REPORT
on air quality protection at the local self-government level in the Republic of Serbia
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<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAQMN</td>
<td>Automatic Air Quality Monitoring Network</td>
</tr>
<tr>
<td>AQ</td>
<td>Air Quality</td>
</tr>
<tr>
<td>AQP</td>
<td>Air Quality Plan</td>
</tr>
<tr>
<td>As</td>
<td>Arsenic</td>
</tr>
<tr>
<td>BaP</td>
<td>Benzopyrene</td>
</tr>
<tr>
<td>C(_6)H(_6)</td>
<td>Benzene</td>
</tr>
<tr>
<td>CAFE</td>
<td>Clean Air for Europe</td>
</tr>
<tr>
<td>Cd</td>
<td>Cadmium</td>
</tr>
<tr>
<td>CLTRAP</td>
<td>Convention on Long-range Transboundary Air Pollution</td>
</tr>
<tr>
<td>CO</td>
<td>Carbon monoxide</td>
</tr>
<tr>
<td>EC</td>
<td>European Commission</td>
</tr>
<tr>
<td>EEA</td>
<td>European Environment Agency</td>
</tr>
<tr>
<td>EIONET</td>
<td>European Environment Information and Observation Network</td>
</tr>
<tr>
<td>EMEP</td>
<td>European Monitoring and Evaluation Program</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>LSGs</td>
<td>145 Local Self-Government Units</td>
</tr>
<tr>
<td>MEP</td>
<td>Ministry for Environmental Protection</td>
</tr>
<tr>
<td>Ni</td>
<td>Nickel</td>
</tr>
<tr>
<td>NO</td>
<td>Nitrogen monoxide</td>
</tr>
<tr>
<td>NO(_2)</td>
<td>Nitrogen dioxide</td>
</tr>
<tr>
<td>O(_3)</td>
<td>Ozone</td>
</tr>
<tr>
<td>PAH</td>
<td>Polycyclic Aromatic Hydrocarbons</td>
</tr>
<tr>
<td>Pb</td>
<td>Lead</td>
</tr>
<tr>
<td>PHI</td>
<td>Public Health Institutes</td>
</tr>
<tr>
<td>PM(_{10})</td>
<td>Particulate matter with a diameter less than 10 micrometers</td>
</tr>
<tr>
<td>PM(_{2.5})</td>
<td>Particulate matter with a diameter less than 2.5 micrometers</td>
</tr>
<tr>
<td>PRTR</td>
<td>Pollutant Release and Transfer Register</td>
</tr>
<tr>
<td>QA</td>
<td>Quality Assurance</td>
</tr>
<tr>
<td>QC</td>
<td>Quality Control</td>
</tr>
<tr>
<td>SCTM</td>
<td>Standing Conference of Towns and Municipalities</td>
</tr>
<tr>
<td>SEPA</td>
<td>Serbian Environmental protection Agency</td>
</tr>
<tr>
<td>SO(_2)</td>
<td>Sulfur dioxide</td>
</tr>
<tr>
<td>StP</td>
<td>Short-term Plans</td>
</tr>
<tr>
<td>UN</td>
<td>United nations</td>
</tr>
<tr>
<td>UNDP</td>
<td>United Nations Development Programme</td>
</tr>
<tr>
<td>UNECE</td>
<td>United Nations Economic Commission for Europe</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
<tr>
<td>YLL</td>
<td>Years of Life Lost</td>
</tr>
</tbody>
</table>
Air pollution is currently one of the most important environmental risks to human health. It is perceived as one of the greatest threats to human well-being around the world, together with climate change issues. As a result, there is a growing political, media, and public interest in air quality and increased public support for action at all levels. In the Republic of Serbia, there are several hot-spots where industry pollutes air (thermal power plants, ironwork and cement factories, mining, etc.). At the same time, traffic and transport in large cities and individual (household) heating pollute air in almost all municipalities. In some cases, such as Užice and Valjevo, the unfavorable geographic location, such as valleys and gorges, additionally aggravate the situation.

The Republic of Serbia has ratified or acceded to all current international conventions, coordinated by the United Nations (UN) such as the Convention on Long-range Transboundary Air Pollution (CLRTAP), Pollutant Release and Transfer Register (PRTR) and others, and has an active role in the coordinating bodies led by UN organizations (UNECE, UNDP, etc.). In the process of European Union (EU) integration, while presenting its Negotiation position for Chapter 27 (Environment and Climate Change) to the European Commission (EC) in 2019, the Republic of Serbia expressed its commitment to the transposition of the entire EU legislation into the national one, including the air quality directives. As a part of this process, the Serbian Environmental Protection Agency (SEPA) started collaboration with the European Environment Agency (EEA) back in 2004 by providing environmental monitoring datasets. Today, Serbia has the status of cooperating country, and it is fully involved in almost all current activities of the EEA and its network of European organizations and experts – Eionet (European Environment Information and Observation Network). In relation to the air quality related issues, this cooperation consists of providing “Core Data Flows”, later to be used in numerous EEA products as well as in participation of national experts in the thematic working groups (Air Quality, Air Emissions, Industrial Pollution, Environment and Health, etc.). SEPA delivers all the required datasets to EEA, including those related to air quality: Air Quality, CLRTAP and PRTR.

One of the main obstacles in tackling air quality related issues, as in many countries in transition, is the lack of administrative capacity at all levels, as well as the lack of an appropriate long-term funding solution. There are plenty of initiatives to provide solution for a local or regional air quality problem. Usually, when certain measures are applied there is a temporary improvement in air quality. However, due to the lack of a strategic and holistic approach and stable funding over the long-term, the problem soon reappears.

Administrative capacity is a question of even higher importance than the funding. The results of the survey used for preparing this Report clearly show that at the local municipal level there is often no person dedicated to environmental protection and no trained personnel to provide a simple overview of the current state of the field of air quality.
1. Background

1.1. Strategic and Legal Framework

The legislative set-up in the Republic of Serbia in the field of Air Quality (AQ) is constantly developing towards the full transposition and harmonization with key EU regulations in this field. The overarching Law on Environmental Protection was introduced back in 2004, and has been amended multiple times, with the latest version adopted in 2018.

The Law on Environmental Protection provides a general framework for environmental protection by defining terms, subjects of environmental protection, main principles as well as a set of laws to cover specific environmental topics, air quality protection among them. Air quality protection is explicitly mentioned in Article 24 which provides guidelines to achieve air quality protection, namely prescribing measures such as systematic air quality monitoring, reduction of air emissions that rise above defined limit values and the application of technical and technological solutions for pollution reduction. It also states that air protection measures ensure the preservation of the atmosphere as a whole with all its processes and climatic characteristics. Several articles of Chapter 2.1. provide details on Environmental quality requirements and emission requirements including air quality control. Another chapter titled “Public participation in decision making” provides rules on public participation in environmental protection activities and, related in particular to air quality protection, it states that “The public and the interested public have the right, in accordance with the law, to participate in the decision-making process on: …. 4) Drafting, amending, reviewing and adopting air quality plans” (Article 81). Other articles also regulate use of funds, the roles of environmental inspectors and penalty provisions.

As defined in this law, the main legislative act in the Republic of Serbia that tackles air quality related issues is the Law on Air Protection (“Official Gazette of the Republic of Serbia”, No. 36/09 and 10/13) accompanied with several by-laws, namely the Regulation on monitoring conditions and air quality requirements (“Official Gazette of the Republic of Serbia”, No. 11/10, 75/10 and 63/13), the Rulebook on the content of air quality plans (“Official Gazette of the Republic of Serbia”, No. 21/10) and the Rulebook on short-term action plans (“Official Gazette of the Republic of Serbia”, No. 65/10).

The Law on Air Protection is the main legislative tool in providing the legal frame for air quality protection in Serbia. It defines the responsibilities and duties in the protection and improvement of air quality, in particular authorizing all levels of government (national, provincial and local) as well as companies and private entrepreneurs to ensure the protection and improvement of air quality (Article 4). The same article also specifies that AQ monitoring and air emissions monitoring should be performed by the competent state administration bodies and legal entities that have a license to perform this activity (provided by the responsible authority).

Articles 5 to 8 defines zones and agglomerations and the conditions for their establishment as well as the list of pollutants required to be monitored: sulphur dioxide, nitrogen dioxide and oxides of nitrogen, suspended...
particles (PM_{10}, PM_{2.5}), lead, benzene and carbon monoxide, ground-level ozone, arsenic, cadmium, nickel and benzo (a) pyrene and others when prescribed by international regulations.

