN 2018 [BILLION]

SOURCE / RANGE	NATURAL [B EUR – B USD]	INDUSTRY AND AGRICULTURE [B EUR – B USD]	TRANSPORT AND AGRICULTURE [B EUR – B USD]	LOW-STACK EMISSIONS [B EUR – B USD]
Natural	2–9	–	–	–
Transboundary	–	5–16	2–7	0–2
National background	–	8–27	1–4	5–17
Urban background	–	1–4	1–5	10–32
Local transport	–	–	5–18	–
TOTAL	**2–9**	**15–48**	**11–36**	**16–52**

The highest external health cost of air pollution is generated by low-stack emission, followed by industry and agriculture, and local transport generating the third highest external health cost. The majority of health effects in Poland come from internal sources. The transboundary impact accounts for less than 30%. It has to be noted that national background statistics are only a rough estimation as they are based on 2010 figures[73].

6.5.2 › REGIONAL LEVEL

A health impact assessment carried out at the regional level can produce much more detailed results for each municipality. The ECAC team has recently prepared a Health Impact Assessment for one region of Poland. A HIA was prepared for a draft of the Air Quality Plan (AQP) of Małopolska Voivodship for 2020. It investigates the health impact reduction for all six emission reduction scenario variants. For each variant an analysis of health improvement compared to 2018 baseline scenario was carried out. Information from local and national datasets was used[74,75,76,77]. The number of avoided health effects per year compared to 2018 is presented in Table 6.3.

[73] Data on shares in PM2.5 concentration from 2010 was used, as in Poland integrated modelling has not been performed since then. Since the calculation with the shares of emission does not include secondary dust and dispersion of air pollution, it is the only valid option on the national level available at the moment.

[74] Marshal's Office of the Malopolska Voivodship, maps in a gdb format in accordance with the maps presented in consultation document, https://powietrze.malopolska.pl/konsultacje/

[75] Central Statistical Office, Local Data Bank https://bdl.stat.gov.pl/

[76] Central Statistical Office, Population projection for 2017-2030 https://stat.gov.pl/obszary-tematyczne/ludnosc/prognoza-ludnosci/prognoza-ludnosci-gmin-na-lata-2017-2030-opracowanie-eksperymentalne,10,1.html

[77] Health risks of air pollution in Europe – HRAPIE project Recommendations for concentration–response functions for cost–benefit analysis of particulate matter, ozone and nitrogen dioxide. World Health Organization, 2013.

TABLE 6.2

ANNUAL AVOIDED HEALTH EFFECTS IN MAŁOPOLSKA REGION FOR EACH AQP VARIANT

HEALTH EFFECT	VARIANT					
	0	1	2 full implementation of the anti-smog resolution	3	4	5 lowering air pollution to WHO standards
Premature death	637	1,195	1,452	1,453	1,454	1,802
Hospitalisation* due to cardiovascular diseases	208	562	661	662	662	841
Hospitalisation * due to respiratory diseases	167	378	451	451	452	567

* the duration of patient's stay in the hospital, lasting at least one night, from the entry in the general ledger to the time of discharge.

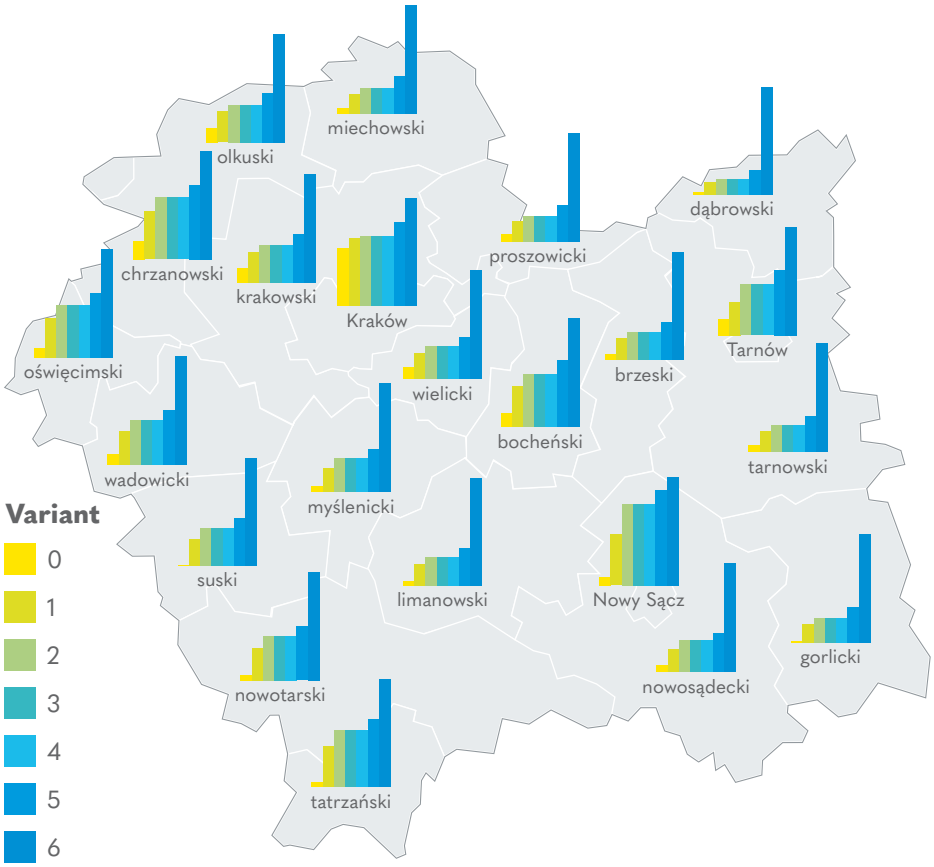
Results are also available at the level of each *poviat*[78] and an example is provided in Figure 6.3. It presents the number of avoided premature deaths per 100,000 population members compared with the baseline scenario. Similar calculations are available for hospitalisations due to cardiovascular and respiratory diseases[79]. Such an in-depth, detailed analysis is a source of knowledge based on research and as such it is a useful tool for developing ambitious air quality plans.

