Air

Air Quality, Energy and related Environment & Health issues in Eastern Europe, Caucasus and Central Asia

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What are the health impacts of air pollution?

According to the World Health Organization (WHO), the global burden of disease associated with both ambient and household air pollution exposure is large and growing (WHO, 2021b).[1]

Air pollution increases morbidity and mortality from the non-communicable cardiovascular and respiratory diseases that are major causes of global mortality; it also increases the disease burden from lower respiratory tract infections and increases preterm birth and other causes of death in children and infants, which remain a major cause of the disease burden in low- and middle-income countries.

WHO estimates show that around **7 million premature deaths** are attributable to the joint effects of ambient and household air pollution. In addition, hundreds of millions of healthy years of life are lost, predominantly seen in low and middle-income countries.

The pollutants with the most robust evidence for health concerns are particulate matter (PM), ozone (O_3), nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and carbon monoxide (CO). The health risks associated with $PM_{2.5}$ (particles smaller than or equal to 2.5 µm) are of particular relevance. $PM_{2.5}$ and PM_{10} are capable of penetrating deep into the lungs; $PM_{2.5}$ can even enter the bloodstream, primarily resulting in cardiovascular and respiratory impacts. In 2013, outdoor air pollution and PM were classified as carcinogenic by WHO's International Agency for Research on Cancer (IARC) (IARC, 2013).

[1] https://www.euro.who.int/en/media-centre/sections/press-releases/2021/new-who-global-air-quality-guidelines-aim-to-save-millions-of-lives-from-air-pollution

For the Western Balkans a recent UNEP report has shown that air pollution levels are breathtakingly high, and take an enormous toll on human health and mortality (UNEP, 2021). The report estimates that life expectancy of city dwellers in the region is reduced on an average by 13–16 months, and accounts for a total of nearly 5,000 deaths. Main sources of air pollution in this region and in Eastern Europe, Caucasus and Central Asia in general are often residential heating with low-quality solid fuels in old appliances, low-quality coal used in power plants without efficient flue gas cleaning technologies, and traffic (IVL Swedish Environmental Research Institute, 2021, World Bank, 2020, UNEP, 2021).

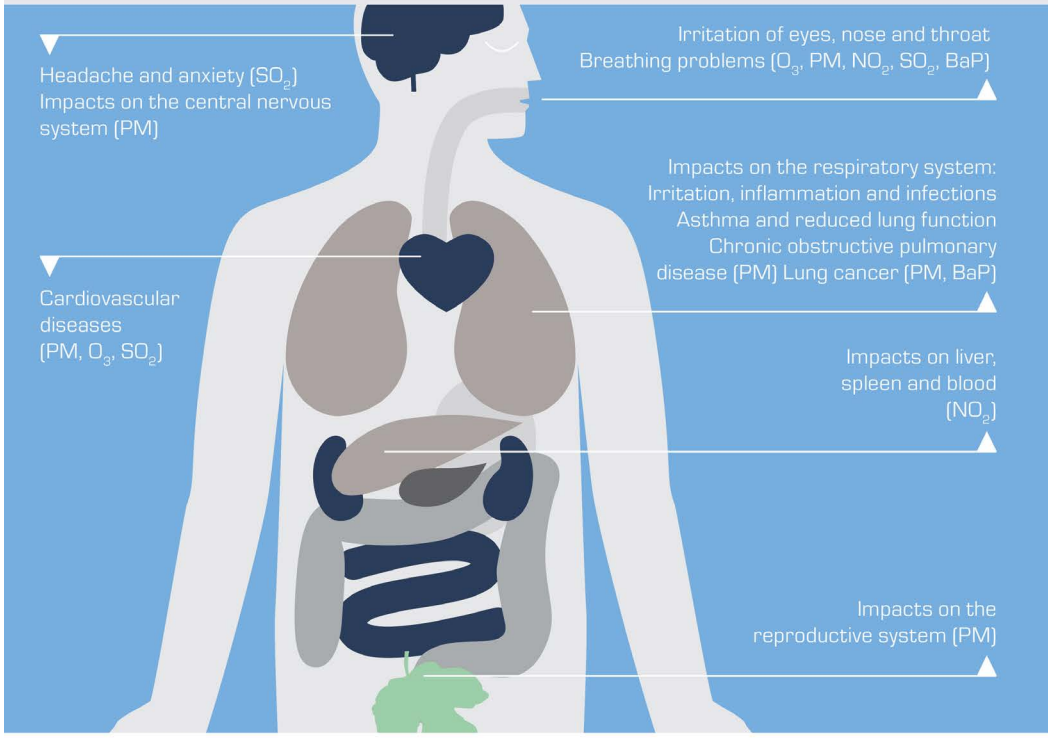
The following figure from WHO provides a broad overview of the regional distribution of health impacts.