Articles 9 to 17 are also dedicated to Air Quality Monitoring, outlining the conditions for performing AQ monitoring (the criteria, methodologies, assessment requirements, quality assurance, scope and content of information to be provided). These articles also delineate the responsibilities for operation of the State Network (Article 13) and local networks (Article 15). In more detail, it describes the local networks (regional or municipal) as those consisting of additional measuring stations and/or measuring points determined by the competent authority of the autonomous province and of the local self-government unit on the basis of measurements or assessment procedures for zones and agglomerations for which there is no data on pollutants, according to their needs and abilities.

In relation to the funding of the local networks, it is explicitly stated that: “Funds for the implementation of air quality control programs in the local network are provided from the budget of the autonomous province and the budget of the local self-government unit” (Article 15, Paragraph 5).

Section 2 of the same Law, entitled “Air Quality Plans” has one Article (31) that defines conditions and responsibilities for creating local Air Quality Plans (AQPs). Namely, it specifies that provincial and local self-government bodies are obliged to produce such plans in cases when in their zone or agglomeration the air quality is assessed as III category quality and, moreover, in cases when air pollution overcomes already implemented measures and when the environmental capacity is endangered or there is a permanent increase in the concentration of pollutants in a particular area. It is also prescribed that these plans must be approved by the relevant Ministry (the Ministry responsible for environmental protection). In more detail, Article 32 provides a detailed overview of the content of AQP specifying that each plan should contain: data on the location (area) of increased pollution; basic information on the zone and agglomeration; data on the type and level of pollution; data on the source of pollution; analysis of the situation and factors that influenced the occurrence of exceedances; details of improvement measures or projects that existed before the entry into force of this law; details of measures or projects implemented with the aim of reducing pollution after entry into force of this law; details of measures or projects planned in the long-term; bodies responsible for the development and implementation of the plan; and a list of documents, publications and other documents which support the data stated in the plan.

In addition, Section 3 defines conditions for producing Short-term Plans (StP), prescribing that preparation of these plans is obligatory in cases that: there is a danger that the levels of pollutants in the air exceed one or more concentration dangerous to human health; and there is a danger of exceeding the concentration of ground-level ozone dangerous to human health. The articles that follow (34 – 36) outline the content of StP, public participation, as well as internal and external reporting procedures.

Section 7 defines other measures for preventing and reducing air pollution, in particular, actions in cases of technological accidents. It also defines the responsibilities of operators, the permitting procedure, and cases of work interdictions.
Finally, Section 9 focuses on providing funding for air quality protection and improvement through two articles. Article 71, covering funding sources, defines national, provincial and municipal budgets as the main resource for funding, while Article 72 prescribes the modes and activities eligible for funding (such as air quality assessment, operational monitoring, realization of programmes, and measures for implementation).

In addition to the law described above, further legal conditions are provided in the Regulation on monitoring conditions and air quality requirements. This by-law defines the conditions for air quality monitoring as including: the criteria for determining the minimum number of measuring points and locations for sampling in the case of fixed measurements and in cases where fixed measurements are supplemented with indicative measurements or modelling procedures; air quality measurement and assessment methodology; data requirements that are used to assess air quality; how to ensure the quality of data for assessment of air quality; and the scope and content of information on quality assessment in accordance with the Law on Air Protection. The by-law also provides definitions of terms, including: the conditions for monitoring and data collection; the responsibilities of the competent authorities; the methods of monitoring air pollution levels; reference measurement methods for air quality assessment; assessment criteria; quality assurance and quality control of the measurements; air quality assessment; the limit and tolerance values and tolerance limits; target values, national and long-term objectives; the concentrations hazardous to human health and concentrations reported to the public; informing the public; and the scope and content of information on air quality assessment.

This by-law has several important annexes, the first one dealing with the determination of measurement points and locations for sampling the measurement of concentrations of sulphur dioxide, nitrogen dioxide and nitrogen oxide, suspended particles (PM$_{10}$, PM$_{2.5}$), lead, benzene and carbon monoxide for the purpose of assessing air quality. The second prescribes the minimum number of measuring points and locations for sampling for the purpose of measuring concentrations and deposition rates of arsenic, cadmium, mercury, nickel, polycyclic aromatic hydrocarbons (PAH) and benzo(a)pyrene in air. Other annexes deals with: the criteria for classification and determination of measuring points and the locations for measuring in order to measure ground ozone concentrations; measurement objectives, the list of parameters to be measured and criteria for determination of measurement places and locations on basic rural locations independent of concentrations of pollutants; reference methods for measuring the concentrations of sulphur dioxide, nitrogen dioxide and nitrogen oxide, suspended particles (PM$_{10}$, PM$_{2.5}$), lead, benzene, carbon monoxide and ground ozone; and the criteria for evaluation of concentrations of different pollution matter.

The two rulebooks mentioned above provide a detailed description of the mandatory content of both types of action plans. The Rulebook on the content of air quality plans prescribes that the Air Quality Plans should contain two main interconnected parts: the textual and graphical part, supported by the annex with additional documentation about the plan. These two main parts and the annex are defined in an itemised list of required sections of the plan, e.g. the top level sections of the textual part contains the data on: the location of the region with increased air pollution; general information on the zone and agglomeration; the pollution level and type; the pollution source; other factors that influence increased pollution; a description of measures to reduce or prevent pollution, before and after plan adaptation; long-term measures and activities;
and the organisations and persons in charge of the implementation of the plan and oversight of the planned measures and activities.

The second rulebook, the **Rulebook on short-term action plans** defines the content of these plans in a very similar way as the air quality plans are defined, enumerating every single required part and differing only in the timeframe for the plan implementation and the scope of time for expected results.

### 1.2 Administrative Set-up

The institutional framework consists of several levels and includes not only public administration at national, provincial and local levels, but also scientific and educational communities. At the national level, two entities are responsible for the implementation of air quality related legislation. The **Ministry for Environmental Protection (MEP)** is in charge of establishing a network for to monitor the quality of air, the authorization for air quality measurement, the determination of zones and agglomerations, as well as to provide consent to air quality plans and short-term action plans, cooperate with other countries and implement the Law on Air Protection. The **Serbian Environmental Protection Agency (SEPA)** is the competent authority that implements the monitoring of ambient air quality and the reporting and establishment, maintenance and operational functioning of the Automatic Air Quality Monitoring Network (AAQMN contains 37 stations to perform the monitoring by the reference methods of standard pollutants: $\text{SO}_2$, $\text{NO/NO}_x/\text{NO}_2$, $\text{CO}$, $\text{O}_3$, $\text{PM}_{2.5}$, $\text{PM}_{10}$ and heavy metals in $\text{PM}_{10}$) including Quality Assurance/Quality Control (QA/QC) procedures of reference methods for AQ monitoring and co-ordination of quality assurance programmes.

At the provincial/municipal level, responsibility is on the **Autonomous Province of Vojvodina - Provincial Secretariat for Urban Planning and Environmental Protection / Local self-government units** and are responsible for implementation of current legislation at the corresponding level, with the same duties as the national level organisations, with additional reporting obligation to MEP and SEPA. **Environmental inspection** at all levels (national, provincial and local) is the competent authority for inspection, including air pollution related issues.

### 1.3 Status of Air Quality in the Republic of Serbia

In accordance with the current regulations, the available results of measuring the concentrations of pollutants, within air quality monitoring, are collected and stored in the Serbian Environmental Protection Agency. Based on these results, and according to the criteria defined in the Law on Air Protection, SEPA assess AQ in zones and agglomerations. This is the official AQ assessment in Serbia that applies standards in accordance with the EU practice (Table 1). This is possible because the EU AQ Directives have been transposed and incorporated into the national legislation. The AQ assessment in Serbia is published within the SEPA annual report. The latest one was published for the year 2019 in September 2020.

