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Air Pollution in the Western Balkans

Key messages for policymakers and the public

General view of the city as smog blankets Sarajevo, Bosnia and Herzegovina. © REUTERS/Dado Ruvic

Acknowledgements
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* References to Kosovo shall be understood to be in the context of UN Resolution 1244 (1999)

Foreword

“Last winter, I wanted to make snowmen and snowballs, but we couldn’t go outside. We must sometimes wear masks or scarves over our faces”, said 9-year old Sarah Kaidić, of the Isak Samokovlija school in Sarajevo, Bosnia and Herzegovina, during a press field trip organized by the UN Environment Programme. Soaring air pollution levels mean that — even prior to COVID-19 — Sarah has been all too used to wearing masks and staying at home while her school must close.

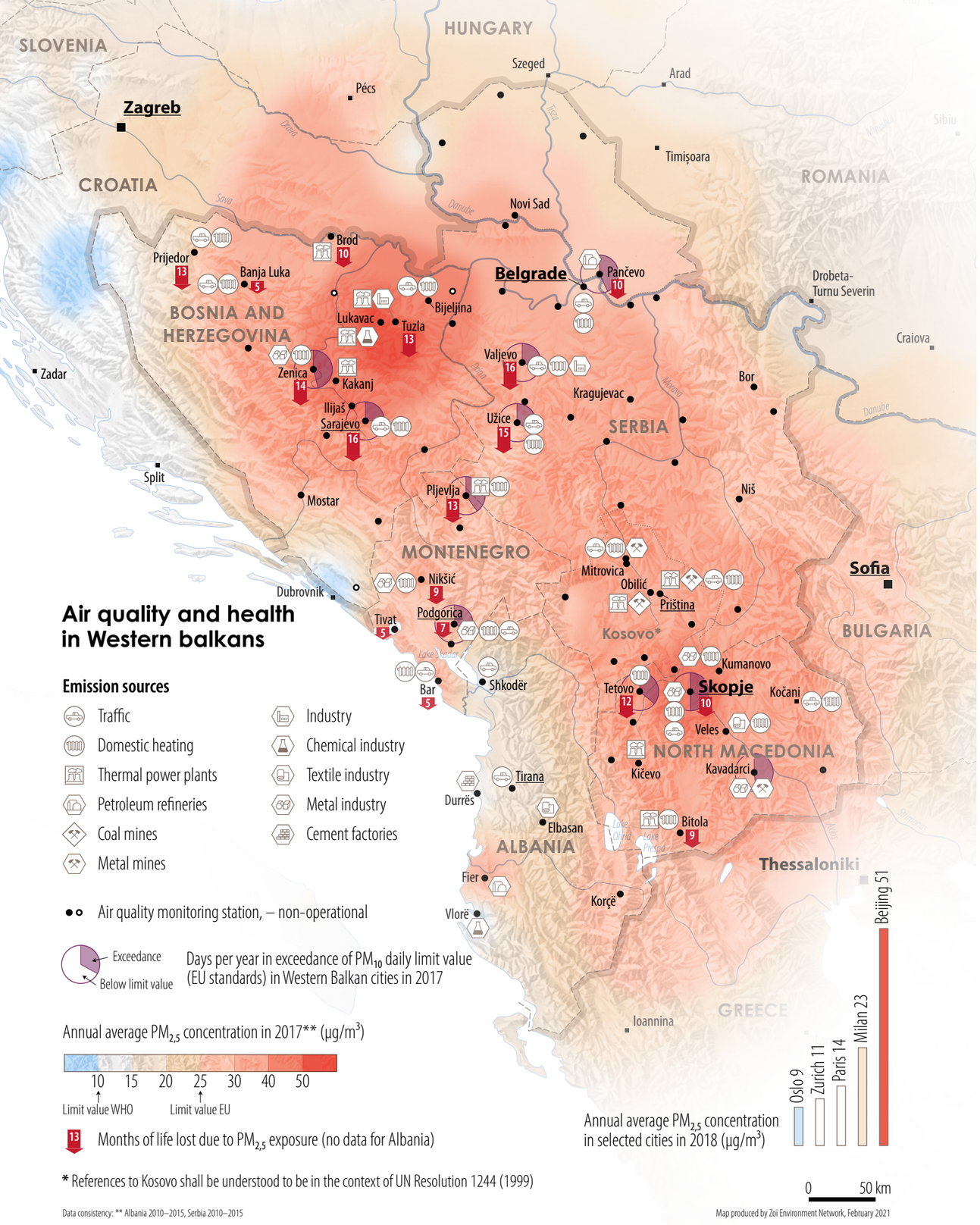
Across the Western Balkans, air pollution levels are breathtakingly high, and take an enormous toll on human health and mortality. Air pollution is the single greatest environmental threat to human health in the region, and in the world. City dwellers in the Western Balkans breathe air with concentrations of pollutants up to five times higher than levels specified in national, European, and WHO Air Quality Guidance standards. As this report points out, air pollution steals an average of 13–16 months of life from city dwellers in the region, and accounts for a total of nearly 5,000 deaths. Air pollution also serves as a warning for the tangible lack of climate action underway. This Study on Air Quality and Human Health in the Western Balkans covers 19 towns and cities and is the first regional assessment that quantifies the impact of air pollution on human health in the region. The synthesis report presents an easy-to-read summary of findings whose main purpose is to motivate decision makers in the region and mobilize long-overdue action to combat air pollution.

Once we acknowledge the intrinsic link between air quality and health and the cross-sectoral nature of air pollution, we can begin to design policies that address the issues at hand, in line with UN Environment Assembly and World Health Organisation resolutions. Furthermore, the EU Green Agenda for the Western Balkans, confirmed during the Sofia Summit in 2020, provides a clear framework for tackling both air pollution and climate change in the region. The UNEP-hosted Climate and Clean Air Coalition works at the nexus of climate and air quality to help ensure strong mitigation activities to achieve the 2030 Agenda. By engaging in these processes, countries and their policy makers can raise their ambition and make the most of the tools available to pursue their goals.

To this end, the UN Environment Programme (UNEP) increased its focus on air quality in the region, and this study is just one of the initiatives underway. UNEP was recently mandated by the UN General Assembly to launch the International Day of Clean Air for Blue Skies to bring attention to this pressing issue. We stand ready to help countries in the region deal with this alarming problem, and remind cities in the Western Balkans that they are not alone in combatting air pollution. As a UN body with decades of experience, we hope to serve as a catalyst for decision making and policy development towards a cleaner environment and better health for all citizens by encouraging decarbonization, greener energy sources and recreating links between urban development and nature-based solutions.

We hope that this earnest evaluation can be a helpful step in accurately understanding the plight of air pollution in the region, and lay out the options for applying remedies.

Bruno Pozzi
Director, Europe Office



Air quality and health in Western balkans

Emission sources

- Traffic
- Domestic heating
- Thermal power plants
- Petroleum refineries
- Coal mines
- Metal mines
- Industry
- Chemical industry
- Textile industry
- Metal industry
- Cement factories

●○ Air quality monitoring station, – non-operational

Exceedance / Below limit value — Days per year in exceedance of PM_{10} daily limit value (EU standards) in Western Balkan cities in 2017

Annual average $PM_{2,5}$ concentration in 2017** (µg/m³)

10 15 20 25 30 40 50

Limit value WHO ↑ Limit value EU ↑

13 Months of life lost due to $PM_{2,5}$ exposure (no data for Albania)

Annual average $PM_{2,5}$ concentration in selected cities in 2018 (µg/m³)

* References to Kosovo shall be understood to be in the context of UN Resolution 1244 (1999)

Data consistency: ** Albania 2010–2015, Serbia 2010–2015

Map produced by Zoï Environment Network, February 2021

Overview

People living in the Western Balkans breathe air that has concentrations of pollutants up to five times higher than levels specified in national and European guidelines. In studies of air pollution in the region, the United Nations Environment Programme confirms what people there have known for a long time – something needs to be done about the poor air quality. In recent years activists have staged protests in cities across the region to raise awareness of the need for action. In an eerie convergence of a deadly disease and one of the factors that make people more vulnerable to that disease, the latest protests occurred just as COVID-19 was beginning to emerge as a global pandemic. Among the earliest health alerts about COVID-19 was the warning that the virus is particularly hard on people with existing vulnerabilities, and further impacts people differently based on age and sex with higher mortality rates reported for men than women. As it happens, breathing highly polluted air can compromise lung function, and its adverse impacts and outcomes are also differentiated by age and sex.