The following figure shows and summarises the health impacts of the main air pollutants (source: European Environment Agency).

European Environment Agency

Health impacts of air pollution

Air pollutants can have a serious impact on human health. Children and the elderly are especially vulnerable.



Particulate matter (PM) are particles that are suspended in the air. Sea salt, black carbon, dust and condensed particles from certain chemicals can be classed as a PM pollutant.

Nitrogen dioxide (NO_2) is formed mainly by combustion processes such as those occurring in car engines and power plants.

Ground-level ozone (O_3) is formed by chemical reactions (triggered by sunlight) involving pollutants emitted into the air, including those by transport, natural gas extraction, landfills and household chemicals.

Sulphur dioxide (SO_2) is emitted when sulphur containing fuels are burned for heating, power generation and transport. Volcanoes also emit SO_2 into the atmosphere.

Benzo(a)pyrene (BaP) originates from incomplete combustion of fuels. Main sources include wood and waste burning, coke and steel production and motor vehicles' engines.

97%
of Europeans are exposed to O_3 concentrations above the World Health Organization recommendations.

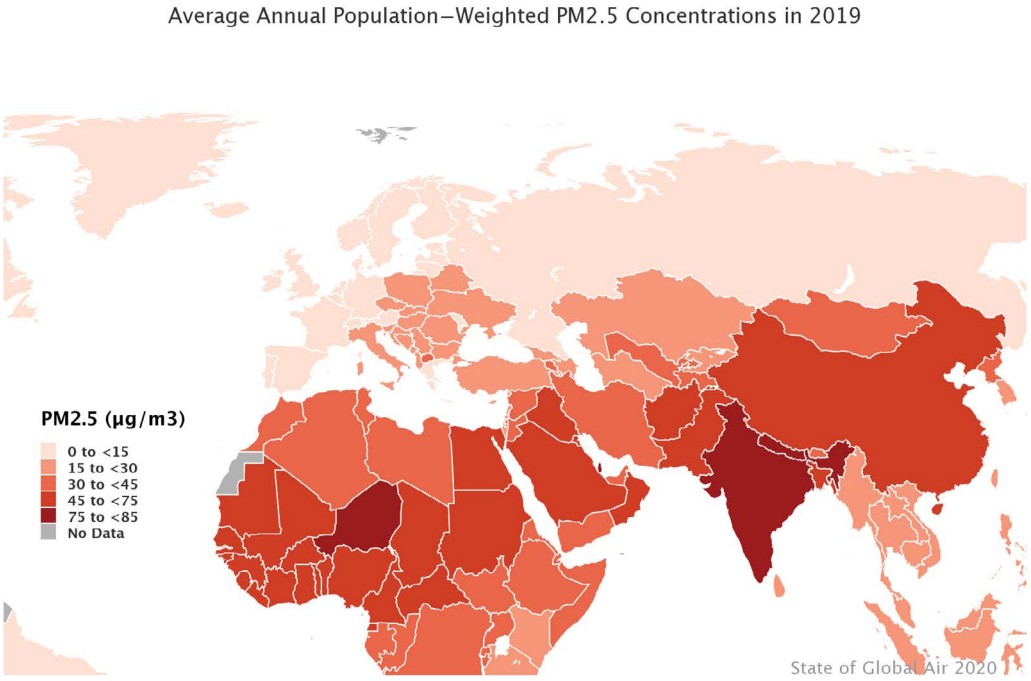
EUR 220-300
is how much air pollution from the 10 000 largest polluting facilities in Europe cost each EU citizen in 2009.

63%
of Europeans say they reduced their car use in the last two years in order to improve air quality.