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### Table 1  
<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging period</th>
<th>Legal nature and concentration</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM\textsubscript{10}</td>
<td>1 day</td>
<td>Limit value: 50 μg/m\textsuperscript{3}</td>
<td>Not to exceed more than 35 days per year</td>
</tr>
<tr>
<td></td>
<td>Calendar year</td>
<td>Limit value: 40 μg/m\textsuperscript{3}</td>
<td></td>
</tr>
<tr>
<td>PM\textsubscript{2.5}</td>
<td>Calendar year</td>
<td>Limit value: 25 μg/m\textsuperscript{3}</td>
<td></td>
</tr>
<tr>
<td>O\textsubscript{3}</td>
<td>Maximum daily 8-hour mean</td>
<td>Target value: 120 μg/m\textsuperscript{3}</td>
<td>Not to exceed more than 25 days per year, averaged over 3 years</td>
</tr>
<tr>
<td></td>
<td>1 hour</td>
<td>Information threshold: 180 μg/m\textsuperscript{3}</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alert threshold: 240 μg/m\textsuperscript{3}</td>
<td></td>
</tr>
<tr>
<td>NO\textsubscript{2}</td>
<td>1 hour</td>
<td>Limit value: 200 μg/m\textsuperscript{3}</td>
<td>Not to exceed more than 18 hours per year</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alert threshold: 400 μg/m\textsuperscript{3}</td>
<td>To be measured over 3 consecutive hours over 100 km\textsuperscript{2} or an entire zone</td>
</tr>
<tr>
<td></td>
<td>Calendar year</td>
<td>Limit value: 40 μg/m\textsuperscript{3}</td>
<td></td>
</tr>
<tr>
<td>BaP</td>
<td>Calendar year</td>
<td>Target value: 1 ng/m\textsuperscript{3}</td>
<td>Measured as content in PM10</td>
</tr>
<tr>
<td>SO\textsubscript{2}</td>
<td>1 hour</td>
<td>Limit value: 350 μg/m\textsuperscript{3}</td>
<td>Not to exceed more than 24 hours per year</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alert threshold: 500 μg/m\textsuperscript{3}</td>
<td>To be measured over 3 consecutive hours over 100 km\textsuperscript{2} or an entire zone</td>
</tr>
<tr>
<td></td>
<td>1 day</td>
<td>Limit value: 125 μg/m\textsuperscript{3}</td>
<td>Not to exceed more than 3 days per year</td>
</tr>
<tr>
<td>CO</td>
<td>Maximum daily 8-hour mean</td>
<td>Limit value: 10 mg/m\textsuperscript{3}</td>
<td></td>
</tr>
<tr>
<td>C\textsubscript{6}H\textsubscript{6}</td>
<td>Calendar year</td>
<td>Limit value: 5 μg/m\textsuperscript{3}</td>
<td></td>
</tr>
<tr>
<td>Pb</td>
<td>Calendar year</td>
<td>Limit value: 0.5 μg/m\textsuperscript{3}</td>
<td>Measured as content in PM10</td>
</tr>
<tr>
<td>As</td>
<td>Calendar year</td>
<td>Limit value: 6 ng/m\textsuperscript{3}</td>
<td>Measured as content in PM10</td>
</tr>
<tr>
<td>Cd</td>
<td>Calendar year</td>
<td>Limit value: 5 ng/m\textsuperscript{3}</td>
<td>Measured as content in PM10</td>
</tr>
<tr>
<td>Ni</td>
<td>Calendar year</td>
<td>Limit value: 20 ng/m\textsuperscript{3}</td>
<td>Measured as content in PM10</td>
</tr>
</tbody>
</table>

An example of a table of annual values of pollutant concentrations measured according to the national AQ Monitoring Program with numbers of days that exceed LV (limit value) is given below (Table 2).
<table>
<thead>
<tr>
<th>Agglomeration Zone</th>
<th>Station</th>
<th>AQ Assessment (Category)</th>
<th>SO₂⁺ (μg/m³)</th>
<th>NO₂⁺ (μg/m³)</th>
<th>PM₁₀ (μg/m³)</th>
<th>PM₂.₅ (μg/m³)</th>
<th>C₆H₆ (μg/m³)</th>
<th>CO (mg/m³)</th>
<th>O₃ (μg/m³)</th>
<th>Days &gt;120</th>
<th>Days &gt;85</th>
<th>Days &gt;50</th>
<th>Days &gt;5</th>
<th>Days &gt;125</th>
<th>Days &gt;85</th>
<th>Days &gt;50</th>
</tr>
</thead>
<tbody>
<tr>
<td>SERBIA</td>
<td>Šabac</td>
<td>I</td>
<td>10.9</td>
<td>0</td>
<td>0.7</td>
<td>0</td>
<td>0.7</td>
<td>0</td>
<td>0</td>
<td>10.9</td>
<td>0</td>
<td>0.7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Kostolac</td>
<td>I</td>
<td>14.7</td>
<td>0</td>
<td>37</td>
<td>62</td>
<td>0.34</td>
<td>0</td>
<td>0</td>
<td>14.7</td>
<td>0</td>
<td>37</td>
<td>62</td>
<td>0.34</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>K. Vis - E MEP</td>
<td>I</td>
<td>10.5</td>
<td>0</td>
<td>14.9</td>
<td>0</td>
<td>17</td>
<td>0.34</td>
<td>0</td>
<td>10.5</td>
<td>0</td>
<td>14.9</td>
<td>0</td>
<td>17</td>
<td>0.34</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Čačak</td>
<td>I</td>
<td>36.8</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.46</td>
<td>0</td>
<td>0</td>
<td>36.8</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.46</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Popovac</td>
<td>I</td>
<td>12.1</td>
<td>0</td>
<td>26</td>
<td>37</td>
<td>18</td>
<td>0.46</td>
<td>0</td>
<td>12.1</td>
<td>0</td>
<td>26</td>
<td>37</td>
<td>18</td>
<td>0.46</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Vranje</td>
<td>I</td>
<td>9.5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.9</td>
<td>4</td>
<td>0</td>
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The table contains the AQ score expressed in terms of air quality, annual pollutant concentrations and number of days with daily LV exceedances. Based on the annual values presented, the air quality category for that year is determined. When there are several measuring points in one zone or agglomeration, which is most often the case, the assessment of the entire zone or agglomeration is determined by the data that shows the worst conditions. Values in white fields represent concentrations below LV, red fields above LV (II category of AQ), while blue fields are in a third category.

Grey fields indicate parameters that are not intended for monitoring at the individual measuring points (as defined by the Regulation on determination of the air quality control program in the state network requirements - “Official Gazette of the Republic of Serbia”, No. 58/11).

The available air quality monitoring data consists of data from automatic AQ monitoring performed by the state SEPA network, local AQ networks of Vojvodina, Belgrade and Pančevo for automatic monitoring and manual measurements by the state network (implemented by local PHI). AQ monitoring in local self-government units are implemented according to local AQ monitoring programs approved by the Ministry. These measurements within local programs are obtained using non-reference and reference methods. All data are presented in the SEPA report, but only data obtained by reference methods are used to assess air quality.

In accordance with the Law on Air Protection and the Decree on Designation of Zones and Agglomerations (“Official Gazette of RS”, No. 58/2011 and 98/2012), zones and agglomerations for air quality monitoring are determined within the territory of the Republic of Serbia. The agglomerations are Belgrade, Novi Sad, Niš, Bor, Užice, Kosjerić, Smederevo and Pančevo while the zones are Serbia and Vojvodina.
Population exposure to air pollutants is given as the distribution of the zones and agglomerations by AQ categories in the period 2011 – 2019 (Table 3).

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The evaluation of air quality in zones and agglomerations, based on annual concentrations of pollutants obtained by air quality monitoring in the Serbian national and local networks in 2019 is:

- In the zone Serbia, except for the city of Valjevo, Kraljevo, Zaječar and Požarevac, the air quality was of category I, i.e., clean or slightly polluted air.
- In the zone Vojvodina except for the city of Subotica and Beočin the air was of category I, i.e., clean or slightly polluted air;
- In the agglomerations Beograd, Niš, Smederevo and Kosjerić, the air was of category III, i.e., over-polluted air, due to concentrations that exceeded the limit values of suspended particles $\text{PM}_{10}$ and $\text{PM}_{2.5}$. In the agglomeration Pančevo, the air was of category III, i.e., over-polluted air, due to concentrations that exceeded the limit value of suspended particles $\text{PM}_{2.5}$. In the agglomerations Novi Sad and Užice, the air was of category III, i.e., over-polluted air, due to concentrations that exceeded the limit value of suspended particles $\text{PM}_{10}$.
- In the agglomeration Bor, the air was of category III, i.e., over-polluted air, due to concentrations that exceeded the limit value of $\text{SO}_2$.
- In the cities Valjevo, Kraljevo and Subotica, the air was of category III, over-polluted air, due to concentrations that exceeded the limit values of suspended particles $\text{PM}_{10}$ and $\text{PM}_{2.5}$; in Požarevac and Zaječar due to concentrations that exceeded limit value of suspended particles $\text{PM}_{10}$; and in Beočin due to concentrations that exceeded limit value of suspended particles $\text{PM}_{2.5}$.
- In Sremska Mitrovica, the lack of measurements of suspended particles in January and February gave an inadequate picture that air quality was of the category I.

During 2019, as many as 92% of the inhabitants in these agglomerations and cities had excessively polluted air, category III air.
If we look at the distribution of the total population in the Republic of Serbia by AQ categories, then the situation is following: 57% of the population had clean or slightly polluted air, and 43% had polluted air (Figure 1).

**Figure 1** Distribution, by percentage, of the population of the Republic of Serbia (upper - total population; lower- population in agglomerations and cities) by AQ categories, period 2011 - 2019.
Information about the different contributions of individual pollutants to the poor air quality conditions is obtained through the structural assessment of AQ. The agglomeration of Belgrade is given as an example (Figure 2).