[78] A poviat is a second-level unit of local government and administration in Poland, an equivalent of a county.

[79] The full report is available at: https://polskialarmsmogowy.pl/files/artykuly/2324.pdf

FIGURE 6.3

ANNUAL AVOIDED PREMATURE DEATHS PER 100,000 POPULATION MEMBERS COMPARED TO 2018 | AS A RESULT OF IMPROVING AIR QUALITY ACCORDING TO A GIVEN VARIANT



6.5.3 › LOCAL LEVEL

The most in-depth analysis can be performed on a municipal level. A small spa-town of Ustroń will be presented for this purpose[80]. This municipality is located in the Silesia region, which is a mountainous terrain. Ventilation is limited as the town is located in a valley. Ustroń has a population slightly exceeding 15,000 people, but during holidays a considerable number of tourists visits the town. Therefore, this example can be extrapolated to other mountain resorts in Poland, with similar emission sources, terrain and patterns of seasonal tourist influx. Very detailed emission data from the local inventory campaign was used for the analysis. Figure 6.4 presents the results of a 100% reduction of all low-stack emission within the municipality, i.e. the introduction of a solid-fuel ban.

[80] Ustroń took part in a research and development project ZONE. ECAC members were in the project consortium and conducted calculations presented here.

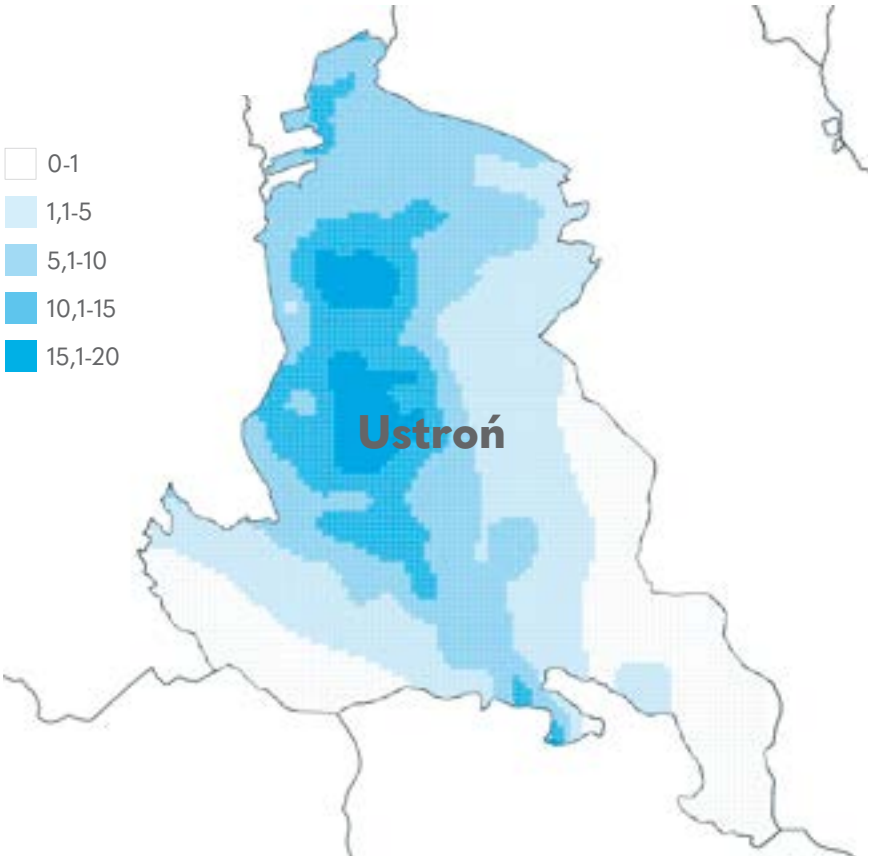
FIGURE 6.4

MAXIMUM REDUCTION OF EMISSION OF ANNUAL PM10 [KG/A] IN USTROŃ MUNICIPALITY WITH FULL ELIMINATION OF SOLID FUEL BOILERS

The spatial representation of this analysis is 100x100 m, which allows respective parts of this small city to be seen. This detailed analysis would not be available without a good inventory of low stack emission sources, which is a rare occurrence in Poland. Detailed input emission data allows to perform detailed air pollution modelling as shown in Figure 6.5.

FIGURE 6.5

CONCENTRATION REDUCTION OF ANNUAL PM10 [µg/m³] IN USTROŃ MUNICIPALITY WITH FULL ELIMINATION OF SOLID FUEL BOILERS



The data shown above presents the difference in the highest PM10 daily concentration in 2018 and the improvement of air quality thanks to the removal of solid fuel boilers. The improvement of air quality is then "translated" into the reduction of negative health effects. The range of health effects results from the fact that air quality improvement is not equal in every part of the city. This highly detailed assessment and presentation can facilitate work on air pollution reduction on the municipal level.