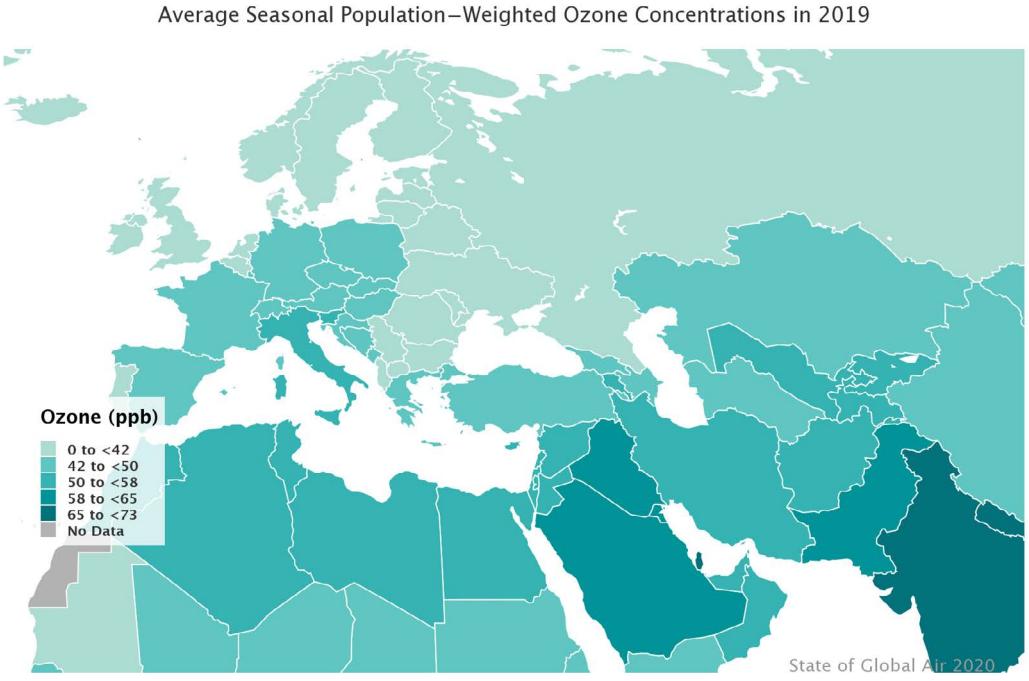
Sources: EEA, WHO, Eurobarometer

What do we know about the current state of air quality and its health impacts?

The State Of Global Air website[2] provides a rough overview on levels of population weighted average annual $PM_{2.5}$ and O_3 of 2019 (see figures below), as well as its health impacts.