The people in the Western Balkans are not alone – globally, nine out of ten people breathe outdoor air that is polluted beyond levels deemed acceptable under World Health Organization guidelines, and about 7 million premature deaths per year are attributable to air pollution. At the 2017 session of the United Nations Environment Assembly, delegates from around the world unanimously agreed that air pollution is the single greatest environmental threat to human health. And the greenhouse gas emissions – the part of overall air pollution that causes global warming – are widely considered to be a threat to humankind's very existence.

Key findings

The contributions of air pollution to premature deaths from heart disease, stroke, chronic obstructive pulmonary disease, lung cancer and other diseases support the consensus that air pollution is the single greatest environmental threat to human health. On average, city dwellers in the Western Balkans lose up to 13–16 months of life to air pollution, and the total number of premature deaths directly attributable to air pollution in the region is nearly 5,000 per year.

The main sources of air pollution in the Western Balkans are thermal power stations, outdated manufacturing plants with inadequate pollution controls, vehicular emissions from an aging fleet, mining, and the burning of coal for domestic heating. The energy supply in the region comes mostly from fossil fuels – coal and imports of oil and natural gas. Thermal power plants, which rely mainly on lignite for fuel, produce substantial amounts of sulfur dioxide, nitrogen oxides and dust or particulate matter. Fine particulate matter is responsible for most of the health impacts identified in the analysis for the Western Balkans. Energy poverty – a condition generally recognized to exist when people are spending a disproportionate share of their income on fuel to heat their homes – is widespread in the region.

Summary of recommendations

The public health effects of air pollution in the Western Balkans provide a powerful incentive to act to reduce emissions. The key recommendations of the United Nations Environment Programme study of air pollution in the Western Balkans for the governments in the region include:

- Introducing stricter emission standards for vehicles, power plants and large- and small-scale industry
- Supporting the renewable energy sector and promoting the reduction of fossil fuel use to generate electricity
- Enabling citizens to switch to cleaner heating and cooking technologies
- Informing citizens of the health risks associated with air pollution including the sex- and age-differentiated risks

The challenges related to air pollution come with opportunities to use air pollution policy initiatives to make progress across a range of related areas. Reducing air pollution protects the environment as well as the public health, contributes to the fight against climate change, supports progress on the United Nations Sustainable Development Goals and – in the Western Balkans – may alleviate energy poverty and support the countries in the EU accession process.

Pollutants and health effects

The health effects of air pollution depend on how much is emitted, where the pollutants are emitted and how harmful they are, how long they remain in the atmosphere, how they interact with other substances in the air, where they end up and how sensitive the exposed population is. The most vulnerable groups are children, the elderly and those with pre-existing heart or lung conditions. The weather can disperse air pollution over great distances and across borders. Local topography plays an important role in the dispersion of pollution, and can be a factor in the development of temperature inversions that trap polluted air.

The underlying studies consider nitrogen oxides (NO_x), ozone (O_3), particulate matter (PM), and sulfur dioxide (SO_2). Not surprisingly, when we breathe in these pollutants, they affect our lungs and other body organs, causing inflammation and exacerbating an array of underlying health conditions.

The air pollutant that affects human health more than any other is particulate matter – a mixture of solid particles and liquid droplets of different sizes and shapes that either enter the air directly from a source such as a fire or a smokestack, or form in the atmosphere through reactions among chemical pollutants emitted by power plants, industry or vehicles. Air quality measurements track two sizes of particulate matter – PM_{10} for particulate matter 10 microns in diameter or smaller, and $PM_{2.5}$ for particles 2.5 microns in diameter or smaller ("micron" is the abbreviation for micrometre, and is one millionth of a metre). The human eye can generally detect particles 25 microns in diameter or larger. The finer particles, which are so small that we can breathe them deep into our lungs, pose the greater risks to health.

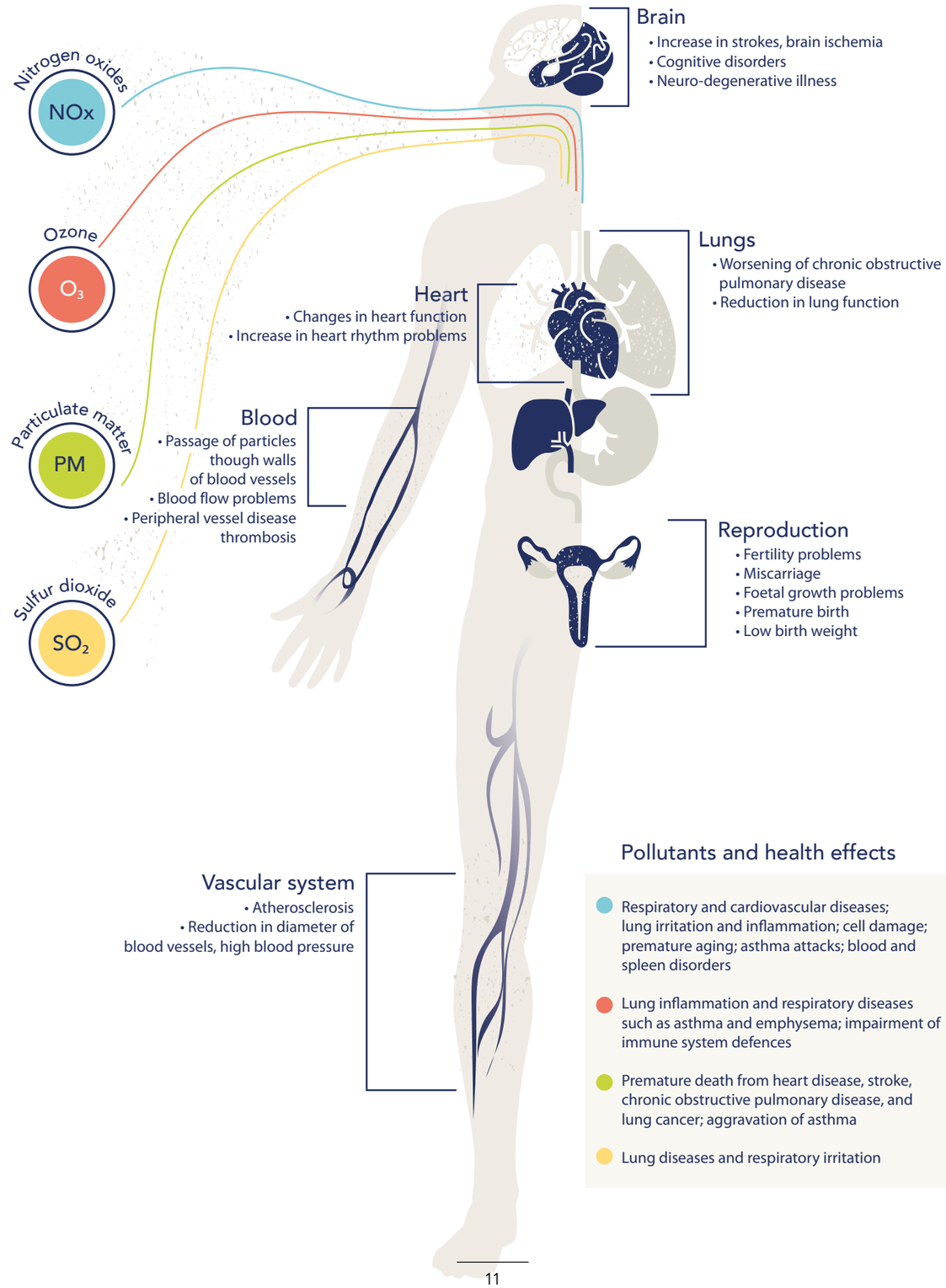
Health risk assessment

Understanding the relationship between the levels of pollutants in the air and the incidence of the diseases they affect is a basic step in the analysis that allows public health and government officials to determine the priorities for public health interventions. Research and field studies on the complex relationships among the factors contributing to disease allow analysts to develop concentration-response functions, which they use to determine the proportion of deaths associated with the population's exposure to a pollutant.