During 2019, in the Belgrade agglomeration, the concentrations of carbon monoxide in 95% of cases were far below the LV, in the class of "excellent" air quality by index SAQI_11. There were no values of carbon monoxide concentrations classifying air quality as "polluted" and "heavily polluted". Even the daily concentrations of sulphur dioxide did not reach the values for "polluted" and "heavily polluted" air categories. Nitrogen dioxide, ozone and, most importantly, suspended PM₁₀ particles, had daily concentrations that made the air "polluted" and "heavily polluted" according to the SAQI_11 index. During 2019, only 2% of suspended PM₁₀ particles measurements were in the "excellent" class, 24% and 26% in the "good" and "acceptable" class. PM₁₀ most often caused "polluted" air, in as many as 46% of cases. For almost half a year, 48% of cases, PM₁₀ was the reason that the air in the Belgrade agglomeration was classified as "polluted" and "heavily polluted", which indicates their dominant influence.

The occurrence of PM₁₀ as the dominant pollutant in Serbia is well known and analysed. There is a small number of measuring points, where the measurement of mass concentrations of PM₁₀ is carried out within the AQ monitoring, where the annual LV is not exceeded.

Figure 2 Structural assessment of air quality in the Belgrade agglomeration in the period 2015 - 2019

The occurrence of PM₁₀ as the dominant pollutant in Serbia is well known and analysed. There is a small number of measuring points, where the measurement of mass concentrations of PM₁₀ is carried out within the AQ monitoring, where the annual LV is not exceeded.

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1. Background

The SEPA National Air Emission Inventory Report is prepared using the EU harmonized methodology defined in the EMEP / EEA Air Pollutant Emission Inventory Guidebook. According to the applied dynamics, the latest data on the values of air emissions are available for 2018.

During 2018, the dominant share of emissions of suspended PM$_{10}$ particles came from heating plants with a capacity of less than 50MW and individual combustion plants, 57% of them, which is unchanged compared to the previous year. In the Republic of Serbia, the industrial sector contributed with 13% to national PM$_{10}$ emissions, and agriculture (without livestock) with 10%. Road traffic emitted only 6%.

The impact of heating plants with a capacity of less than 50 MW and individual combustion plants on the total emissions of suspended PM$_{2.5}$ particles was extremely large and amounted to 77%. As with suspended PM$_{10}$ particles, the industry sector is in second place but only with 9%, while in third place in terms of importance is road transport at 5%. Other sources contributed 7% to total PM$_{2.5}$ emissions.

![Figure 3](image)

**Figure 3** Annual concentrations of PM10 (µg/m3) and number of days with exceedance of LV in 2019 (Source SEPA)
As an example of the spatial distribution of PM$_{10}$ emissions, the presentation of emissions during 2016 is given, and based on the data submitted by SEPA$^4$ (Figure 4).

When considering air emissions, the energy sector has a characteristic contribution. According to SEPA’s data for 2018$^5$, the electricity and heat production sector generates 90% of sulphur dioxide (SO$_2$) emissions and 53% of nitrogen oxide (NO$_x$) emissions.

Available data from multi-year measurements of mass concentrations of suspended PM$_{10}$ particles indicate a seasonal character of the appearance of this pollutant$^6$.

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In the urban agglomerations of Belgrade, Novi Sad and Nis, daily values of PM10 demonstrate some significant changes across the year. The highest values of PM10 during the winter, on the average, are three times greater than the minimum values during the summer (Figure 5). Highest exceedances of LV of daily PM10 values fall into the period from 5th November until 20th March.

In Užice and Valjevo, these changes are more expressive, and the period in which, on average, exceedances of LV can be expected, is longer. Winter values of PM10 in Valjevo and Užice, on average, are five times higher than the summer values. Exceedances of LV of daily PM10 values in Valjevo and Užice are most likely, on average, during the period from 20th September until 30th April. This estimated period, with the most probable appearance of LV exceedances of daily values, is almost two times longer than the equivalent for Belgrade, Novi Sad, and Nis.

*Figure 5* The average annual trend of daily PM10 concentration for Belgrade Novi Sad and Nis - brown lines and Valjevo and Užice - blue lines
1.4 Air Quality and Health

The very definition of “polluted air”, as air in which a pollutant is contained, underlines the impact on human health. The negative impact of specific pollutants on human health has been determined by long-term research. For that purpose, data on the concentrations of pollutants in the ambient air and the health condition of the examined sample of inhabitants are necessary. As a result, the standards or limit values of concentrations of pollutants are defined in order to avoid either a short or long-term negative impact on human health.

Investigations of the impact of polluted air on human health are part of the activities of health workers. By collecting the results globally, the World Health Organization (WHO) proclaims air quality standards. States or unions of states adopt these standards, often in modified form, and declare them to be their legal solutions for air quality standards. These alterations often imply lowering the WHO criteria.

Air quality assessment in the EU is performed in a unified way. The results of permanent monitoring of concentrations of the same pollutants are evaluated. Concentration measurements are performed by applying the same methods. This provides an opportunity to analyse the state of air quality and the impact on health in an integrated way.

The result of this type of analysis at the EU level is contained in one of the latest reports on these topics: “Air pollution continues to have significant impacts on the health of the European population, particularly in urban areas. Europe’s most serious pollutants, in terms of harm to human health, are PM, NO₂ and ground-level O₃”.

The same report contains a thorough assessment of the impact of polluted air on the health of Europeans. The assessment was performed using the calculated indicator YLL (Years of Life Lost) due to the measured levels of PM₂.₅, NO₂ and O₃. The calculations indicated that the impact on the health of the inhabitants of the Balkans is one of the most distinctive.

During the same period, the WHO Regional Office for Europe and PHI of Serbia “Dr Milan Jovanovic Batut” published a study in 2019 “Health impact of ambient air pollution in Serbia A CALL TO ACTION”. According to the results of this study, premature mortality is attributable to levels of PM₂.₅ exceeding the WHO air quality guideline of 10 μg/m³. The study states that in total, exposure to PM₂.₅ accounts for 3,585 premature deaths in the 11 cities analysed. The estimated proportion of all deaths attributable to PM₂.₅ ranged from 7.1% in Beočin to 18.7% in Užice and 18.8% in Valjevo.

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2. Goals and Methodology

To identify the existing potentials, shortcomings, and needs that local governments have in solving the problem of air pollution in their territories, UNDP and the Standing Conference of Towns and Municipalities (SCTM) performed a survey. The survey was conducted via google questionnaire in the period August - September 2020. The survey questionnaire was disseminated through SCTM networks (Eco-officers Network, Liaison Officers Network, and through mayors’ offices) to all 145 Local Self-Government Units (LSGs) excluding those within the territory of the Autonomous Province of Kosovo and Metohija*.

Although this activity was conducted in the period of annual leaves and the Covid-19 epidemic, which might have limited the responses, the research was deemed successful, as the number of collected responses to the survey questionnaire exceeded 50% of the entire number of LSGs.

The online questionnaire as a survey method has its advantages in easily reaching its target audience, providing predefined sets of choices when possible and producing almost immediate results, which facilitates further analysis since the data is in digital form. At the same time, in cases where users had the opportunity to give answers to “open-ended questions” this type of questionnaire was not the best way to collect data since, in many cases where there was no additional clarification, users gave non-relevant responses.

The survey questionnaire consisted of 45 questions divided into five sections: basic data on the local self-government unit; air quality monitoring; strategic framework at the local level; LSG capacities to deal with air quality issues; and implementation of measures aimed at reducing air pollution. The survey questionnaire can be found at this link: https://forms.gle/Z356Xda9WTxmqBDRA.

Two general types of user attitudes are expected in online questionnaires, the first, openly criticizing the current situation and their position and workload in relation to the topic and the opposite attitude in which users promote their results and achievements. With this in mind, the “extreme” responses should be taken with caution.
3. Survey Results Analysis

3.1 Coverage Statistics

The Local Self-Government Units (LSG) Questionnaire resulted in a sample of 77 individual responses.

The questionnaire was sent to 145 LSG (excluding those in the territory of the Autonomous Province of Kosovo and Metohija9). As a result, 53.1% of LSG have provided answers and established their records in the database. In addition, these 77 LSG represent a population of 5,385,125. Therefore, the sample provided by the questionnaire can be seen as representative since this amounts to 77.1%10 of population of Serbia (Figure 6).

As it can be concluded from Figure 6, the city of Belgrade with a population above 500,000 as well as all the cities with population larger than 100,000 submitted the requested information, except the city of Leskovac (12 out of 13 cities – 92%). LSGs with a population between 50 and 100 thousand citizens also have good coverage (12 out of 15 – 80%; Ruma, Bačka Palanka and Požarevac did not submit answers). Smaller LSGs with populations up to 50.000 are less represented (45%).