TABLE 6.3

USTROŃ'S HIGHEST DAILY HEALTH EFFECTS REDUCTION DUE TO REMOVAL OF SOLID FUEL BOILERS

HEALTH EFFECT	HOSPITALIZATION due to cardiovascular diseases	HOSPITALIZATION due to respiratory diseases	PREMATURE DEATH
Minimum	0.2%	0.5%	0.3%
Average	4.0%	11.1%	6.3%
Maximum	9.1%	25.3%	14.4%

7 SOCIAL ATTITUDES TOWARDS AIR POLLUTION

7.1 › SUMMARY

At a declarative level, smog is currently perceived as a problem by the majority of Poles (from 45% to 96-98%, depending on factors such as the survey profile as well as the type and context of questions). This perception prevails in southern regions and large cities, where the awareness of smog shapes people's daily routines and forces them to change their habits.

Factors which support air quality improvement include: an intense public debate on smog, increasing public awareness, the engagement of urban centres, understanding of health hazards, smog-induced impediment of outdoor activities, the intensity of the negative wintertime smog experience, active smog apps and a growing public support for restrictions.

Barriers include: social, demographic, political and economic divisions, denial of the problem of emissions (particularly in the case of wood burning), regional differences in awareness and low awareness outside urban areas, limited awareness of the existing air quality improvement tools and, last but not least, generally held misconceptions concerning emission sources.

As public awareness of air pollution is not uniform, campaigns should be run also outside of larger urban units. Both the perception and awareness of the problem among the residents of smaller localities require additional stimulation, especially in villages and cities of up to 20,000 inhabitants. When it comes to health risks linked with air quality, respiratory hazards are accurately identified, but cardiovascular problems are still underestimated. **A much wider promotion of the available air quality improvement measures (e.g. tax relief, subsidies, anti-smog regulations) is necessary,** as awareness of these tools remains low. Awareness raising campaigns should focus on two groups: (i) owners of old-type boilers with a relatively high and mid-range income, since the economic barrier is easier to overcome and (ii) lowest income group of boiler users who cannot afford unaided heat source replacement – they need a low financial threshold for modernisation and a simple procedure helping to avoid any formal obstacles to obtaining support.

The list of available quantitative and qualitative research is provided in the annex to this report.

7.2 › AIR QUALITY TRIGGERS

This chapter provides a brief overview of the factors which stimulate air quality improvement measures.

An intense public debate on smog: The discussion about air quality in Poland has been accelerating over the last 5 years. The general public has become aware of the problem of smog. It has permeated into conversations in direct social circles and impacted the daily routines of many Poles. The vast majority of Poles, amounting to 60%, declare[81] getting information about air quality from the media.

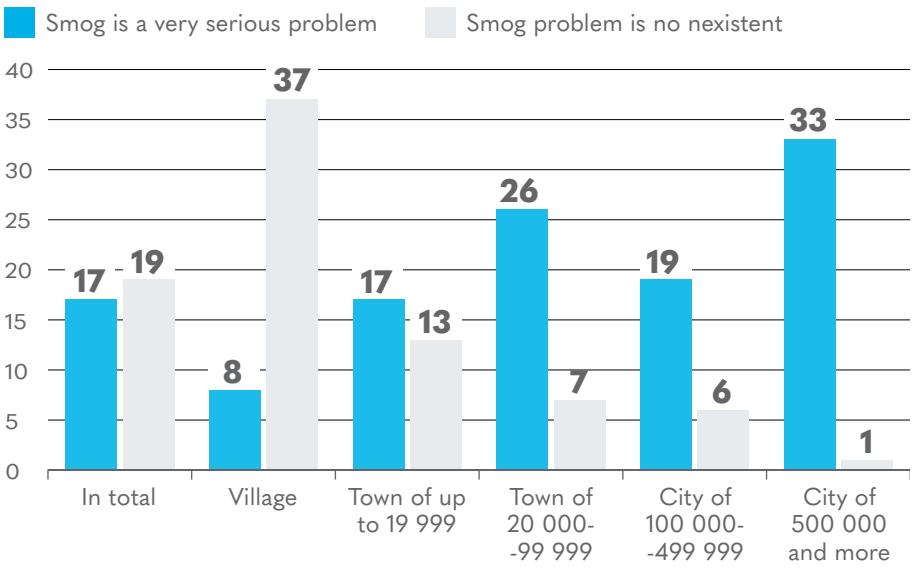
[81] CATI n=1109, December 2018, IPC.

Increased public awareness: the awareness of the level of air pollution is growing systematically[82], which translates into increasing importance of smog in the public discourse and expanding boundaries of the acceptance for solutions (e.g. withdrawal from coal use). Air pollution is considered to be the top environmental issue in Poland[83]. In some surveys[84], as many as 98% of respondents admit that the problem of air pollution is important to them. The percentage of people marginalising the problem declines from year to year.

Urban centres supporting the acceleration of the debate: Assessment of air quality in the place of residence is strongly linked with the size of a given locality. The example of Warsaw, the largest Polish city, shows[85] that air quality is essential to residents. The larger the city, the stronger the public reaction to the problem of smog[86]. It indicates the necessity to raise awareness in smaller centres, with a focus on villages and towns of up to 20,000 inhabitants.