This study relies on concentration-response functions developed by the World Health Organization (WHO). The assessment was prepared by gathering relevant public health data and air quality data from the respective national Public Health and Hydrometerological Institutes. After a detailed analysis, 19 towns had representative data necessary. A computer programme, AirQ+, has been used to input the gathered data and qualitative results of the impacts of air quality and pollution on human health was achieved. Estimates of the exposure of the populations being studied come from air quality monitoring networks in the region, and together with the concentration-response functions allow analysts to calculate what percentage of a disease in a given population can be attributed to the exposure of interest. With knowledge of this attributable proportion and local data on mortality, analysts can then calculate the number of deaths attributable to the exposure of the population under study. This study considers mortality data for four selected causes of death – ischaemic heart disease, stroke, chronic obstructive pulmonary disease and lung cancer – for which concentration-response functions are available.

It is also important to recognize the gender-specific health impacts of air pollution. For example, while both girls and boys suffer from negative impacts in their pubertal stages due to pollution, it was found that PM_{10} exposure in utero and during infancy led to these issues in girls while sulfur dioxide and nitrogen dioxide exposure in utero and during infancy impacted boys more heavily. Additionally, PM, sulfur dioxide, and nitrogen dioxide have been found to lead to cognitive declines after long-term exposure, and were found to have the greatest effects on less-educated men. It should also be noted that household air pollution poses a more significant risk to women and children (leading to 60 percent of worldwide premature deaths) as they traditionally spend larger amounts of in the house, often cooking or participating in domestic activities. Acknowledging these distinctions is crucial in having an accurate overview of the health implications from air pollution.

Impact on human health



Health risk assessment terms

Attributable proportion
The fraction of all deaths associated with a given exposure

Concentration-response function
A measure of the cause-and-effect relationship between exposure to pollution (cause) and specific outcomes (effects)

Number of deaths attributable to a given exposure
The total number of deaths from selected causes in the population under study multiplied by the attributable proportion

Premature death
A death that occurs before the average age of death in a certain population

Attributable mortality rate
Deaths attributable to an exposure divided by the total population at risk, usually given as deaths per 100,000 people

Years of life lost
A summary measure of premature deaths calculated using data on the number of people and deaths by age

Air quality monitoring

The countries in the Western Balkans monitor air quality in accordance with European Union legislation and report the data to the European Environment Information and Observation Network. The national annual air quality reports in the region emphasize the problems of inconsistent data often resulting from the lack of financing for the maintenance of stations and the absence of both certified calibration laboratories and air quality modelling. Inconsistency and gaps limit the analysis and compromise the ability to monitor long-term health impacts and formulate targeted policy responses. The country profiles presented in report provide information on the status of each country's air quality monitoring efforts.

As candidate countries for membership in the European Union, Albania, Montenegro, North Macedonia and Serbia have all begun the process of transposing – or integrating – EU legislation into national law, and have for the most part transposed the EU ambient air quality standards into national legislation. Bosnia and Herzegovina and Kosovo* are potential candidates, and are also making progress on air quality standards. Bosnia and Herzegovina is still at an early stage in the process, and defines all limit values in line with EU air quality standards, except for $PM_{2.5}$. Kosovo* is aligning its limit values for air quality in accordance with EU standards. Air quality measurements suggest that the Western Balkans still face serious challenges in meeting the EU standards set in the limit values, which establish the pollutant concentration levels that should be maintained to reduce health effects of the population's exposure.

Results in the Western Balkans

The health risk assessment finds that air pollution reduces life expectancy by up to 13–16 months in Western Balkan cities and contributes more than 15 per cent of the total mortality in 7 cities studied. The premature deaths of people younger than 65 years of age account for about 20 per cent of the years of life lost due to the exposure to air pollution. Premature deaths directly attributable to air pollution in the 19 cities assessed by this study total nearly 5,000 per year. Belgrade, the largest city in the region, had 1,004 deaths, the highest number of deaths among these cities. The highest morality rate, however, occurred in Pljevlja, Montenegro, with approximately 310 deaths per 100,000 people. In the cities of Tetovo and Skopje in North Macedonia, nearly one fifth of all deaths are linked to air pollution.

Fine particulate matter – $PM_{2.5}$ – accounts for about three quarters of the air pollution health impacts in the study. The concentration levels of $PM_{2.5}$ are high across the region. The annual ambient concentrations of $PM_{2.5}$ in the cities included in this study exceed the WHO Air Quality Guideline value (with the exception of Vlorë in Albania), and almost 75 per cent of the cities exceed the less stringent EU limit value. No health impact assessment of $PM_{2.5}$ exposure was possible for Belgrade or for any cities in Albania because the necessary $PM_{2.5}$ data for these cities was incomplete.

The PM_{10} concentrations in the selected Western Balkan cities show strong seasonal variations. Burning wood and coal is widespread in the region, and PM_{10} concentrations increase considerably during the winter months due to high heating demands and to the region's topography. National and EU legislation limits the number of exceedances of the daily limit value for PM_{10} to 35 per year. These exceedances often occur in winter. Of the 12 cities for which data are available, 10 exceeded the daily limits for more than the allowed 35 days in 2017.

Sex- and Age-disaggregated data

Air pollution impacts men, women, girls and boys differently, with additional consequences for pregnant women and unborn children. There is a need for standardized methodologies on the collection of health data disaggregated by sex and age. Measuring and analyzing disaggregated data enables linkages to be drawn between air pollution and adverse health outcomes for the different categories and such information supports the formulation of targeted interventions designed to maximize human health and other associated benefits.

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Exceedances of the daily WHO limit for PM_{10} concentrations by city, 2017

Country	City	Number of days with exceedances
Bosnia and Herzegovina	Sarajevo	89
	Zenica	168
Kosovo*	Priština	61
Montenegro	Bar	11
	Nikšić	33
	Pljevlja	145
	Podgorica	118
North Macedonia	Kavadarci	175
	Skopje	181
	Tetovo	132
Serbia	Pančevo	157
	Užice	122
	Valjevo	114

The annual average nitrogen dioxide concentration levels recorded in most cities of the region were below the WHO Air Quality Guideline value, with the exception of some stations in Belgrade and the new stations in Gnjilane and Priština.

Traffic jam in Belgrade, Serbia. © REUTERS/Marko Djurica

Air pollution sources

Electricity generation from thermal power plants, most of which are lignite-fired, produces substantial amounts of sulfur dioxide, nitrogen oxides and particulate matter. Lignite power plants in North Macedonia, Bosnia and Herzegovina, Montenegro and Serbia are major sources of SO_2 in the region, while high concentrations of particulate matter come primarily from plants in Kosovo*, North Macedonia and Serbia. The main sources of air pollution in urban and industrial areas include emissions from thermal power, domestic heating, traffic, manufacturing plants, and mines.

Pollutants and sources

Fifteen coal-fired power stations are currently active in five of the Western Balkan countries. Coal is also a major source of heating, especially for individual furnaces, resulting in higher air pollutant concentrations during the winter months. Most buildings in the region rely on decentralized heating systems, while 12 per cent of the buildings are connected to district heating. Albania and Montenegro have no district heating systems. Next to the use of coal, biomass is the most important source of energy in the region, accounting for 42 per cent of the energy required for heating.