Source: State of Global Air 2020

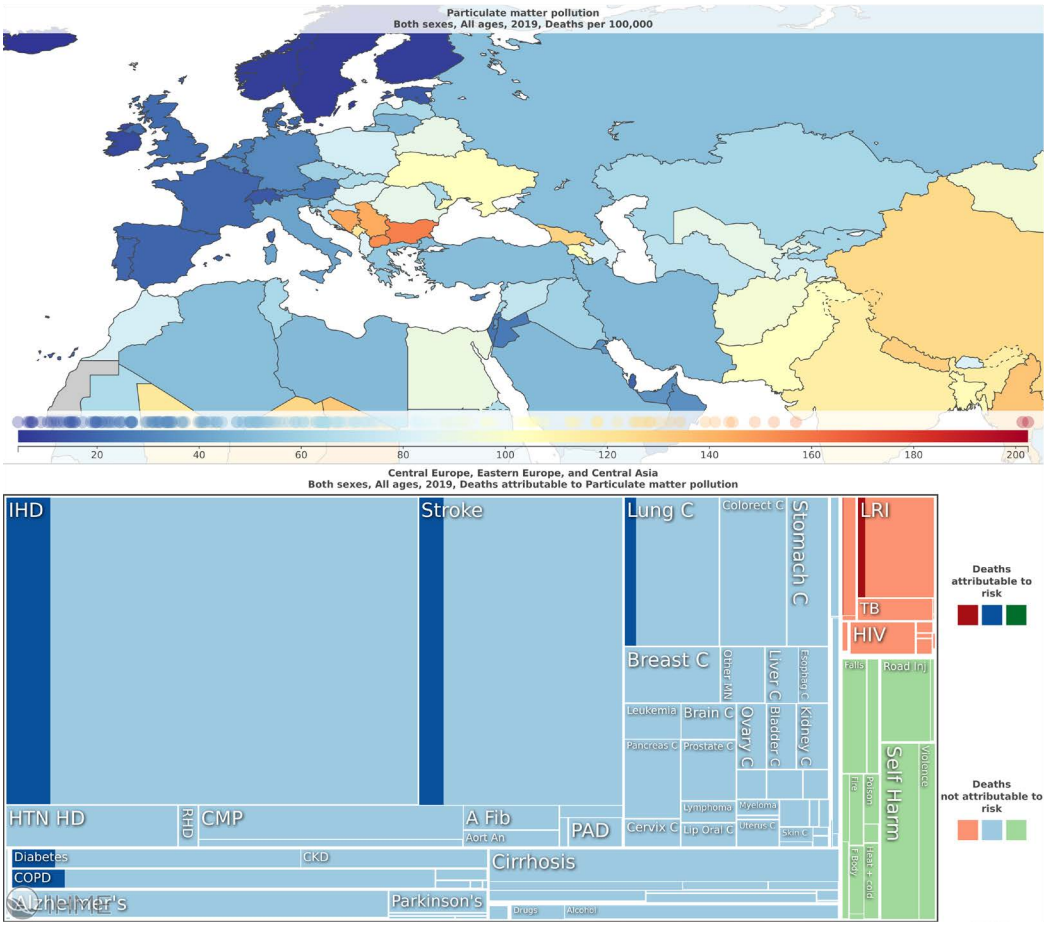


Source: State of Global Air 2020

A more detailed analysis regarding health impacts can be done via the Global Burden of Disease visualization tool[3]. The following figure shows the number of premature deaths per 100,000 inhabitants attributable to $PM_{2.5}$ ambient air pollution. The lower half of the figure shows the contribution of $PM_{2.5}$ to the overall risks of various diseases. $PM_{2.5}$ thus contributes to ischemic heart disease, strokes, lung cancer, chronic obstructive pulmonary disease, diabetes, lower respiratory infections.