FIGURE 7.1

PERCEPTION OF THE SERIOUSNESS OF THE AIR POLLUTION PROBLEM, CAPI N=968, FEBRUARY 2019, CBOS

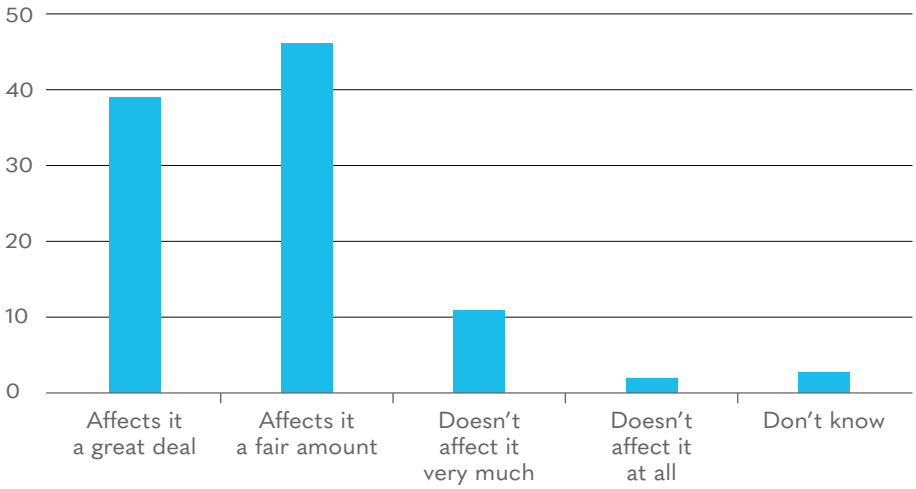


Smog has reached a high position in the hierarchy of health risk factors. It appears among the top 5 factors[87] which are currently the biggest health hazard to Poles. 91% of respondents in Poland are worried about air pollution as a public health issue[88]. Air pollution comes ahead of infectious diseases (85%) – note that the poll was conducted after the COVID-19 outbreak, climate change (85%), mental health (78%), drugs and alcohol (73%), obesity (72%) and smoking (62%). Poles know[89] that poor air quality translates into an affected well-being, a growing number of infections, respiratory problems, etc. Associations with the respiratory system have been established, but awareness of the influence of air pollution on the cardiovascular system is still lacking.

[82] CATI n=1000, September 2016, CEM for KAS.
[83] CAWI N=500, qualitative online forum, January 2019, Kantar.
[84] CAWI n=802, IDI n=20, March 2019, Kantar.
[85] CAPI n=1100, June 2016, Realization for Warsaw City Hall.
[86] CAPI n=968, February 2019, CBOS.
[87] CAWI n=955, November 2017, ARC.
[88] CAWI n=1005, June 2020, CAF.
[89] CAWI n=802, IDI n=20, March 2019, Kantar.

FIGURE 7.2

AWARENESS OF AIR POLLUTION'S IMPACT ON RESPONDENTS' HEALTH IN POLAND. CAWI N=1005, JUNE 2020, CAF



Lifestyle changes forced by smog result in a growing frustration: Maintaining a healthy lifestyle through eating a healthy diet, doing sports and having access to clean air is gaining importance in Poland[90]. Inhabitants of regions most severely affected by smog[91] are forced to modify their daily plans due to bad air quality more and more often. Smog hinders the expected forms of leisure, which increases the potential of public engagement. Almost 80% of respondents[92] admit that air pollution is burdensome to them. Change of behaviour during smog events is usually declared[93] by people between 25 and 34 years of age (28%). The larger the city, the more aware and "responsive" their residents are.

In winter season the negative effects of smog are most obvious: air pollution is most noticeable during the heating season[94] (winter – 95%, autumn – 55%). This reflects the fact that air quality ratings during the heating season are much lower than the general ratings, regardless of the size of a given locality[95].

Apps attract attention and remind of the importance of the problem: Smog alerts and the tangible results of poor-quality air are a source of inconvenience and prevent people from carrying their plans out. Information about smog is followed just like weather forecasts. As many as 94% of Poles[96] notice the problem of smog in Poland. Every fifth respondent follows smog alerts and modifies their behaviour if the smog level is high. Younger respondents and those with higher education seek such information more often than others[97].