Outdated heating equipment and the burning of green wood result in the inefficient use of biomass and high particulate emissions. The region's heavy reliance on imported oil and gas and its low energy conversion efficiency explain the high carbon intensity In the Western Balkans. These inefficiencies play out at the household level where expenditures on heating and electricity are so high that most of the Western Balkan countries are below the energy poverty line. Only Albania among the countries in the region relies predominantly on hydropower for energy production.

A tractor filled with corn husks next to one loaded with wood in preparation for winter in the village of Kosare, Kosovo*.
© REUTERS/Hazir Reka

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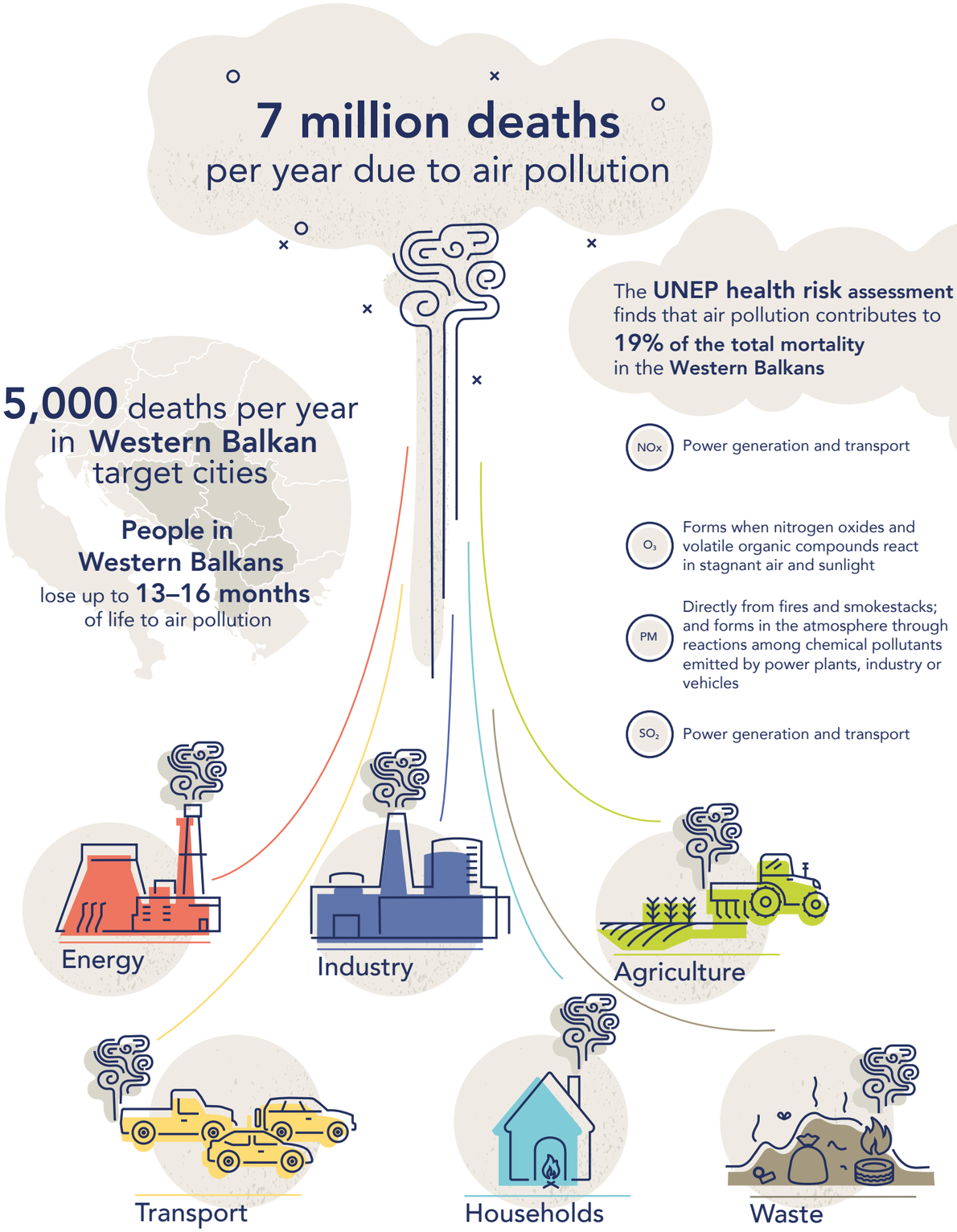
Pollutants and sources



Opportunities for co-benefits

The public health effects of air pollution in the Western Balkans provide a powerful incentive to act to reduce emissions, and the co-benefits are significant. Reducing air pollution protects the environment as well as public health, contributes to the fight against climate change, supports progress on the Sustainable Development Goals and – in the Western Balkans – may alleviate energy poverty and support the countries in the EU accession process.

Environmental effects

Poor air quality can exacerbate food insecurity, hinder economic development and degrade the environment upon which livelihoods depend. Air pollutants, particularly sulfur dioxide and nitrogen oxides, may affect the functioning of soils, forests and aquatic ecosystems. Nitrogen from air pollution may contribute to eutrophication – an excessive richness of nutrients that causes algae blooms in water bodies resulting in reduced oxygen and loss of biodiversity.

The health and environmental impacts of energy generation and consumption are important influences on energy policy in the region in light of the countries' intentions to join the European Union. The countries have started reducing their emissions from large combustion plants to comply with the Energy Community rules requiring Western Balkans coal power plants to gradually cut their emissions by the end of 2027.

Air pollutants and environmental effects

Pollutant	Environmental effects
Nitrogen oxides (NO_x)	Eutrophication; acidification; precursor of Ozone, $PM_{2.5}$ and smog; and reduced agriculture yields
Sulfur dioxide (SO_2)	Acid rain and acidification in the environment
Particulate matter (PM)	Acid rain and climate change
Ozone (O_3)	Reduced agriculture yields

Climate change

The relationship between climate change and air pollution is complex. Nitrogen oxides, for example, are precursors to ozone, which is both a health hazard and a greenhouse gas. Ground level ozone forms when nitrogen oxides and other air pollutants are trapped in the lower atmosphere on stagnant days, which now occur with more frequency as a result of climate change. The newly formed ozone then not only contributes to warming but also increases the threats to public health. But the best part about the relationship between climate change and air pollution is that the main sources of air pollution are the same sources of the greenhouse gas emissions that cause global warming. Progress on one front is progress on both.

Gender Considerations

Addressing air pollution in the Western Balkans is also an opportunity to make progress on gender issues in the region. Health risks in general are strongly correlated with gender, particularly in low-income households. Often, women and girls are expected to gather solid fuels for burning, which disproportionately exposes them to higher levels of pollutants. Air pollution also contributes to various issues during pregnancy which impacts both the mother and development of the child.

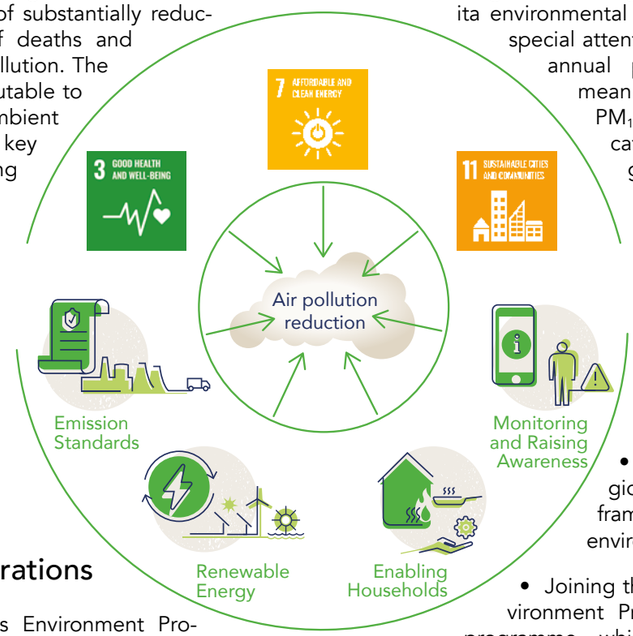
The Sustainable Development Goals

The Sustainable Development Goals (SDGs) address a range of global challenges that include poverty, inequality (including gender inequality), climate change, environmental degradation, peace and justice, and set targets for significant improvements by 2030. Three of the goals and the related targets and indicators are particularly relevant to the air pollution issues in the Western Balkans.