This size of the sample makes it possible to extrapolate the conclusions and recommendations derived from the survey results to the entire territory of the Republic of Serbia.

9 As defined by the UNSC Resolution 1244
10 According to the last estimation (June 1, 2018) of the Statistical Office of Republic Serbia the population of Serbia is 6,982,604
3.2 Current State-of-play

When asked about heating energy sources, almost exactly half, 39 of the 77 LSGs (50.6%) reported that have a district heating system in place. 51 (66.2%) out of 77 local self-government units have implemented the gas network. However, in 23 local self-government units, there is a gas network, but there is no district heating system. In 11 LSGs there is a district heating without a gas network (Question 6, Question 7).

Biomass (primarily wood and/or agricultural residues) is an energy source that is mainly used for heating in 25 localities, which accounts for almost 34% of LSG. Natural gas and coal dominate in 22 and 18 local governments, respectively 29% and 24% of LSGs. A smaller number of LSGs use oil, electricity and heating oil as a dominant fuel, with 8.1%, 5.4% and 1.4% of coverage respectively (Figure 7) (Question 8).

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Figure 7 Heating Energy Sources reported as dominant sources in the LSGs through the survey, author’s calculation

11 Does LSG have a district heating system?
12 Does LSG have a gas network?
13 Which fuel is mainly used for heating in the territory of the local self-government? Specify another energy source.
3.3 AQ Monitoring

Air quality monitoring provides us with information about the current status of air quality, as well as with valuable information about the patterns and trends when it comes to air pollution. Based on air quality data, policies are formulated, air protection measures are selected and the effectiveness of the applied measures is assessed. Local monitoring stations are an important part of the air quality monitoring network, in addition to the national network managed by SEPA.

According to the LSGs that responded to the survey, local air quality monitoring is insufficient. In most LSGs, it is necessary to either establish the improve their existing local AQ monitoring.

In addition to new measuring points, the needed improvement includes the use of reference methods for AQ monitoring. The existing regulations define both the necessary availability of data and the time coverage with measurements.

Local AQ monitoring is established in 42 (54.5%) of the 77 LSGs. AQ monitoring established in this way covers 85.8% of the population covered by the questionnaire (or about 66.1% of the population of the Republic of Serbia).

The air quality control program for 2020, with the approval of the Ministry, was applied by 21 (27.3%) of the 77 LSGs that took part in the survey (covering 62.1% of the population). It is realistic to expect that there are more AQ monitoring activities and that the percentage of the population covered is slightly higher. This is because the procedure for obtaining Ministry approval for the program usually take some time, as well as because there is also a multi-year local AQ monitoring program (Question 9\textsuperscript{14}, Question 10\textsuperscript{15} and Question 11\textsuperscript{16}).

It is necessary to reanalyse the number and location of measuring points in accordance with the analysis of available data from previous AQ monitoring, and with the amendments to the EU CAFE Directive\textsuperscript{17}, expected to be transposed into the Serbian legislation.

In more than half of the LSGs, there are measuring points where AQ monitoring is performed or has been performed. In 70% of cases, LSGs have more than 5 years of experience with AQ monitoring. The number of measuring points ranges from 1 to more than 15 (Belgrade). The most common number of measuring points is 1 to 5, in 71% of local self-government units, and then 6 – 10 in about 22% of local self-government units (Figure 8) [Question 12\textsuperscript{18} and Question 13\textsuperscript{19}].

\textsuperscript{14} Is a local air quality monitoring network established in your local self-government?
\textsuperscript{15} Has the LSG adopted the Air Quality Control Program for 2020?
\textsuperscript{16} If the answer to the previous question is “YES”, has the local self-government unit received the consent of the Ministry of Environmental Protection for the Program?
\textsuperscript{17} COMMISSION DIRECTIVE (EU) 2015/1480 - amending several annexes to Directives 2004/107/EC and 2008/50/EC of the European Parliament and of the Council laying down the rules concerning reference methods, data validation and the location of sampling points for the assessment of ambient air quality.
\textsuperscript{18} How many years ago did the LSG implement the Air Quality Control Program?
\textsuperscript{19} How many measuring points does your air quality monitoring network consist of?
It should be noted that the time it takes to go through the entire procedure, from the adoption of the local Air Quality Monitoring Program, through the approval of the Ministry, to the beginning of the implementation of the program is uncertain. This is because the choice of operator for the implementation of the local program is performed through public procurement. There are opinions (expressed in the questionnaire) that the regulations on public procurement should facilitate the procedure so that the programs can be more easily implemented throughout the calendar year.

The survey shows the need to improve local AQ monitoring programs. Improvement should be based on the analysis of the conditions and needs of individual LSGs, with a focus on the choice of parameters and type of monitoring.

Local AQ monitoring programs mainly deal with the non-reference methods, common pollutants and partly specific pollutants. According to the existing regulations\(^\text{20}\), the results of measurements by non-reference methods are acceptable only with the appropriate equivalence test with reference methods. These are most often SO\(_2\), NO\(_2\), soot and total suspended matter with heavy metal analysis (TDM with HM) and more recently PM\(_{10}\) with or without heavy metal analysis - PM\(_{10}\) HM. Measurements of PM\(_{10}\) or PM\(_{10}\) HM are expensive, both due to the operational cost and due to the need to fulfil the required conditions for accreditation. In many local programs, such measurements are not carried out every day, therefore having a character of indicative measurements [Question 14\(^\text{21}\)].

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20 Regulation on monitoring conditions and air quality requirements
21 Select parameters [PM\(_{2.5}\), PM\(_{10}\), SO\(_2\), CO, NO\(_2\), O\(_3\), Soot, Benzene]
Depending on the air emissions impacting an area covered by the local AQ monitoring plan, the specific pollutants measured also include: NH₃, TNMHC, BaP, polycyclic aromatic hydrocarbons (PAH) in PM₁₀, BTX and PM₁₀ analysis on mercury content. The monitoring of allergenic pollen, which can be considered to be a unique natural pollutant, is also mentioned.

**Implementation of the local AQ monitoring program**, in accordance with the applicable regulations²² is conducted or has been conducted in 40 of the 77 LSGs and is assigned to interested legal entities through tender within the public procurement procedure. In most cases, the realisation of AQ monitoring is awarded to the local Public Health Institutes (PHI) (26 of 40 LSGs, or 65% of LSGs that have local monitoring, Figure 9).

They can also be PHI from another LSG or a specialized organization. The legal entity that performs the air quality measurements on the local level is to have accreditation for measuring parameters specified in the local program and an adequate permit from the Ministry. Types of pollutants monitored per LSG are presented in Figure 10.
The city of Pančevo with its automatic AQ monitoring and the Institute of Mining and Metallurgy at Bor are participating in monitoring within the state of AQ for many years and should be seen as unique, successful implementers of AQ monitoring at the local level [Question 15].

The survey showed that there are a number of LSGs that need support to establish AQ monitoring. Namely, of the 17 LSGs that recognize the need for AQ monitoring, 14 of them do not have the financial and professional capacity for these activities.

There are usually two main reasons that measuring points or local networks for AQ monitoring are not established - lack of need and/or lack of funds. Some LSGs reported that there is 'no need' for AQ monitoring due to the absence of polluted air (Žitiste, Ražan), or due to the location of the LSG within the 'Serbia Zone', which positions it within the first category of air quality (Rača), according to the most recent decree on determining the list of air quality categories by agglomeration zones in the Republic of Serbia for 2017 ("Official Gazette of RS", No. 104/2018). There are also LSGs (e.g., Plandište) that are in communication with the Ministry about obtaining the consent for the AQ Monitoring Plan, either sending it for the first time or supplementing it in accordance with the Ministry’s remarks [Question 16].

The existing regulations do not stipulate the obligation that the LSGs should have the appropriate equipment for performing AQ monitoring. However, in 13 cases the LSGs confirmed that they own such equipment. These are

23 Is the measurement of air quality in your LSG entrusted?
24 If the answer to question no. 9 is "NO", i.e. if a local air quality monitoring network is not established in your LSG, state the reasons.
mostly the LSGs with specific and extensive experience in this field (e.g., Pančevo, Bor, Valjevo, Užice). There are also LSGs that have recently started paying more attention to AQ monitoring, and have decided to purchase the equipment (Kraljevo) [Question 17\(^2\) and Question 18\(^3\)].

The answer to the question of what is missing, when nothing is available, is easy to address. However, based on the total available knowledge, including the fact that powdered substances, monitored through the values of PM\(_{10}\) and PM\(_{2.5}\), are the dominant pollutants, it is clear that the procurement of equipment should primarily be directed to address that issue. Some LSGs may need to monitor additional pollutants, but almost all LSGs require monitoring of PM\(_{10}\) and PM\(_{2.5}\) concentrations.