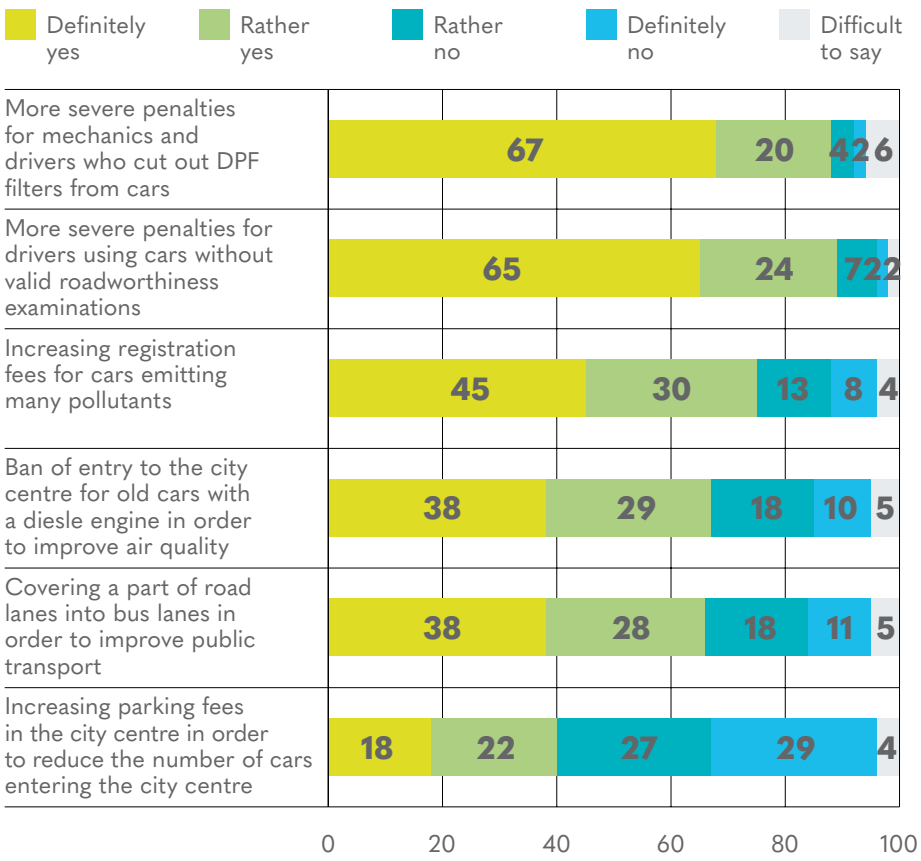
Support for restrictions is growing: The problem of air pollution is such a common phenomenon that respondents expect resolute action on the part of the local authorities[98]. For example, a large portion of Małopolska's population holds a conviction that the problem of air pollution can only be solved by means of a substantial limitation of the number of coal-based heating sources and a major reduction of the amount of coal used in individual households or even through imposing a total ban on the use of that fuel[99]. Subsidies obviously enjoy a widespread

[90] CAWI N=500, qualitative online forum, January 2019, Kantar.
[91] CAWI n=802, IDI n=20, March 2019, Kantar.
[92] CAWI n=802, IDI n=20, March 2019, Kantar.
[93] CAWI n=955, November 2017, ARC.
[94] CAWI n=802, IDI n=20, March 2019, Kantar.
[95] CATI n=1109, December 2018, IPC.
[96] CAWI n=955, November 2017, ARC.
[97] CAPI n=968, February 2019, CBOS.
[98] CAWI n=1000, January 2020, Kantar.
[99] CATI n=1000, March-April 2018, CEM for KSA.

support – they are spontaneously mentioned by 72% as the main air quality improvement measure[100]. Over 90% of Małopolska's residents support the obligation to replace old-type boilers, provided that subsidies are secured. A similar percentage of respondents supports the ban on low quality coal sale[101]. Restrictions aimed at reducing motor traffic pollution are also gaining support[102].

FIGURE 7.3

SUPPORT OF THE INHABITANTS OF THE FIVE LARGEST CITIES IN POLAND FOR ACTIONS AIMED AT REDUCING TRAFFIC-RELATED AIR POLLUTION. CATI, N=1500, FEBRUARY 2020, CEM FOR KSA



7.3 › AIR QUALITY BARRIERS

Public and demographic divisions: The higher the level of education and the bigger the urban centre, the stronger the criticism of air quality[103]. People living in the countryside as well as people with the lowest income are the least critical as far as the quality of air is concerned. For example, in Małopolska only 29% of the respondents living in rural areas assess air quality negatively, compared with 52% of the general population of the region[104]. The assessment of air quality in the place of residence becomes more negative[105] with respondents' age: the older respondents tend to be more critical than the young. The level of education marks another division: among the people with the lowest level of education, 62% find the quality of air satisfactory, while in the group with highest level of education – half as many (31%). This situation creates a risk of an economic conflict.

[100] CATI n=1000, March-April 2018, CEM for KSA.
[101] CATI n=1000, March-April 2018, CEM for KSA.
[102] CATI n=1500, February 2020, CEM for KSA.
[103] CATI n=1000, March-April 2018, CEM for KSA.
[104] CATI n=1000, March-April 2018, CEM for KSA.
[105] CATI n=1109, December 2018.

Social and political divides overlap: One's evaluation of the effectiveness of the governmental anti-smog policy is determined, to some extent, by their political views and preferences[106]. In general, it is received well by respondents expressing right-wing and conservative views.