SDG 3 calls for ensuring healthy lives, and includes the specific target of substantially reducing the number of deaths and illnesses from air pollution. The mortality rate attributable to household and ambient air pollution is the key indicator for marking progress.

SDG 7 calls for ensuring access to affordable, reliable, sustainable and modern energy for all, and targets universal access to affordable, reliable and modern energy services. The proportion of population with primary reliance on clean fuels and technology is the key indicator for marking progress.

SDG 11 calls for making cities and human settlements inclusive, safe, resilient and sustainable, and includes the target of reducing the adverse per capita environmental impact of cities, with special attention to air quality. The annual population weighted mean levels of $PM_{2.5}$ and PM_{10} in cities are key indicators for marking progress.



Policy considerations

The United Nations Environment Programme study of air pollution in the Western Balkans offers a range of policy recommendations for the governments in the region. Recommendations for reducing emissions include:

- Introducing stricter emission standards for vehicles, power plants and large- and small-scale industry
- Requiring industry to reduce and eliminate emissions of harmful air pollutants
- Prioritizing emission reductions from highly polluting industrial facilities such as coke ovens, smelters, refineries, cement plants and brick kilns
- Supporting the renewable energy sector and promoting the reduction of fossil fuel use to generate electricity
- Enabling citizens to switch to cleaner heating and cooking technologies

More general recommendations include:

- Creating national, regional and international frameworks to address the environmental challenges
- Joining the United Nations Environment Programme air quality programme, which supports governments at all levels in building evidence on the effects of air pollution
- Informing citizens of the health risks associated with air pollution including the sex- and age-differentiated risks
- Monitoring and raising awareness of air pollution by publishing air quality monitoring data and promoting awareness campaigns

Policymakers in the Western Balkans face daunting challenges related to air pollution, but they also have many opportunities to use air pollution policy initiatives to make progress across a range of related areas – combatting climate change, supporting the Sustainable Development Goals, alleviating energy poverty and advancing in the EU accession process. In November 2020, at the Sofia Summit, ministers jointly signed the Green Deal, which amongst other goals, aims toward having no net greenhouse gas emissions by 2050, decoupling economic growth from resource use, and leaving no person or place behind. Any country-specific recommendations appear in the country profiles.

Smoke billows from the Kosovo* power station. Obilić, Kosovo*. © PANOS/Andrew Testa

* References to Kosovo shall be understood to be in the context of UN Resolution 1244 (1999)

Albania

Compared to its Western Balkan neighbours, Albania's air quality is considered good. Reported annual mean concentrations of primary air pollutants are generally within the EU standards and WHO recommended values, with the exception of PM_{10}.

Tirana, the country's capital with nearly one third of the country's population, has exceeded annual limit values for NO_2 and PM_{10} in recent years, largely due to increased road traffic. In the Elbasan, Fier and Korçe regions, where high concentrations of particulate matter can be found, the main sources of air pollution are industrial activities, notably a petroleum refinery and metal and textile manufacturing.

A 2014 national health report finds that the health risk from both indoor and ambient air pollution declined substantially between 1990 and 2010, but in 2010 was still responsible for nearly 10 per cent of the total burden of disease in Albania. A 2016 WHO global assessment estimated that ambient air pollution caused 1,855 premature deaths in Albania (63 per 100,000 inhabitants).

Legal and institutional framework on air quality

In 2014, Albania passed a key legal instrument – the Law on Protection of Ambient Air Quality. A 2015 Decision of the Council of Ministers provides an update on the limit values of national air quality standards in line with EU air quality standards and sets various deadlines for those limits to be met.

At the national level, the Ministry of Environment, Forests and Water Administration is in charge of the approval of monitoring systems and inter-institutional and international coordination on air quality issues. The National Environmental Agency is the competent authority for assessing air quality, analysing evaluation methods and ensuring the accuracy of measurements. Other line ministries and local government units are responsible for certain air quality measures. Municipal authorities are required by law to prepare an air quality plan where a pollutant concentration exceeds the limit value, but so far only Tirana has prepared a draft plan

Progress, challenges and gaps

While the Directive on Ambient Air Quality and Cleaner Air for Europe has been fully transposed in Albania, some provisions – such as sharing air quality data with the public – have lacked effective implementation mechanisms.

Albania adopted a National Air Quality Strategy in 2014, but failed to adopt an action plan due to the lack of financial resources for implementation. The estimated cost of full implementation of the measures to improve air quality in Albania is EUR 494.5 million, while the contribution from the national budget is EUR 1.3 million.

Annual mean values of PM_{10} concentrations have declined significantly from 2012, especially in the coastal areas of Durrës and Vlorë due to the closure of the only thermo-power plant in Vlorë and a general decrease in the use of fossil fuels. Albania has no infrastructure for district heating, and uses electricity for 62 per cent of household heating. The use of firewood for household heating is limited to only 20 per cent of households, much lower than its Western Balkans neighbours. Hydropower – with no negative effects on air quality – is the main source of energy production in Albania.

In 2011, the country established a national air quality monitoring network consisting of seven automatic stations located in Tirana, Elbasan, Durrës, Shkodër, Vlorë and Korçe, but air quality monitoring in Albania does not align with EU requirements, and the 2018 Supreme State Audit found that Albania's air quality data have a low level of reliability. The environmental inspection authorities lack the equipment and expertise to regularly control emissions from stationary emission sources.

Air quality monitoring and assessment in Albania

Status

Network coverage	The number of monitoring stations is limited and provides no coverage in remote locations.
Monitoring consistency	$PM_{2.5}$ was not continuously monitored across the stations over the years, resulting in a lack of comparable national data. The Elbasan monitoring station cannot monitor $PM_{2.5}$, while the Fier station does not carry out continuous air quality monitoring.
Facility accreditation and quality assurance	The country has no accredited calibration laboratory, but contracts with a local company for the service. Air quality data are not regularly validated nor subject to quality assurance/quality control.
Air quality assessment	Air quality assessments performed by national agencies do not conform to international standards and do not regularly include source apportionment and air quality modelling.
Health impact assessment	Inconsistent air quality data and lack of appropriate national health statistics preclude the development of health assessments. The Institute for Public Health lacks a clear mandate to monitor the impact of air pollution on public health or to raise public awareness.

Summary

Clear enforcement mechanisms would improve the legal and strategic framework on air quality in Albania. The National Environmental Agency needs to strengthen air quality monitoring and assessments to include accreditation for air quality monitoring, the application of quality assurance/quality control procedures to ensure data quality and capacity-building for air quality modelling and source apportionment. The Institute of Public Health should conduct regular assessments of the health impacts of air pollution, raise public awareness of the issue, and use an Air Quality Index to provide accessible information to the general public in real time.

Bosnia and Herzegovina

The majority of monitoring stations located in Bosnia and Herzegovina (FBiH) recorded annual mean PM_{10} concentrations close to or higher than EU ambient air quality limit values between 2015 and 2017. $PM_{2.5}$ concentrations measured at all stations in FBiH exceeded the air quality limit values. In 2015, concentrations measured in Živinice and Tuzla were 10 times higher than the limit. The high $PM_{2.5}$ concentrations are attributable to emissions from several major industrial facilities, including a power plant, a soda chemical manufacturing facility and a cement factory in the vicinity of the monitoring stations. An air emission model shows that power plants, residential combustion and heating, and industrial processes altogether account for 78 per cent of the total $PM_{2.5}$ emissions.