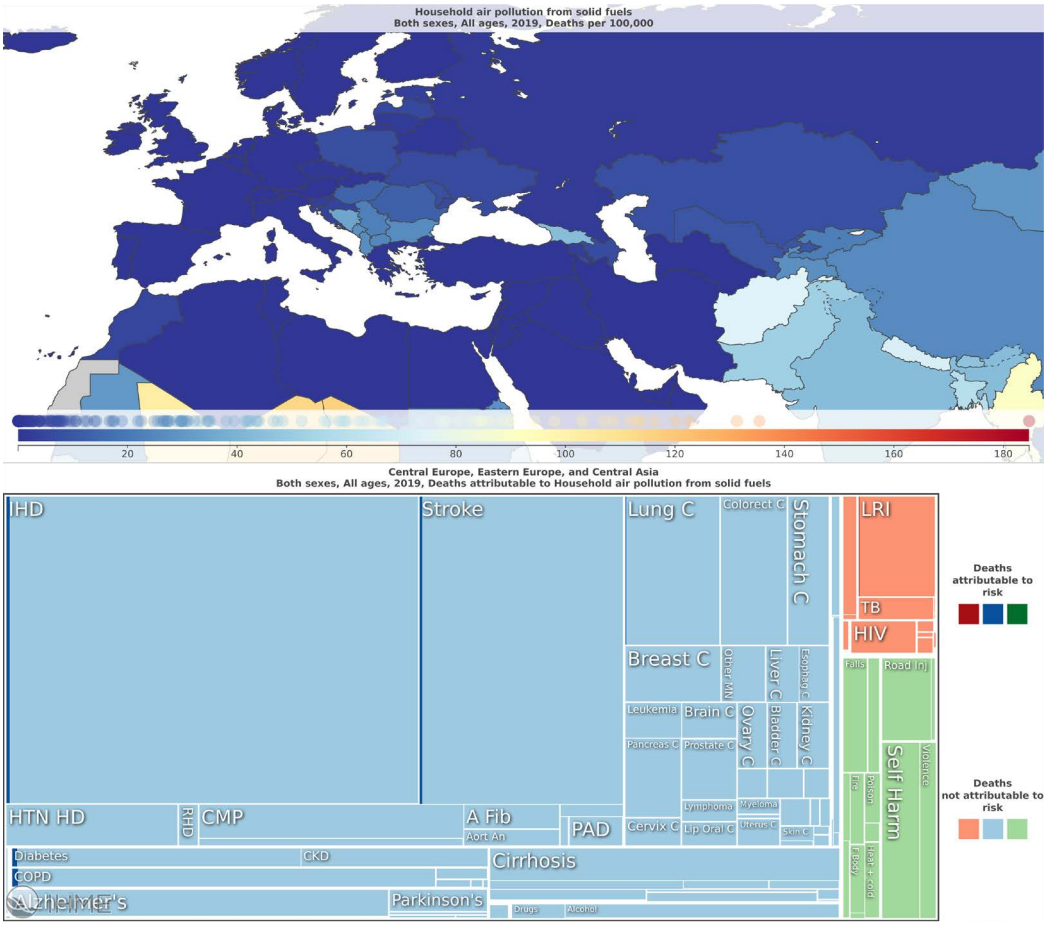
2 https://www.stateofglobalair.org/

3 https://vizhub.healthdata.org/gbd-compare/



Source: Institute for Health Metrics and Evaluation (IHME)

A comparison with the number of premature deaths due to household (indoor) air pollution from solid fuels (figure below) clearly shows that the main risk factor in general in Central Europe, Eastern Europe and Central Asia is ambient air pollution.



Source: Institute for Health Metrics and Evaluation (IHME)

In addition, WHO provides *inter alia* indicator data for concentrations of $PM_{2.5}$ (SDG indicator 11.6.2)[4] and deaths attributable to ambient and household air pollution (SDG indicator 3.9.1)[5].

What are the interlinkages between air pollution and COVID-19?

Increased levels of air pollution are known to result in higher incidence of respiratory diseases, and studies have suggested that exposure to elevated levels of air pollution, especially PM, may increase the incidence and the severity of Covid-19. However, investigations on effects of air pollution on COVID-19 are still in their infancy, even though studies suggest such an association (Becchetti, Beccari, Conzo, Conzo, Santis, Salustri, 2020). A study for the Environment Committee of the European Parliament highlights, that COVID-19 is an extremely difficult endpoint for air pollution related impacts to study as the spread of the disease is highly dynamic (Bert BRUNEKREEF et al., 2021). Time-series studies are still very short and can be vulnerable to a number of uncontrolled errors, especially by the variety of lockdown measures, which created artificial correlations between COVID-19 cases and air pollutant concentrations. Nevertheless, there are indications that reduced levels of air pollution in Western Europe in the last decades have resulted in less severe impacts of COVID-19 (Eidgenössische Kommission für Lufthygiene EKL, 2020).

A recent review study[6] for the Panel for the Future of Science and Technology of the European Parliament highlighted that a body of evidence emerged that shows that chronic and short-term exposure to different fractions of aerosols and types of air pollution exacerbates symptoms, affects co-morbidities and increases mortality rates for respiratory diseases similar to COVID-19, as well as for COVID-19 (Rodó, 2021). Although other pathways can contribute, the airborne route is likely to be the dominant mode. There is consistent and increasing evidence that SARS-CoV-2 spreads by airborne transmission, and it is possible that different variants have different environmental sensitivities. The study concludes that safer indoor environments are required, not only to protect unvaccinated people and those for whom vaccines fail, but also to deter vaccine-resistant variants or novel airborne threats that may appear at any time. The study recommends that the public health community, governments and health agencies should act accordingly, referring to this mode as the principal mode of transmission in their recommendations and statements, enhancing associated research and improving monitoring networks.

In addition, a Swiss commission concluded that there are indications that reduced levels of air pollution in Western Europe in the last decades have resulted in less severe impacts of COVID-19 (Eidgenössische Kommission für Lufthygiene EKL, 2020).