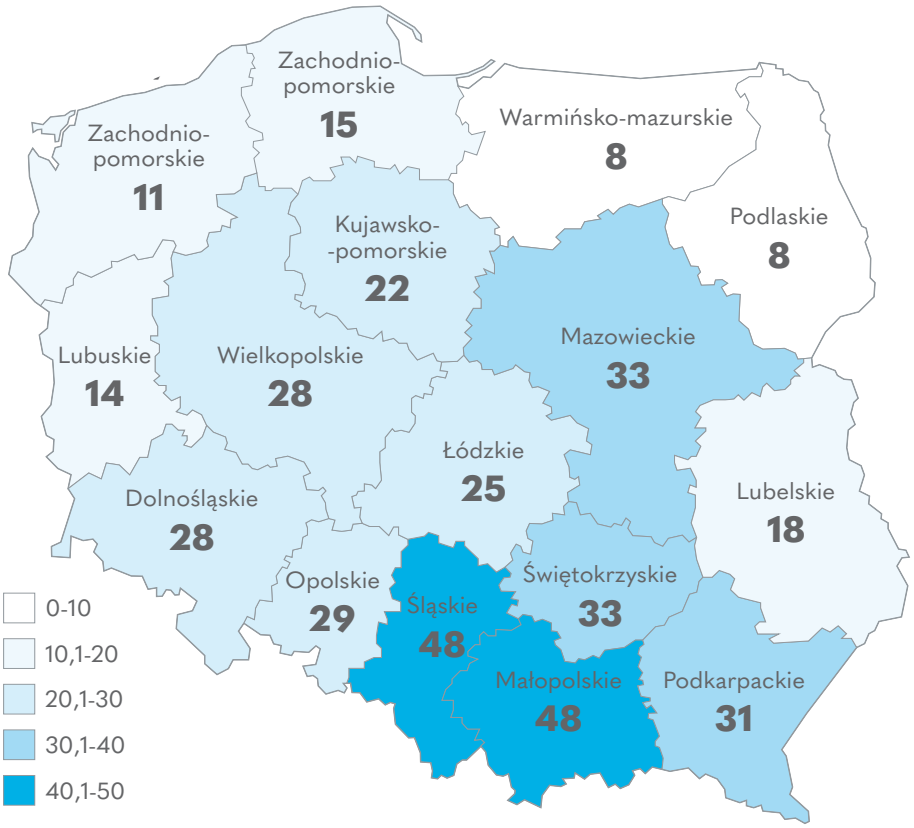
Serious economic divides: According to the vast majority of respondents[107], the fight with smog can be ineffective due to economic reasons: the high cost of heating equipment and too low subsidies. In the opinion of Poles, air quality problems would be solved most effectively through financial drivers[108], promoting low-emission products. e.g. heat sources[109].

The problem of emissions is denied: Many respondents express a view that smog[110], while being a serious problem on the national scale, is rather insignificant in their local area. Many also believe that their area is free from smog. Owners of solid fuel boilers tend to make light of their personal contribution to the smog problem in Poland[111].

Regional differences hinder finding common ground on the national level: A person's approach to smog may depend on the area of the country they live in. It is caused by the fact that the level of air pollution varies from area to area and it is lower in the north of the country.

FIGURE 7.4

NEGATIVE ASSESSMENT OF AIR QUALITY, DEPENDING ON THE REGION. CAWI, N=1965, DECEMBER 2019, PIE



[106] CAPI n=968, February 2019, CBOS.
[107] CATI n=1109, December 2018, IPC.
[108] CAPI n=1009, December 2017, Kantar.
[109] IDI n=10, May 2019, CEM.
[110] CAWI N=500, qualitative online forum, January 2019, Kantar.
[111] IDI n=10, maj 2019, CEM for KSA.

Insufficient awareness of the low-stack emission problem: Most Poles are not able to identify the main sources of pollution. Only 35% of the respondents are aware of the fact that more air pollutants are generated by households burning solid fuels than by industry. What is more, the recent CAF research reveals that most respondents wrongly identify industry as the largest contributor to air pollution (72%), which is followed by transport (55%) and domestic heat production (46%). It should be noted, however, that regular campaigns result in an increased awareness. Research conducted in the Małopolska region confirms that the awareness of low-stack emission being the main source of air pollution has been growing systematically, increasing from 58% to 72%.

Low awareness of legislation and air quality improvement tools persists: The majority of respondents (43%) admit[112] that they are not sure whether any financial tools supporting the implementation of solutions aimed at combating poor air quality, such as thermo-modernisation or boiler replacement, are available to them. Slightly over one-third of respondents (38%) believe that such solutions are available in their place of residence. The opposite opinion is expressed by almost half as many respondents (19%). Unfortunately, this awareness is also low among the owners of "smokers", which need to be replaced in the coming years according to anti-smog resolutions. Only 45% of the owners of "smokers" have heard about the obligation to replace old-type coal and wood boilers and only 13% know the deadline by which this should happen. Likewise, the awareness of support programmes, such as the Clean Air Programme or the tax relief, is low among this group – 80% declare that they know nothing or little about subsidies to boiler replacement and thermal renovation[113].

7.4 › COMMUNICATION AND CAMPAIGNS

Numerous anti-smog campaigns with a significant social impact were held in Poland in the recent years, with the first ones taking place almost a decade ago. Such campaigns combine numerical data with an emotional impact, promoting pragmatism and focusing on the problem of smog, while maintaining political neutrality. What is important, frequently they not only draw the public's attention to the problem but also offer specific solutions, such as legislative changes or financial programmes.

When shaping communication about smog in Poland, there are three main aspects to consider: **the locality of the problem, the directness of the experience and the economic constraints experienced by a part of users of old-type boilers** which may lead to strong opposition and denial of the problem. Another aspect to consider is the misconception about coal being the most economically advantageous fuel. Locality is the key to success, both in identifying the local causes of air pollution and changing the attitudes towards the problem of smog in small communities.

The importance of the smog problem on the local level is best communicated through references to proximity, the local neighbourhood and personal, everyday experience. Messages addressing smog on the national level, e.g. "Poland has the worst air in Europe", have less impact. Another factor to consider is the reaction of the local community, as it has to show capacity to accept the new laws and adapt to them. Smog, in the eye of the general public, is the smelly air outside the home, a neighbour burning garbage, dark smoke coming from chimneys. It is necessary to have an understanding of the local conditions, to be aware of what aspects of bad air quality are found disturbing by a given community, how a given community defines its smog-related problems and what capacity for change it has. If these aspects are not taken into account, administrative changes may prove to be ineffective.

[112] CATI n=1109, December 2018, IPC.