While NO_2 concentrations are generally satisfactory, one station in Sarajevo recorded high annual concentrations and exceedances, a result mainly of traffic and heating. Annual mean concentrations of SO_2 in Zenica and Tuzla, attributable to the presence of major industrial emitters in the two cities, raise concerns.

Legal and institutional framework on air quality

Between 2002 and 2004, the Inter-Entity Steering Committee in Republika Srpska, the FBiH and the Brčko District approved laws on air quality and emissions prepared under the direction of the EU Community Assistance, Reconstruction, Development and Stabilisation Programme. The Law on Air Protection prescribes air quality standards and specific technical and administrative regulations and measures to protect and improve air quality.

The Parliament of the FBiH adopted a 10-year Federal Air Protection Strategy as part of the Federal Environmental Protection Strategy. The Ministry of Environment and Tourism of FBiH, the Ministry of Spatial Planning, Civil Engineering and Ecology of Republika Srpska and the Department for Spatial Planning, Property Rights Matters of the Brcko District Government as well as cantonal ministries of the Federation are responsible for environmental issues and air quality management. Cantonal law-making bodies must provide cantonal air quality protection plans for a period of at least five years as part of cantonal environmental protection plans. So far two cantons – Sarajevo and Una-Sana – have developed such plans.

Progress, challenges and gaps

Bosnia and Herzegovina has undertaken efforts since 2011 to transpose the EU environmental standards into national legislation, but is still at an early stage in this process. BiH legislation defines all limit values in line with EU air quality standards, except for $PM_{2.5}$.

The Federal Hydrometeorological Institute in Sarajevo and the Hydrometeorological Institute of Republika Srpska in Banja Luka are responsible for air quality monitoring and meteorological activities. Both institutes publish meteorological and air quality data on their websites and actively cooperate in collecting, processing and publishing data in line with the laws and the regulations of the World Meteorological Organization.

Summary

The introduction of a Pollutant Release and Transfer Registry would help the country develop knowledge of emission sources and levels, and aid policymakers in developing abatement strategies. While the country has worked on reducing emissions certain pollutants into the air from large combustion plants, the competent entity and cantonal authorities need to develop local protection plans for cities with poor air quality and to implement measures to reduce the emissions, particularly in the thermal power plants in Tuzla, Kakanj, Ugljevik and Gacko and the iron and steel plant in Zenica.

Air quality monitoring and assessment in Bosnia and Herzegovina

Status

Network coverage	There are 32 monitoring stations in Bosnia and Herzegovina, but many of the stations are not regularly maintained due to lack of funds, and the data they provide are questionable and not verified by a reference centre. Most of the stations lacked $PM_{2.5}$ data for 2015 and 2016.
Monitoring consistency	The adequacy, maintenance, data quality and reporting of measurements represent the biggest challenges. Due to the lack of funds available to the hydrometeorological institutes, many monitoring stations have not been operational for some time.
Facility accreditation and quality assurance	A general monitoring quality assurance system has not yet been established in BiH.
Air quality assessment	BiH does not currently carry out the air pollution modelling necessary to determine emission sources and air quality.
Health impact assessment	Inconsistent air quality data and lack of appropriate national health statistics preclude the development of health assessments. The Institute for Public Health lacks a clear mandate to monitor the impact of air pollution on public health or to raise public awareness.

Monitoring station, Sarajevo, Bosnia and Herzegovina. © Alejandro Laguna

Kosovo*

Multiple episodes of high-level air pollution recorded during the 2016–2018 period have heightened public concerns about air pollution in Kosovo* and intensified efforts by public institutions to improve air quality management.

Key sources of emissions are power plants, lignite mining, industry (including ferronickel, cement and asphalt production), central heating systems, and transport. Maximum hourly values for PM_{10} and $PM_{2.5}$ can be extremely high in areas of Dardhishte, Gjilan and Priština. In particular, Priština recorded the highest number of PM_{10} exceedances – 61 days of exceeded mean daily values in 2017. The annual report on the state of air in Kosovo* also attributes the poor air quality to unfavourable weather conditions – such as elevated humidity and no wind.

The time coverage of air quality data is insufficient for establishing data trends that could present a reliable picture of air quality in recent years. The Strategy on Air Quality of Kosovo* recognizes the lack of reliable and independently verified data for emission sources.

A 2013 health impact study in Priština finds that the number of hospital admissions for cardiovascular diseases were positively correlated with concentrations of $PM_{2.5}$ and PM_{10}. The study also reports higher numbers of hospitalizations during winter and days with dust.

Legal and institutional framework on air quality

A provision in the Law on Air Protection requires the government to approve limit values for air emissions in accordance with EU and World Health Organization standards. An administrative instrument prescribes limit values of ambient air pollutants that are harmonized with the EU air quality standards.

The law specifies that the majority of activities related to air quality are the responsibility of the Ministry of Environment and Spatial Planning. The Ministry is responsible for continuous air quality monitoring and for determining air quality impacts on the environment and on population health. The Kosovo* Environmental Protection Agency (KEPA), which is part of the Ministry, performs air quality monitoring together with the Hydrometeorological Institute of Kosovo*. Local authorities are limited to the development of local air quality plans and the implementation of air protection measures at the local level.

Progress, challenges and gaps

The 2013 Strategy for Air Quality outlines legislation priorities and measures for reducing air emissions. In response to poor air quality in December 2016, the Government of Kosovo* updated the strategy with a new action plan that includes increasing public awareness and access to air quality information; establishing a task force to coordinate activities at the national level; increasing institutional coordination for air quality management; and intensifying the cooperation and communication with civil society organizations. Lack of funding delayed the adoption of the plan. The 2018 report of National Audit Office notes that the Strategy for Air Quality and the Law on Air Protection had still not been enforced. The Ministry of Environment and Spatial Planning is responsible for identifying sources of air pollution and implementing immediate measures to reduce the levels of air pollution, but has made limited progress.

The Kosovo* air quality monitoring network suffers from insufficient maintenance and inconsistent monitoring practices, resulting in serious data gaps. For most of 2016 and 2017, only 17 per cent of monitoring stations were operational, 33 per cent were out of service for more than seven months during 2017. At the local level, Priština is the only municipality that has undertaken an initiative to conduct its own air quality monitoring.

* References to Kosovo shall be understood to be in the context of UN Resolution 1244 (1999)

Air quality monitoring and assessment in Kosovo*

Status

Network coverage	The air quality monitoring network officially consists of 12 fixed automatic stations and one mobile station, but the number of operational stations is less than the official number. The composition of the network is not well balanced.
Monitoring consistency	Establishing data trends is impossible because of serious gaps in time coverage and inconsistent monitoring practices.
Facility accreditation and quality assurance	An administrative instruction provides the criteria for setting up monitoring points, the number and frequency of measurements, classifications of pollutants being monitored, methodology and data reporting.
Air quality assessment	The time coverage of air quality data is insufficient to present a reliable picture of air quality in Kosovo* in recent years. Only five stations cover more than six months per year. KEPA publishes annual air quality reports, but often falls short of providing an explanation or analysis of recorded values.
Health impact assessment	The obligation to monitor the impact of air pollution on the environment and the public health is clearly stipulated in the law, but an assessment of the health impact of air pollution is not part of regular air quality assessments.

Since May 2018, the KEPA website has published real-time air quality information using the European Air Quality Index. The US Consulate in Priština measures $PM_{2.5}$ and publishes its own data using the US Air Quality Index. The different US and EU standards sometimes lead to confusion and a further deterioration of public confidence.