Two cases studies prepared by UNDP for the Eighteenth session of the Joint Task Force on Environmental Statistics and Indicators in October 2021 show correlations between exposure to several air pollutants (esp. $PM_{2.5}$) and the number of COVID-19 cases in Serbia, and between the number of COVID-19 deaths through the end of March 2021 and mean $PM_{2.5}$ concentrations during winter 2020/2021 in a number of Northern, Eastern and South-Eastern European countries (UNDP, 2021a, UNDP, 2021b). The authors note that the results do not imply direct causality, as the morbidity and mortality rates are the outcome of many factors (including population age and density, healthcare quality and capacity, implemented restrictions and policies, etc.). At the same time COVID-19 mortality rates in the assessed countries (including Norway, Denmark, Poland, Ukraine, Bosnia and Hercegovina, Serbia and North Macedonia) show the most clear inverse correlation to the percentage of vaccinated citizens.

What are the global and European Union policies to improve ambient and indoor air quality?

A number of different sources at spatial scales ranging from local to regional, national and international often affect ambient air quality. The relevance of individual sources and source categories varies from pollutant to pollutant and from location to location. Furthermore, their individual contribution to air quality changes over time. Improving air quality thus requires policies and legislation addressing a number of issues:

- Emissions from source sectors of air pollution (e.g., industry, power plants, traffic, domestic heating and agriculture)

[4] **The Organisation for Economic Co-operation and Development (OECD) provides charts and maps for $PM_{2.5}$ exposure for the OECD countries:** https://data.oecd.org/air/air-pollution-exposure.htm

[5] https://www.who.int/data/gho/data/indicators/indicator-details/GHO/ambient-and-household-air-pollution-attributable-death-rate-(per-100-000-population), https://www.who.int/data/gho/data/indicators/indicator-details/GHO/concentrations-of-fine-particulate-matter-(pm2-5)

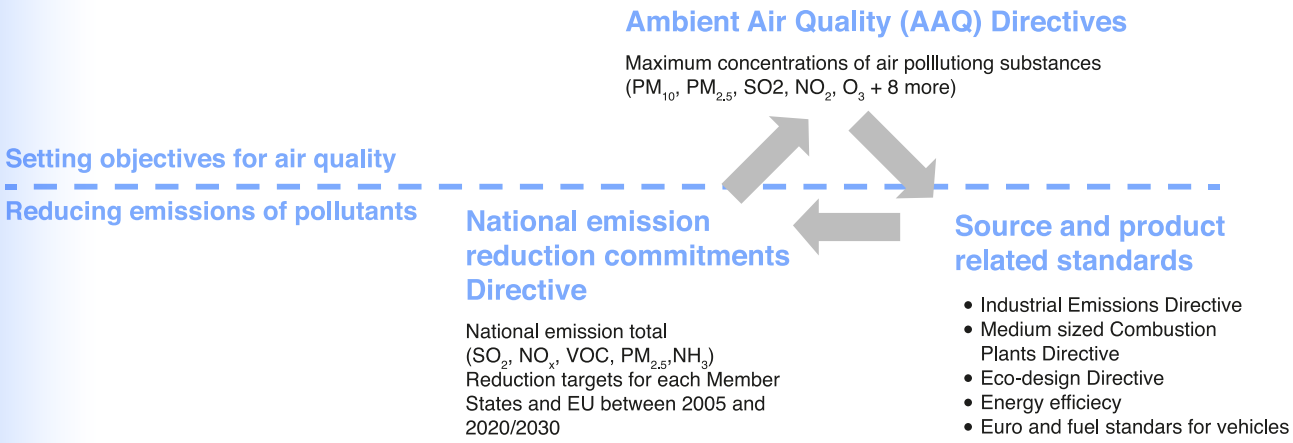
[6] https://www.europarl.europa.eu/stoa/en/document/EPRS_STU(2021)697192

- Products that contribute to air pollution (e.g., vehicles and solvents)
- Monitoring of polluting activities, emissions and air quality
- Air quality standards
- Air quality management in case these standards are exceeded or there is a risk thereof.