[113] CATI, n=600, February 2019, CEM for IEE.

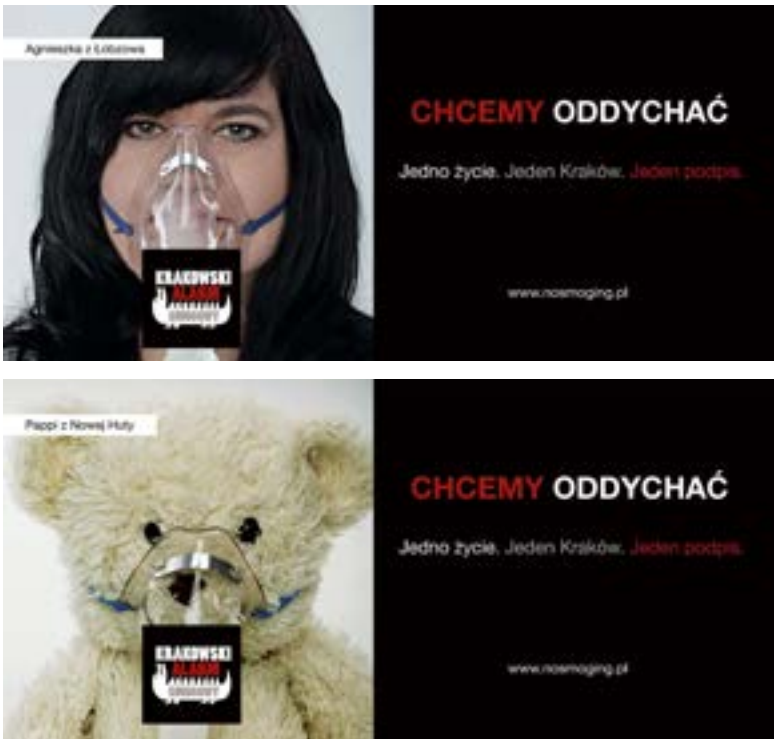
When talking about smog, it is important to make it relatable by appealing to people's personal, direct experience of it. Everyone has contact with air and is aware of its existence, we all experience it. Therefore, anti-smog campaigns should not only communicate facts but also appeal to people's sensory experiences. When talking about smog, one can remain ideologically and politically neutral and still be effective thanks to drawing on people's shared experience of smog.

Economic restrictions constitute an important factor in the fight with smog in Poland. Because of the economic restrictions they face, low-class boiler users may disregard or deny the problem of smog. It is crucial to understand low air quality as a common problem of the entire society. Stigmatising negative attitudes will not help overcome the economic barrier. Collaboration and affordable programmes are needed.

EXAMPLES OF CLEAN AIR CAMPAIGNS

Air quality campaigns are usually initiated and led by motivated groups of people associated around foundations or other grassroots organisations with limited resources. They are frequently supported pro-bono either by PR agencies or celebrities.

First air quality campaigns were organised in 2013, by Kraków Smog Alert. The objective of the February 2013 campaign, under the slogan „ Kraków wants to breathe", was to draw attention to air pollution in Kraków and to encourage the signing of a petition calling for adopting effective measures of improving air quality and introducing a ban on using coal. Outdoor media, regional and national media were used. What is interesting, the campaign was conducted pro-bono by one of advertising agencies based in Kraków.



The next campaign led by Kraków Smog Alert in September 2013 was aimed at convincing the Regional Parliament to vote in favour of the coal ban. Posters showing appeals and comments from Kraków residents, placed under the anti-smog petition, appeared on 50 tram and bus stops in Kraków. The messages were literal and rooted in the local reality, as they came from Cracovians and were illustrated by graphic designers from Kraków. The campaign was financed by Cracovians themselves, which linked it even more with the local area and further strengthened its appeal to the local community.

At the end of 2016, the Małopolska Regional Authority – Marshal's Office – led a strong campaign under the slogan „The smoke from your stove kills." Its purpose was to raise awareness of the fact that individual consumers' decisions concerning heating their homes have a huge impact on the health of the entire community. The message was accompanied by a visual element evoking a strong emotional response, a disturbing picture of a child suffocating inside a plastic bag, with the aim of attracting recipients' attention.

A recent campaign of the Marshal of the Małopolska Voivodship in cooperation with the Kraków Smog Alert, called „There is a thief living in your home", focused on raising awareness of the drawbacks of old-type furnaces: the time spent operating them, the related costs as well as the impact on health, comfort and freedom. The campaign was conducted in the Małopolska region, using electronic and traditional media. It shows the benefits of replacing the old coal boilers, quoting real, satisfied consumers who have replaced their old-type coal boilers with heat pumps, geothermal energy and gas boilers.

Drawing on the experiences of the past campaigns and awareness-raising activities, the following can be recommended:

- To focus on a well-defined, specific smog problem, omitting other aspects of environmental protection;
- To avoid political disputes and keep the topic of air pollution politically neutral;
- To talk about practical solutions and point out issues related to the quality of fuel and the class of the heating boiler, remaining within the realm of issues which the consumers may have experienced and can relate to;
- To convey messages based on facts and with a potential of evoking emotions in a recipient.