Summary

Regardless of the quality and quantity of the available data, air pollution clearly poses a threat to public health in Kosovo* and therefore deserves more public attention and intensified efforts by public institutions to engage in proper air quality management, including monitoring and reporting on air quality and reduction of air emissions. Kosovo* needs to improve its measurements, data collection and validation, to make information available to the public and to strengthen its legal and policy framework.

The 2018 report of the National Audit Office includes the following recommendations:

- Central and local level entities should ensure the establishment of a comprehensive and up-to-date legal framework, and efficient and sustainable monitoring and reporting mechanisms
- The Ministry of Environment and Spatial Planning should update and implement the Law on Air Protection from Pollution, the Air Quality Strategy and the Action Plan for Air Quality
- The Environmental Protection Agency should make the air quality monitoring network fully operational
- Municipalities should approve or renew their environmental action plans, and provide complete information on the implementation of measures to improve air quality

Following these recommendations and addressing other issues highlighted in this report would significantly improve air quality management in Kosovo*.

Montenegro

Particulate matter frequently exceeds limit values and episodes of poor air quality occur during the winter months mainly due to the use of coal, household heating and unfavourable winter climate conditions in the inland north. During the 2012–2017 period, annual concentrations of PM_{10} and $PM_{2.5}$ in the northern city of Pljevlja considerably exceeded the national and EU limit values. Transportation and the production of electricity and heat account for most of the particulate matter emissions.

While NO_2 concentrations have generally remained under the limit value, the concentrations of ground level ozone vary seasonally, geographically and by elevation. The coastal and central areas where the majority of the population lives, enjoy relatively good air quality compared to the northern area.

In 2011, the most recent year for which emissions data are available, the generation of electricity and heating accounted for 52 per cent of NO_2 emissions, 59 per cent of PM_{10} emissions and 42 per cent of $PM_{2.5}$ emissions. The Pljevlja thermal power plant was an important source of these emissions. Nearly one-third of NO_x emissions come from road transport, while residential heating accounts for 42 per cent of $PM_{2.5}$ emissions.

A 2016 health impact assessment implicated air pollution in nearly 6 per cent of all deaths in Podgorica, 12 per cent in Nikšić and 22 per cent in Pljevlja. The assessment also indicates that over 250 premature deaths and 140 hospital admissions per year are associated with exposure to particulate matter. Over half of these cases were related to increased levels of air pollution in winter due to higher use of fossil fuels.

Legal and institutional framework on air quality

In Montenegro, the Law on Air Protection and a set of secondary acts regulate air quality control in line with the EU environmental standards. The Law on Air Quality covers a range of matters – the establishment of air quality zones and air quality assessment; the monitoring of emissions from stationary sources; emission inventories; the content of policy documents such as the national strategy on air quality management and air quality plans; and public information disclosure on air quality and the adoption of plans, programmes and measures aimed at air quality improvement.

The Ministry of Sustainable Development and Tourism (MSDT) is primarily responsible for developing national air quality policy, drafting legislation and monitoring implementation. The Nature and Environment Protection Agency (NEPA) is responsible for managing the network of air quality monitoring stations, maintaining an inventory of air emissions, producing air quality reports and public information and submitting air quality data to the European Environment Agency.

The national reference laboratory is responsible for annual air quality monitoring at sampling points within the national network. In cooperation with MSDT and NEPA, local authorities develop and implement air quality plans in zones where air quality limit values are exceeded. The inspection administration supervises the implementation of air quality and other environmental legislation.

Progress, challenges and gaps

Montenegro's national legislation is fully aligned with the EU ambient air directives. A report on the 2017–2020 Action Plan found that 77 per cent of the planned measures had been implemented and good progress had been made in the development of the legal and strategic framework, and in improvements in air quality monitoring and reporting. The country has also made some major investments in the reduction of air emissions. In accordance with the EU directive and domestic legislation, Montenegro developed air quality plans for Pljevlja, Nikšić and the City of Podgorica. All three plans were produced as a result of exceedances of PM_{10} during the winter.

Montenegro is upgrading its air quality network through an ongoing EU-financed project that aims to expand the network from the seven current air quality monitoring stations to ten, including a new European Monitoring and Evaluation Programme station to assess transboundary air pollution.

Air quality monitoring and assessment in Montenegro

Status

Network coverage	Montenegro's air quality monitoring network currently consists of seven automatic stations distributed across three air quality zones – Northern, Central and Coastal. The existing network is expanding its coverage.
Monitoring consistency	Most stations perform consistent monitoring. Due to frequent failures of the measurement equipment, however, data on concentrations of ground level ozone are only comparable for shorter periods.
Facility accreditation and quality assurance	Accredited to carry out air quality assessments in accordance with EU directives, the national reference laboratory participates in inter-laboratory tests; performs measurements, analyses, data verification and validation; and implements quality assurance and quality control procedures.
Air quality assessment	Air quality modelling, source apportionment exercises and assessments of the impact of air pollution on human health and the environment are not a regular component of air quality assessments.
Health impact assessment	In 2016, health impact assessments of air pollution in three cities were conducted under the framework of the biannual collaborative agreement between the WHO and the Ministry of Health in close collaboration with the Ministry of Sustainable Development and Tourism.

Summary

Air quality varies considerably from season to season. The winter months bring a severe increase in concentrations of particulate matter, often doubling the prescribed limit values and far exceeding the WHO recommended values, thus presenting a serious health threat. Approximately 65 per cent of households use solid fuels for domestic heating, and more eco-friendly household heating would improve air quality in Montenegro.

Air quality in the northern City of Pljevlja has deteriorated while emissions from industrial activities, domestic heating and the transport sector remain major concerns in the central region of Montenegro.

The national air emissions inventory needs to be updated and maintained, key emission sources need to be continuously monitored, and the impacts on public health need to be assessed. In addition, air protection institutions need further capacity-building in source apportionment and air quality modeling.

North Macedonia

Between 2012 and 2016, the average annual concentrations of $PM_{2.5}$ in Skopje were approximately twice the limit value prescribed by national and European legislation, and across the country PM_{10} concentrations exceeded the annual limit value, with peaks during winter. A decrease in the production of ferroalloys between 2006 and 2016 reduced PM emissions, but 62 per cent of residential heating – one of the primary sources of PM emissions – relies on wood for fuel, and only 8 per cent of the households are connected to a district heating system.

The generation of power and heat accounts for most of the SO_2 emissions in North Macedonia, and transport, energy and manufacturing are responsible for most NO_x emissions. Reduced coal consumption in major thermal power plants contributed to about a 40 per cent decline in SO_2 and NO_x emissions between 2006 and 2016, during which period the annual mean concentration of NO_2 stayed below the annual limit value.

A 2012 study linked air pollution to every fifth premature death and every fourth hospitalization due to respiratory problems, and attributed over 1,350 deaths annually to particulate air pollution. Several thousand work years are lost annually from hospital admissions and days of restricted activity related to chronic bronchitis and asthma. Particulate air pollution cost the North Macedonian economy approximately EUR 253 million or 3.2 per cent of GDP in 2011.

Legal and institutional framework on air quality

The Law on Ambient Air Quality aligns national legislation with the relevant EU standards and covers a range of topics including the sources of air pollution; limit and target values of concentrations and emissions of air pollutants; air quality assessments and monitoring; information and reporting; and strategic documents and measures on air protection.

Under the Law, the Macedonian Environmental Information Centre (MEIC) within the Ministry of Environment and Physical Planning (MOEPP) carries out most of the activities related to air protection in the country – the development of policy documents; participation in international cooperation; monitoring of air quality; data validation and processing; preparation and generation of reports; public access to air quality data; cooperation with civil society and the public; data collection on emissions of air pollutants; preparation of the national emissions inventory; and air quality modelling. The ministry is responsible for the development of air quality plans, but local authorities are responsible for the development of those local air quality plans that are considered priorities.

Progress, challenges and gaps

Since 2004, North Macedonia has succeeded in reaching a significant level of harmonization with the EU standards on air quality. The 2018 European Commission Progress Report notes that the legislative alignment is near completion, but that implementation remains weak.