In addition, pollutants such as ozone and PM are strongly affected by transboundary transport of these pollutants and their precursors[7], which is especially important for small countries. Therefore, international cooperation is required to lower emissions of precursors and primary PM emissions. The United Nations Economic Commission for Europe (UNECE) Air Convention[8] is such an international framework, which has developed the Gothenburg Protocol to reduce the impact of transboundary air pollution to ecosystems and human health by lowering national emissions of certain air pollutants[9].

The European Union has developed a legally binding policy framework, which was partly built on and is interlinked with the Gothenburg Protocol and the UNECE Air Convention in general. This framework is also a requirement for accession and candidate countries[10] to the European Union. Other countries may introduce elements of this framework according to their specific needs, which is, for example, the case for the European Union Eastern Partnership[11] and European Neighbourhood[12] countries. The European Union air quality policy framework comprises the following elements (see figure below) (Schneider, Nagl, Read, 2014, Karamfilova, 2021):

- Ambient Air Quality Directives to protect human health on the one hand and the environment on the other
- Reduction of national emissions of certain atmospheric pollutants to achieve European environmental targets in a cost effective way (prescribed in the so-called NEC Directive)[13]
- Source related emission regulations (e.g., for transport, industrial installations and power plants)
- Product related regulations (e.g., for solvents, fuels and appliances).



Source: European Commission, European Environment Agency.

Indoor air quality is often largely affected by ambient air quality. WHO has published a number of guidelines to address household fuel combustion and exposure to chemicals. In addition, there are a number of initiatives inter alia by WHO and other parts of the United Nations system, the World Bank and the Asian Development Bank (see Annex).

How can policy-makers and citizens improve air quality in Eastern Europe, Caucasus and Central Asian countries?

Exposure to air pollutants is largely beyond individuals' control. Therefore, a reduction of pollutant

7 in case of ozone, these are mainly NO_x, volatile organic compounds (VOC), CO and CH_4. Main precursors for secondary particles are ammonia (NH_3), NO_x, SO_2 and VOC.

8 Convention on Long-range Transboundary Air Pollution, https://unece.org/environment-policy/air

9 NH_3, NO_x, $PM_{2.5}$, SO_2, VOC

10 https://ec.europa.eu/neighbourhood-enlargement/enlargement-policy_en

11 https://eeas.europa.eu/regions/central-asia_en

12 https://eeas.europa.eu/diplomatic-network/european-neighbourhood-policy-enp_en

13 Directive (EU) 2016/2284 on the reduction of national emissions of certain atmospheric pollutants

levels requires action by public authorities at the national, regional, local and even international levels.

Air quality management (AQM), i.e. activities by these authorities to protect human health and the environment from harmful levels of air pollutants, requires in general the following, partly parallel steps (Clean Air Asia, 2016, Stockholm Environment Institute, 2004):

1. Assessment of the air quality situation via **monitoring and modelling**: the results of air quality assessments should feed into a continuous process of improving air quality and having more stringent standards; the establishment of quality assurance/quality control (QA/QC processes), communicating air quality and co-benefits; and evaluating the effectiveness of policies and measures. Air quality modelling allows for better baseline data to provide more accurate air quality forecasts; allows pollutant concentration interpolation and extrapolation; and allows analysis of the efficacy of emission control strategies.
2. **Identification of sources** of elevated air pollutant levels: this involves an understanding of emission sources and their contribution as relevant input in developing short-, medium- and long-term strategies, and the conducting of an emissions inventory.
3. **Communication** – involves developing communication and awareness-raising campaigns to mobilise political and public support for AQM.
4. **Governance** – includes policy instruments, institutional setup and mechanisms, resources, periodic review, compliance monitoring and enforcement programmes, capacity building and training.
5. Setting up an **air quality plan** that reduces air pollutant levels to prescribed levels.
6. Health, environmental, and economic **risk assessments** – strengthening and adoption of national and local programmes that allow for better baseline estimates and inform better strategies to address these risks.
7. **Implementation** of the air quality plan and the individual measures of the plan by different actors. Respective policies should promote a participatory approach to policy making.
8. **Progress monitoring** and update of the air quality plan at regular intervals.