The survey also showed that the way LSGs display the results of AQ monitoring requires improvement: data is often in an inadequate format, in the cases of some LSGs not displayed, or displayed with low visibility.

Almost half of LSG, 36 out of 77 (47\%), display the results of AQ monitoring on their website. Less frequently, in 20.8\% of cases, the results are published on the PHI website. In 18.2\% of cases the results are not published at all, and in 14.3\% of cases, the results are published elsewhere (Figure 11). Other places listed as the publishing location include the SEPA website, local newspapers, a special publication, and the annual reports in the local Official Gazette [Question 19\(^7\)].

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25 Does your LSG have appropriate air quality monitoring equipment?

26 If the answer to the previous question is “NO”, state which equipment is missing?

27 The results of air quality measurements at the local LSG are shown: [list of options]
The survey showed that the way LSGs display the results of AQ monitoring requires improvement since in only 35 out of 77 LSGs is the air quality data stored in a **computer-readable format**. It is very important to comply with the existing regulations and submit the data to SEPA. Thus, the data become part of the Air Quality Information System, i.e., the IS of the environmental protection of the Republic of Serbia [Question 2089].

### 3.4 Pollution sources

The predominant number of LSGs did not provide an answer to the number of days per year that experienced exceedances of a specific pollutant [Questions 2129 and 2230].

The responses that LSGs gave to the question about the key source of air pollution within their territory show high correlation with the data presented in the Annual Report on the Status of Air quality published by SEPA every year. SEPA’s report for 2019 shows that Individual heating/combustion units and heating plants (with a capacity of less than 50 MW) are the source of 77% of PM$_{2.5}$ particles and 57% of PM$_{10}$ particles.

Most LSGs that participated in the survey (62.3%), identified **individual heating/burning units** as the most significant sources of pollution. This is followed by **Traffic 13.0%, Industry 11.7%, Other 5.2%, Landfills 3.9% and Pollution outside the territory of the LSG 3.9%** (Figure 12) [Question 2331].

![Figure 12 - Key pollution sources identified by LSGs on their territories](image-url)
According to the LSGs, “Other” sources of pollutant emissions into the air include: Ironworks Complex (Smederevo), Mining and metallurgical complex ZIJIN Bor, Chemical industry, Refinery NP and HIP Petrohemija, MB purpose-built industry Lučani, Cement industry, Paints industry and Cable industry, Rubber industry, Mineral Fertilizers and Stone Wool industries.

3.5 Local AQ Action Planning

The level of compliance with the obligation to develop a local Air Quality Plan and/or Short-Term Plan demonstrates that there is a lot of room for improvement in the area of action planning.

According to existing regulations, the LSGs are obliged to adopt an Air Quality Plan in cases where they have a level III category of air quality - excessively polluted air. 13 (16.9%) out of 77 LSGs that responded to the survey are under this obligation, namely Belgrade, Smederevo, Pančevo, Novi Sad, Niš, Kosjerić, Bor, Užice, Subotica, Sr. Mitrovica, Kragujevac, Kraljevo and Valjevo (other LSGs do not have a legal obligation to develop Air Quality Plan). Out of the 13 with this obligation, 7 have AQP, which is 53.8% (Questions 2412, 2513 and 2614).

The LSGs that have adopted an Air Quality Plan are:

- Belgrade - Air quality plan in the Belgrade agglomeration, introduced in February 2016, and valid until the end of 2020;
- Bor - Air quality plan for Bor agglomeration 2013;
- Novi Sad - air quality plan in the agglomeration “Novi Sad” for the period 2017-2021;
- Pančevo - Air quality plan for the city of Pančevo 2015-2020;
- Smederevo - Air quality plan for the city of Smederevo, adopted in 2020, valid until 2025;
- Valjevo - Air Quality Plan 2016-2021 (Correction at the request of the Ministry - in progress);
- Užice - Air quality plan adopted in 2018

LSGs with the obligation to prepare and adopt the AQ Plan (5 LSGs) are Niš, Kraljevo, Subotica, Sremska Mitrovica and Kragujevac.

The Short-term Plan was adopted in 7 LSGs (Kikinda, Kladovo, Kruševac, Novi Pazar, Pančevo, Sombor and Užice) according to the survey. In the case of LSGs that have adopted the Air Quality Plan, the Short-term Plan for air protection is part of that plan.

32 Are you required to develop an Air Quality Plan?
33 Does the LSG have a developed Air Quality Plan?
34 If the answer to the previous question is “YES”, please name the document.
When it comes to the Short-term Plans (StP), the situation is as follows: Subotica is currently working on its preparation; The Sombor – StP is in the process of adoption (for the period 2020-2023); AQP Pančevo contains a short-term action plan; Kruševac developed a StP in 2020 and delivered it to the ministry for approval; in Kladovo – a short-term action plan for air quality with zones and agglomerations in the Municipality of Kladovo with five years of validity was adopted on December 16, 2019; Kikinda adopted a Short-term plan for air quality in the city of Kikinda in 2020. [Questions 27 and 28].

Kladovo produced a StP, although there are no recorded exceedances of air pollutants that would put the LSG in the category that requires StP, which is the same situation in Kruševac. During focus group discussions, some of the representatives of LSGs specified that a StP had been developed (although not legally required), in line with the request of the Ministry of Environmental Protection given at the end of 2019 when there were episodes of high air pollution across the country.

According to the Law on Air Protection, Article 33 (“Adoption of short-term plans”) specifies when the local self-government body is obliged to adopt StP in the zone or agglomeration and when they can be prepared if necessary. Mainly because many LSGs do not monitor air quality, there is a large number of LSGs that are not legally obligated to adopt StP.

At the beginning of November 2019, LSGs received a request from the Ministry of Environmental Protection asking the LSGs that have AQ Plans or that are in the III category of air quality, to provide certain information or to comply with the law. In the same letter, the Minister required from all other local self-government units to draft a StP especially “in cases where there is a danger to human health and the environment...”. Upon that request, the Kladovo and Kruševac LSGs started drafting their short-term action plans.

### 3.6 Implementation of air protection measures

All LSGs that have adopted an AQP reported that the plan contains measures to [Question 29]:

a) reduction of pollution from heating and combustion plants

b) reduction of traffic pollution

c) reduction of pollution from industry

d) improving the notification/reporting system

e) additional measures

Additional measures specified include Education, Reduction of pollution from construction activities, Procurement of equipment and the Plan for burning agricultural crops.

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35 At the time of the survey: October 2020.
36 Does the LSG have a developed Short-Term Action Plan for Air Protection?
37 If the answer to the previous question is “YES”, please indicate the document(s) and year of adoption and validity.
38 If the answer to question 25 is “YES”, please indicate whether the plan contains measures to: (list of options).
When it comes to the methodology applied in AQ action planning, the answers from LSGs show ambiguity. While slightly more than half of LSGs say that the methodology is clear, the majority of LSGs (81.3%) believes that professional training is needed.

All 77 LSGs answered the question related to the level of understanding of the methodology for the development of Air Quality Plans. The majority of LSGs (52, 67.5%) stated that the methodology is completely clear [Questions 3039 and 3140]. Out of all the LSGs that have the obligation to develop an AQ plan, but have not yet done so, only Kosjeric stated that the methodology for the action plan development is insufficiently clear.

The remaining surveyed LSGs, those that do not have the obligation to develop an AQ plan, shared their views of the methodology:

- Bajina Bašta - Partly unclear methodology;
- Kosjerić - Inconsistent legal regulations, unclear methodology of drafting;
- Kula - No measurements ever made, so there is no data for the adoption of a short-term plan for air protection, nor for proposing protection measures;
- Malo Crniće - Lack of information regarding the adoption of plans;
- Pirot - No legal obligation;
- Plandište – A lot of ambiguities, assistance needed;
- Rača - Not familiar with the methodology;
- Sokobanja - Methodology of determining the number of measuring points unclear;
- Srbobran – No appropriate directive to produce AQP;
- Vranje - Methodology for drafting Air Quality Plans unclear (measures to prevent or reduce air pollution, description of measures and activities or projects planned in the long-term, bodies and persons responsible for implementation of the plan, etc.).

The content of the Air Quality Plan is defined by the Rulebook on the content of air quality plans, prepared and adopted in accordance with the Law on Air Protection, serving as guidance to the LSGs. As reported by LSGs in focus group discussions, the development of the first AQP that was outsourced through public procurement, and this example was followed by other agglomerations.