The National Plan for the Protection of Ambient Air, adopted in 2012, proposes over 100 different measures to improve air quality. Local air quality plans were developed for Skopje, Bitola, Tetovo, Strumica and Veles and Skopje has made good progress in implementing the air quality control measures even with a shortage of financial resources.

The country has made progress in reporting air quality data. The improved air quality web portal maintained by MEIC now allows more user-friendly access by the public and contains full information on the state of ambient air quality in the country, as well as information on measures to improve air quality, health advice in case of exceedances of air quality limit values and alert thresholds, information on monitoring networks, policy and legislative frameworks, projects, emission inventories and the results of air quality modelling.

Apart from the state network, some local measurements are carried out by the City of Skopje in a central location.

Air quality monitoring and assessment in North Macedonia

Status

Network coverage	The air quality monitoring system in North Macedonia consists of 18 fixed monitoring stations with one complementary mobile station across the country's three air quality zones – western, eastern and the Skopje agglomeration. Monitoring stations are generally located in places to capture multiple emission sources. Until 2017, only the Skopje agglomeration measured $PM_{2.5}$.
Monitoring consistency	Despite of all the efforts invested in air quality monitoring and disclosure, the air quality data is often inconsistent due to the lack of funding for maintenance of the air monitoring network. The time coverage of monitoring data has numerous gaps.
Facility accreditation and quality assurance	Although there is no accredited laboratory for air quality assessment in North Macedonia, the measurement instruments are regularly maintained and calibrated by the MOEPP calibration laboratory, which voluntarily participates in inter-laboratory comparisons.
Air quality assessment	The MOEPP and the MEIC conducted air quality assessments during the 2005–2015 period. Monthly and annual air quality reports are publicly available on the air quality web portal.
Health impact assessment	The Law on Ambient Air Quality does not specify the methods and conditions for conducting health impact assessments of air pollution, nor does it explicitly prescribe the frequency of such assessments and the reporting of results. Training and support for the introduction of basic health impact assessment methodologies have been provided to the responsible health authority.

Summary

North Macedonia needs to improve its data quality on air pollution, improve time coverage at a majority of its sampling points, and needs substantial funding to implement and report on the measures to enhance air quality and to conduct regular assessments of the effectiveness of the measures. The human resources and technical and financial capacities of the MEIC are insufficient for it to perform its air quality monitoring and reporting tasks.

A transition to cleaner fuels and more efficient systems of household heating is underway in Skopje, but needs to be accelerated and implemented in other urban centres where the use of coal and firewood for household heating is the dominant source of particulate matter during winter months. Public transport in Skopje needs to be improved to prevent exceedances of NO_2. Ground level concentrations of ozone are high and should be monitored at targeted locations.

Serbia

In the 2015–2017 period, the annual concentrations of $PM_{2.5}$ exceeded limits at all monitoring locations, and several cities recorded PM_{10} concentrations above the limit value. Thermal power plants in Kolubra and Kostolac are the largest emitters of PM particles and Belgrade and Pančevo lead the group of cities with the highest PM_{10} values. Other stationary combustors, such as individual furnaces, account for 45 per cent of PM_{10} emissions and 75 per cent of $PM_{2.5}$ emissions. Most of the rest comes from industry, agriculture, the generation of electricity and heating, and traffic.

The cities of Belgrade and Užice recorded annual concentrations of NO_2 above the limit value in recent years. In Bor, the copper smelting industry is the source for hourly episodes of concentrations of SO_2 that exceeded the limit value. The generation of electricity and heating accounts for 95 per cent of total SO_2 emissions, and for half of the NO_2 emissions. Heavy traffic in city centres accounts for 25 per cent of the NO_2 emissions.

Legal and institutional framework on air quality

The Law on Air Protection transposes the European Parliament directive on ambient air quality and cleaner air for Europe into national legislation. It defines measures for the protection and improvement of air quality, regulates air quality monitoring and reporting, and requires the development of key national policies such as a six-year air protection strategy and action plan.

The Ministry of Environmental Protection is in charge of air protection in Serbia. Within the ministry, the Serbian Environmental Protection Agency (SEPA) is responsible for air quality monitoring at the national level. SEPA performs public administration tasks relating to the development and management of the national information system for environmental protection, the monitoring of air quality, the management of the national laboratory, collection and compilation of environmental data and preparation of reports on the state of the environment. It is also in charge of cooperation with the European Environment Agency and the European Environment Information and Observation Network, but is not involved in issuing permits or performing inspections.

Progress, challenges and gaps

The 10-year National Environmental Protection Programme adopted in 2010 includes an assessment of the state of the environment in Serbia and defines policy objectives, implementation measures, and institutional and financial resources. The absence of an air protection strategy limits the overall vision of what needs to be done, and standards, best practices and other air pollution prevention tools are currently not sufficiently applied to achieve air quality improvements.

The provisions on emission limit values for pollutants align with EU standards, but measuring and verifying the emissions levels and assessing adherence to the limit values remain difficult. For the past two years, SEPA has maintained the National Pollutant Source Register and has prepared an annual National Emission Inventory Report.

The country relies on practical assistance from the European Union in air quality monitoring as unresolved financing for servicing and maintaining equipment has diminished air quality monitoring and reduced the volume and time coverage of monitoring data significantly in recent years.

Air quality monitoring and assessment in Serbia

Status

Network coverage	The state air quality monitoring network consists of 37 automatic monitoring stations in eight agglomerations in the Republic of Serbia. The spatial coverage of PM_{10} is uneven, with over 60 per cent of PM_{10} monitoring stations concentrated in Belgrade and the surrounding area and less in the southern and western parts of the country.
Monitoring consistency	The Serbian Environmental Protection Agency is responsible for air quality monitoring. The data on the state of air quality is scarce and far below the legal requirements in relation to both scope and quality. Regular operational monitoring is particularly challenging due to the lack of funds for maintenance of equipment.
Facility accreditation and quality assurance	By-laws regulate specific requirements such as the establishment of a national network of air quality monitoring and data quality assurance.
Air quality assessment	Since 2010, SEPA has prepared and released annual reports on the state of air quality in Serbia.
Health impact assessment	In 2018, little information about the relationship between the recorded air quality and the state of human health in the Republic of Serbia was available.

Summary

The data on the state of air quality in Serbia is scarce and far below the legal requirements in both scope and quality. The air quality information, when available, is not present in a form that could be used by the general public to increase awareness of the importance of good air quality or to reduce the negative consequences of exposure to poor air quality.

Some cities in the Republic of Serbia have prepared air quality improvement plans and local environmental action plans, and other cities need to develop such plans to tackle poor air quality.

Pollution is mainly caused by old industries such as power generation, heating, smelting and mining. The energy sector, particularly the generation of electricity and heating, requires substantial investment to meet emission reduction targets and need technological and financial support from the international community.

An employee operates a combine as he harvests oilseed rape at Pelagonija collective farm next to a coal power plant near Bitola, North Macedonia.

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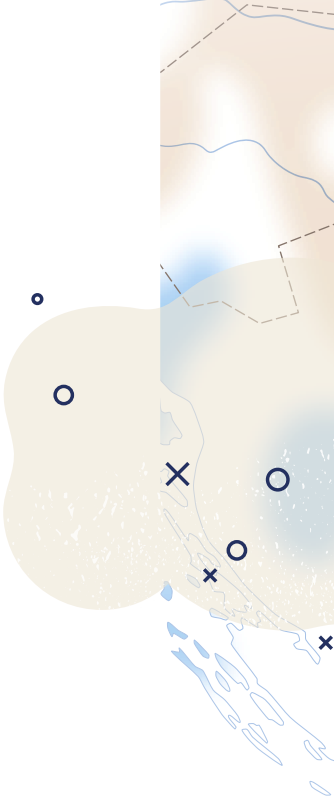

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