SEGMENTATION OF AUDIENCES AND STAKEHOLDERS TO BE ENGAGED

In the anti-smog activities conducted so far, three basic types of target audiences can be distinguished:

- The Polish population in general, as it is the target audience of information campaigns and nationwide programmes aimed at improving air quality, as well as an active participant of public debates;
- Local provincial and urban populations for which local campaigns have been undertaken, highlighting the local dimension of the smog problem, which is more severe in some regions than in others;
- The urban population, people with higher education and economic standing above average, people in touch with academic circles, people able to invest in their health and self-care, young parents with children, etc. These groups are a natural ally because incorporating physical activity into their daily routines (running, cycling, going out for walks with children) has become more difficult because of smog. From the very beginning of the heated discussion on smog in 2012 – 2013, the middle class has been the most engaged group who embraced and carried on the idea of clean air in Poland.
- Owners of outdated emission heating boilers; it is necessary to reach this group, as they are responsible for the main source of air pollution. They need to be informed about their impact on air quality, legislation obliging them to replace their heating sources and financial programmes that can help them this.

Among the stakeholders who need to be engaged in future air quality improvement campaigns are:

- **Smog activists:** citizens fighting locally for air quality improvement, currently associated in more than 40 local Smog Alerts, who are usually volunteers devoting their spare time to acting against smog. The success of the anti-smog campaign on a national level depends on the involvement of smog activists in their local areas. They have access to local government authorities, initiate discussions in the local community and conduct educational campaigns.
- **National politicians:** responsible for adopting necessary legal changes along with control measures as well as developing and implementing financial programmes aiding clean air reforms.
- **Local government authorities** of all levels, from municipal to regional level. They are the primary recipient of public pressure, including local smog alerts. Simultaneously, they are responsible for implementing specific air quality improvement measures.

ANNEX | LIST OF PUBLIC OPINION RESEARCH ON AIR QUALITY

2020

- Survey on eco-friendly attitudes, CAWI n=1000, weighted purposive sample, January 2020, Kantar for commercial Client
- Survey entitled "Transportation behaviours of Polish city dwellers," CATI n=1500, February 2020, CEM Market and Public Opinion Research Institute for Krakow Smog Alert
- Survey entitled "Climate change in the perception of Lesser Poland residents," CATI n=1000, March 2020, CEM Market and Public Opinion Research Institute for European Clean Air Centre
- Survey entitled "Air pollution and COVID-19", CAWI n=1005, May 2020, YouGov for the Clean Air Fund

2019

- Survey entitled "Air quality in Poland," CAWI N=500, qualitative online forum, January 2019, Kantar for commercial Client
- Survey entitled "Current problems and affairs" CAPI n=968, February 2019, CBOS Public Opinion Research Centre
- Survey entitled "Attitudes towards environmental protection," CATI, nationwide weighted sample, February 2019, Kantar for commercial Client
- Survey entitled "Owners of single-family buildings heated with solid fuel boilers" CATI n=600, March 2019, CEM Market and Public Opinion Research Institute for the Institute of Environmental Economics
- Survey on the air-related market sector, CAWI n=802, IDI n=20, March 2019, Kantar for commercial Client
- Survey entitled "Installers of solid fuel boilers," IDI n=10, May 2019, CEM Market and Public Opinion Research Institute for the Institute of Environmental Economics
- Survey entitled "Poles and air protection", CAWI, n=1965, December 2019, Polish Economic Institute

2018

- Survey entitled "Air quality according to Malopolska residents" CATI n=1000, March-April 2018, CEM Market and Public Opinion Research Institute for Krakow Smog Alert
- Survey entitled "Awareness of air quality protection", CATI n=1109, Masovian Voivodeship population structure, December 2018, IPC for the Masovian Voivodeship
- Survey entitled "Coal-fired boilers and fireplace users," FGI n=4, December 2018, CEM Market and Public Opinion Research Institute for Krakow Smog Alert

2017

- Survey entitled "I know what I breathe in – Poles' view on smog", CAWI n=955, November 2017, ARC for Aviva
- Survey entitled "Smog! And what's next?," CAWI n=609, March 2017, Assessment Centre
- Survey entitled "Air quality in EU", CAPI n=1009, December 2017, Kantar

2016

- Survey entitled "Adaptation to climate changes," CAPI n=1100, representative sample for the structure of Warsaw inhabitants, June 2016, Realisation for Warsaw City Hall
- Survey entitled "Air quality according to Małopolska residents" CATI n=1000, September 2016, CEM Market and Public Opinion Research Institute for Krakow Smog Alert

EUROPEAN CLEAN AIR CENTRE (ECAC) was founded in 2019 by Krakow Smog Alert, a civil society organization advocating for clean air. ECAC is a think-tank whose mission is to support civil society organizations and decision makers with knowledge and solutions aimed at air quality improvement and climate protection. Its founders possess multiyear experience in advising international, national and local institutions on air quality policies with particular focus on health impacts, environmental finance and regulations as well as behavioural aspects.

KANTAR

KANTAR is one of the global leaders specializing in data, knowledge and understanding society. It operates in the entire spectrum of research disciplines, and its specialized organizations employing 30,000 people deliver inspiring knowledge and formulate business strategies for corporations and public institutions in 100 countries. Kantar is a member of Bain and WPP capital group, and its services are used by over half the companies from the Fortune Top 500 list.

Frank Bold

FRANK BOLD FOUNDATION is a legal non-governmental organization that focuses on human rights protection, the right to clean environment and respect for the principles of the democratic rule of law. One of the Foundation's areas of activity is air quality improvement – Frank Bold provides legal assistance to citizens fighting for clean air, organises training for local authorities on environmental law and advises central government bodies on legislative solutions aimed at air protection.