On the other hand, Pančevo was the first to conduct an AQP independently, with the engagement of external experts when needed and since this approach proved to be applicable, LSG Užice followed it.
Moreover, the procedure for determining the number and location of measuring points (mentioned by LSG Sokobanja) is prescribed in the decree on conditions for monitoring and air quality requirements, in parts: “The criteria for determining the minimum number of measuring points and locations for sampling for fixed measurements and measurements of nitrogen, suspended particles (PM₁₀, PM₂.₅), lead, benzene and carbon monoxide concentrations in air” and “The criteria for the determination of the minimum number of measuring points and locations for fixed measurements of ground level ozone concentrations”.

Procedurally and chronologically, this activity should be planned long before the development of the AQP. Firstly, measuring points have to be determined, measurements made during not less than one year continuously, with a minimum of 90% of hourly values. After that, an AQ assessment is made, the limit value is determined and only then are the conditions for drafting the AQ Plan met.

One LSG noted during the focus group discussions, that the procedure for giving an order to analyse the methodology for the development of Air Quality Plans is nowhere explicitly envisaged. However, the expert of the local self-government who has air quality issues in his field of competence is expected to know the laws and bylaws in this area including the methodology of AQP.

In spite of the fact that the majority of LSGs claim that the AQ action planning methodology is clear, the majority of LSGs, 64 (81.3%), believe that professional training is needed to develop an Air Quality Plan [Questions 32, 33 and 34]. 13 LSGs (16.9%) had their concrete proposals for improving the process of drafting the Air Quality Plan:

- Užice, Bajina Bašta, Vladičin Han, Veliko Gradište, Kosjerić - Strengthening local capacities for making plans;
- Doljevac - Provide financial resources;
- Kraljevo - Improve monitoring and introduce it as an obligation so that there is a basis for drafting a plan. Many local governments are treated as if they do not have air pollution due to non-existent or inadequate monitoring;
- Pančevo, Loznica, Subotica - Adoption of the Air Protection Strategy as an instrument of national policy.

It is necessary to improve the LSGs’ inspection capacities and specify the procedures for controlling the implementation of measures and activities envisaged by the air quality plans.

LSGs that have adopted an AQP -- meaning Belgrade, Bor, Novi Sad, Pančevo, Smederevo and Užice – stated in their responses that they have monitored the degree of implementation of plans and/or efficiency of
measures applied in the field of air quality. Only Valjevo expressed indecision on this issue [Question 3544]. The lack of data on the level of implementation of AQPs suggests that the monitoring isn’t sufficiently applied.

When it comes to human capacities for dealing with air quality on the local level, there is a significant lack of expertise in this particular field. In a number of LSGs, air quality management is assigned to LSG staff mainly dealing with communal affairs inspection, and environmental protection in general, while in many cases LSGs report that there is no department that deals with this air quality issue.

Within 39 LSGs (50.6%), there is a body or organizational unit that deals with air quality issues. 81.2% of the population surveyed live in these LSGs [Questions 3645, 3746 and 3847].

The names of the organizational unit and the number of LSG employees working with air quality issues within the local self-government body varies considerably:

- Niš, Belgrade, Subotica, Pančevo, Novi Sad, Kragujevac, Čačak, Kraljevo – Dedicated LSG unit with more than two employees;
- Kruševac, Kikinda, Sabac, Sombor, Surdulica, Plandište, Srbobran, Kula, Zrenjanin, Bečej, Novi Pazar, Užice, Vranje, Aleksinac, Loznica, Vršac, Žabali, Smederevo, Gornji Milanovac, Jagodina, Bor, Zaječar, Lapovo, Doljevac, Ub, Jagodina, Srmska Mitrovica – One to two employees within the competent organizational body for environmental protection (usually with additional duties such as urbanism, communal affairs, etc.);
- Kladovo, Ćićevac, Malo Crniće, Bela Crkva, Vladičin Han, Pirot, Kosjerić, Bojnik, Knjaževac, Kanjiža – One employee within the LSG department with other responsibilities such as Communal Affairs or Inspection.

In cases when there is no organizational unit with a description of the tasks related to air quality, the local self-government units have planned these tasks differently in their operational organization (listed without interpretation):

- Veliko Gradište, Žitiste, Trstenik, Boljevac, Petrovac na Mlavi - Assigned to a person who deals with environmental protection;
- Osečina, Alibunar, Ćuprija, Lučani, Bajina Bašta, Nova Crnja, Priboj - Inspections of supervised entities that release polluting matter into the air;
- Bosilegrad, Valjevo, Ražanj, Sokobanja - Other department within LSG;
- Žitoradja, Rekovac, Velika Plana, Knić, Varvarin, Dimitrovgrad, Rača, Topola, Ljubovija - No dedicated unit;

44 Does the LSG monitor the degree of implementation of plans and/or the effectiveness of measures it applies in the field of air quality?
45 Is there a body or organizational unit in your LSG that deals with air quality issues?
46 If the answer to the previous question is “YES”, please indicate the name(s) of the body or organizational unit and the number of executors on air quality activities per body/organizational unit.
47 If the answer to question 36 is “NO”, describe how it is organized to deal with the issue of air quality in your LSG.
The lack of financial resources has been recognized as one of the biggest barriers to improving air quality in LSGs.

The question on obstacles to improving air quality in LSGs produces a wide range of answers. However, a large proportion of responses, 35 out of 66 (53.0%), cite funding as the main or one of the main factors that represent a barrier to cleaner air [Question 3948].

Greater funding to address air quality issues, such as monitoring and evaluation of AQ in LSGs, is certainly desirable. Such an obstacle can be overcome in a relatively short time. However, additional barriers to improving air quality have also been identified, some of which also fall out of LSG jurisdiction.

The type of fuel, poor locations of industrial facilities, the establishment of industrial activities without considering the impact on the environment, as well as traffic are obstacles that are also mentioned.

A critical review of the relationship between the answers to the questionnaire and the local self-governments from which they originate indicates that the answers are consistent with the LSGs’ capacity, experience and depth of understanding of the issue. Therefore, the perceived barriers to better air quality range from monitoring the implementation of measures and finances, to an analysis of legal compliance, and a small number of operational expert staff.

Concerning the implemented measures to reduce air pollution in the past three years, only 26 LSGs (33.8%) confirmed that they have implemented some of the measures in the past three years in order to reduce air pollution (Figure 13). Such activities were not implemented in 32 local governments, and 19 LSGs expressed indecision, together representing 66.2% of the responses received [Question 4049].

Figure 13 Implementation of measures

Some measures in past three years  No measures or indecisive

33.80%
66.20%

48 What do you recognize as the biggest barriers to improving air quality in your LSG?
49 Has your LSG implemented any of the measures to reduce air pollution in the past three years?
In **83.3%** of cases (Aleksinac, Belgrade, Bor, Kanjiža, Kosjerić, Kragujevac, Kula, Niš, Osečina, Pančevo, Paraćin, Pirot, Šabac, Sombor, Sremjska Mitrovica, Ub, Užice, Valjevo, Zaječar, Zrenjanin) **local budgets** were the main sources of funding for measures taken to reduce air pollution during the past three years.

Four LSGs had reported following sources of funding: Kraljevo - financing from the Public Energy Company Kraljevo (switching one of the boiler rooms for district heating from fuel oil to gas, works to improve the system in the central city boiler room); Novi Sad - funding is provided from various sources because different administrations and institutions are involved in the implementation of measures determined by the AQP, and a coordination team has been formed which is obliged to write a report on implemented measures from last year; Smederevo - local sources, donations, public investment management office; and Subotica - from the budget of the Republic of Serbia, the budget of the city, as well as through a competition for cross-border cooperation [Question 4150].

The highly commended experience of Novi Sad includes successful horizontal cooperation for the implementation of activities planned by the AQP.

The replacement of equipment to change energy sources and in order to reduce emissions into the air, as was done in Kraljevo, is not uncommon in recent years in Serbia. The local public energy company financed those activities in Kraljevo. In the previous period, the City of Užice implemented similar measures in order to increase the consumption of natural gas for heating.

The example of Subotica, which also finds sources of funding through cross-border cooperation competitions, points to the application of the comparative advantages of local self-government in solving environmental issues.

Šabac and Zaječar listed permanent measures that cannot be outside the budget financing. The continuity and scope of these measures can only be supported by a budget.

The majority, representatives of 64 LSGs, submitted their opinions on the **most important measures** and activities that should be taken in order to improve the air quality in LSGs [Question 4211]. Their answers mostly reflect the specifics and situation within the LSG so these inputs, having in mind the appropriate competence of their authors, provide valuable information about the directions of the necessary action.

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50 If the answer to the previous question is “YES”, i.e., if the LSG has implemented the measure/s in order to reduce air pollution in the past three years, state from which source the financing of the given measure (s) was provided.

51 In your opinion, what would be most important measure to implement, so that the air quality in your community improves?
In a summary of all the answers of LSGs, the causes, measures and activities in order to improve air quality could be ranked as follows:

- Local combustion plants, Energy efficiency (Bajina Bašta, Bela Crkva, Beograd, Dimitrovgrad, Doljevac, Gornji Milanovac, Jagodina, Kanjiža, Knjaževac, Kosjerić, Kraljevo, Osečina, Petrovac Na Mlavi, Plandište, Subotica, Alibunar, Bosilegrad, Nova Crnja);
- Orientation towards natural gas as the main energy source, Increasing the share of the population connected to the central heating system (Kragujevac, Kula, Niš, Novi Pazar, Novi Sad, Pančevo, Rekovac, Aleksinac, Priboj, Smederevo, Sokobanja, Sombor, Sremska Mitrovica, Stara Pazova, Kladovo, Topola, Ub, Užice, Varvarin, Velika Plana, Vranje, Zaječar, Zrenjanin, Žitorađa);
- Traffic regulation with emphasis on transit (Čačak, Ćićevac, Aleksinac, Zrenjanin);
- AQ Monitoring establishment (Lapovo, Ljubovija, Ljubuški, Malo Crniće, Merošina, Paraćin, Pirot, Ražanj, Srbovran);
- Landscaping, StP (Bečej, Bojnik, Kruševac);
- Elimination or at least mitigation of industrial air pollution, burning of stubble and landfills (Bor, Šabac, Smederevo, Surdulica, Vladičin Han, Žabalj);
- Adoption of strategic documents (Pančevo, Šabac).

### 3.7 Financing the air protection

Local budgets have been the main sources of funding for measures taken to reduce air pollution over the past three years.

When it comes to financing air protection, LSGs show a high dependence on support from the government and they underline some burning issues [Question 4352]. The majority of local self-governments, 59 out of 77 (76.6%) believe that "the government should allocate more funds from the budget for solutions at the local level". Next, 10 out of 77 (13.0%), state that: "The government should enable us to reach a solution on our own, by co-financing the allocation from the budget of our local self-government,". It should be noted that LSGs with more experience in dealing with air quality issues have opted for "to ensure that we can borrow funds from financial institutions and carry out monitoring, planning and measure implementation ourselves," (Figure 14).

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52 In your opinion, what kind of support to local self-government units would be needed by the government of the Republic of Serbia, in order to reduce air pollution in your community? In terms of financial support, the Government should…?
Allocate more funds
- Co-finance the allocation from the LSG budget of LSG
- Ensure funds for monitoring and planning, but not measures
- Ensure funds for monitoring and planning, including measures

LSGs depend on external expertise but do not have sufficient funds to engage additional air quality experts.

In relation to the technical support needed from the state level in order to increase air quality at the local level, LSGs expressed high expectations from the Government [Question 4453]:

- **50** LSGs (64.9%) expect Government to **enable them to engage experts**, but also **pay** for the engagement of experts to solve this complex problem;

- **19** LSGs (24.7%) expect Government to **hire experts** (directly) to solve this complex problem;

- **8** LSGs (10.4%) expect Government to **facilitate experts’ engagement** to solve this complex problem.

This high reliance on the government can be easily interpreted by the state of finances and capacity at the local level.

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53 In your opinion, what kind of support to local self-government units would be needed by the government of the Republic of Serbia, in order to reduce air pollution in your community? In terms of technical support, the government should…?
Finally, the last question is about other measures and legal actions to be conducted at the state level in order to increase air quality at the local level [Question 4554]. In addition to the already presented request for more funds, local self-government units recognize the possible influence of the government on the industrial and traffic infrastructure operators under state jurisdiction, so they have requests to regulate their impact on local air quality. The LSGs listed the following measures that they would expect from the government in order to help reduce air pollution:

- Respect for existing legislation and increased inspection supervision,
- Stimulation of energy efficiency,
- Greater attention to the education of employees in local self-government,
- Development of strategic documents,
- Expansion of the air quality monitoring system,
- Recommendations for applicable and sustainable solutions,
- Afforestation and landscaping.
4. Conclusions and Recommendations

During 2019, as many as 92% of the inhabitants in the agglomerations and the cities discussed here had excessively polluted air (category III). If we look at the distribution of the total population in the Republic of Serbia by AQ categories, available data shows that: 57% of the population had clean or slightly polluted air, and 43% had polluted air. A studies conducted by experts from the WHO and the Public Health Institute “Dr Milan Jovanović Batut” have established the correlation between polluted air and human health, and have quantified the damaging effect on health. The Balkan region, including Serbia, suffers the most intense negative impact in Europe.

Various challenges to solving the air pollution problem have been recognized by the LSGs, including the lack of funds and technical/administrative capacity, lack of monitoring as an essential prerequisite for adequate air quality assessment, lack of air quality plans, their evaluation and adjustments.

Within the survey, representatives of LSGs recognised several main obstacles in reducing air pollution and achieving better air quality status in their communities. They can be summarised as:

- Lack of strategic documents;
- Legislation and bylaws do not recognize emissions from individual house heating;
- Non-existent or insufficient capacity of LSGs to treat AQ issues;
- Lack of local Air Quality monitoring;
- Inefficient individual heating;
- Emissions of air pollutants from operators operating under national jurisdiction;
- Lack of inspection and monitoring of compliance;
- Lack of air quality expertise on the local level;
- Insufficient allocation of budget funds for cleaner air.

4.1 Administrative/Technical Capacity

Based on the expressed interest, it is recommended to organize **capacity building focused on the preparation of the local Air Quality Plan**. Examples of good practice should be presented, e.g.: the experience of Novi Sad in terms of its strong horizontal cooperation in implementing the activities planned by the AQP; the example of Subotica, which finds sources of funding through cross-border cooperation competitions; the financing mechanisms used by Uzice and the activities of the local self-governments of Šabac and Zaječar.
Strengthening the capacity of LSGs for inspection supervision in accordance with the law and bylaws in the field of air quality is needed, as well as strengthening the capacity of local self-government for control of measures and activities envisaged in the Air Quality Plans.

It is recommended that in local self-government units with more than 20,000 inhabitants, air quality related duties should be listed and clearly recognized in the job descriptions of local government bodies.

4.2 Legal Framework

Legislation should be amended in order to clearly define responsibilities in relation to the emissions from individual house heating, namely wood and coal fireplaces, which are identified as the dominant source of air pollution in most LSGs.

It is advised that public procurement procedures related to air quality monitoring services should be further amended, in order to facilitate the selection of monitoring operators (for example, to allow a negotiating procedure for the AQ monitoring service for a period of one year, regardless of the price).

Stricter compliance of operators (industry, mining, traffic, etc.) with AQ regulations is needed.

4.3 AQ Monitoring, Planning and Implementation

Part of the AQ monitoring in the state network is carried out by the local PHI. They receive an annual fee for these activities from the Ministry of Environmental Protection. The details of the program are harmonized every year. By directing monitoring towards the reference monitoring of PM10 and increasing its frequency during the year, the government, through the Ministry, is therefore increasing the funding of local monitoring. Continuation of these activities, aiming at reaching the frequency of measurements sufficient to assess air quality, deserves full support.

In order to stimulate pilot monitoring of AQ in LSGs that don't have monitoring system, a reference monitoring of PM10 particles could be organized and implemented as a project activity for a period of one year (e.g. the locations of the measuring points could be: Kruševac, Vranje, Pirot, Trstenik and Negotin.

In order to have better overview on air quality within the territory of the Republic of Serbia, AQ reference monitoring in LSGs has to be performed to obtain valid data for AQ assessment in all cases where there is even a suspicion that there might be exceedances of any pollutant. In all cases defined by the regulations, Air Quality Plans should be developed, prepared and adopted.

While the participation of local experts in the preparation of AQ Plans is evident, AQP should be prepared either by LSG, or under direct control or closer monitoring of the LSG. The measures and activities envisaged in the AQ Plans should be carried out under strict LSG's monitoring and should lead to the improvement of the AQ status.
Measures to improve air quality should tackle priority issues identified in each LSG: local combustion plants, energy efficiency, orientation towards natural gas as the main energy source, increasing the portion of the population using central heating systems, traffic regulation with emphasis on transit, landscaping, elimination or at least mitigation of industrial air pollution, burning of stubble and landfills and adoption of strategic documents.

In the preparation and adoption of the budget of the local self-government, determine the **funds for the implementation of measures from the Air Quality Plan and the Short-term Action Plan for Air Protection**. LSGs should apply successful financial models/incentives that will support the citizens address the air pollution problem on the level of their household, making sure that no one is left behind.


12. Decree on determining the air quality control program in the state network, *Official Gazzette RS*, No. 58/11.


Report on air quality protection at the local self-government level in the Republic of Serbia