Key messages and recommendations for air quality management in Eastern Europe, Caucasus and Central Asian countries

- Stringent and **integrated policies** are often necessary to tackle air quality problems in a cost-effective way. The policies should be **coherent** across administrative and governance levels.
- The focus should be on **improving public health**, not so much merely achieving compliance with standards.
- **Stakeholders and citizens** should be involved from the beginning in the air quality management process.
- A sound **data basis** should be developed; however, data will never be perfect, hence data improvements should not delay the implementation of measures.
- **Progress** should be regularly **monitored** with the help of suitable indicators.
- **Communication** is an important part of the air quality management process.

Case studies

A recent report funded by UNEP highlights three case studies implemented in the Western Balkans, Eastern Europe, Central Asia and the Caucasus (IVL Swedish Environmental Research Institute, 2021). These case studies are summarised below; three further case studies regarding, best available techniques for large combustion plans, banning coal for domestic heating, and import bans for old vehicles, which are especially pollutant and energy-ineffecient are provided further below.

Air pollution in the Western Balkans

Taken from (IVL Swedish Environmental Research Institute, 2021): Air pollution is directly responsible for up to one in five premature deaths in 19 Western Balkan cities, due to some of the worst air quality in Europe. Large urban areas such as Sarajevo (Bosnia and Herzegovina), Belgrade (Serbia),

Skopje (North Macedonia) and Sofia (Bulgaria) are particularly affected by poor air quality. Thermal power plants and individual heating (both public and residential) represent the main emitters of particulate matter. Even though air quality monitoring systems are in place, the lack of financing for maintaining stations and the absence of both certified calibration laboratories and air quality modelling is evident throughout the region. As a result, inconsistency and data gaps limit the possibilities of conducting thorough analyses and compromise the ability to monitor long-term health impacts and formulate targeted policy responses. Nevertheless, solutions to these problems are being sought and several country-wide and local initiatives to promote and achieve cleaner air are ongoing in the region:

- Six Bulgarian municipalities are working together to improve air quality in the EU integrated project LIFE IP CLEAN AIR[14]. One of the main project aims is to develop and test a new demonstration scheme to replace heating installations in 500 households and apply this scheme in around 10,000 households in the 6 municipalities.
- Sarajevo Canton's Strategy[15] for Restricting the Use of Coal and Other Solid Fuels in Sarajevo Canton for 2021-2031, is the first tangible decarbonization plan in Bosnia and Herzegovina. The strategy has been developed in cooperation with the UNDP country office in Bosnia and Herzegovina with support through UNDP's Green Economic Development project.
- Bosnia and Herzegovina has considerably improved its air quality monitoring capacity and a national air quality index has been created.
- Skopje, the capital of North Macedonia, has developed the AirCare monitoring app[16]. In addition, Skopje has implemented an investment subsidy scheme to replace old wood stoves and oil boilers with inverter air conditioners.
- Since 2015, the City of Užice, has co-financed application of energy efficiency measures in 609 individual residential buildings. In addition, the city invested in a significant number of energy efficiency studies.
- UNEP initiated the establishment of the South East European Platform to Beat Pollution (SEEPP), a regionally-owned institutional platform to catalyse action and facilitate regional coordination to improve air quality.

Eastern Europe, Central Asia and the Caucasus – joint efforts and capacity building on the way to clean air

Taken from (IVL Swedish Environmental Research Institute, 2021): The need for more active participation of the countries in Eastern Europe, Central Asia and the Caucasus (EECCA region) in the work of the UNECE Air Convention[17] was recognized years ago. In 2010, the Coordinating Group on promotion of actions towards implementation of the Air Convention in countries of Eastern Europe, Caucasus and Central Asia (EECCA Coordinating group)[18] was established. The programme resulted in notable progress in the countries' involvement in the Convention work:

- Analysis of national legislation and development of national action plans enhances progress towards ratification.
- The quality and completeness of submitted emission inventories improves.
- Understanding and implementation of Best Available Techniques (BATs) are facilitated by information exchange.
- Air Convention participation and awareness rises.

Central Asia - public awareness on air quality. Power of citizen knowledge

Taken from (IVL Swedish Environmental Research Institute, 2021): Public awareness around air quality issues has been relatively low among the countries in Central Asia until recently. Signs of positive developments around public awareness have been seen in some Central Asian countries. UNEP, UNDP, the World Bank and the US State Department are active in the region to support national efforts towards improving air quality. Several projects are being developed or are currently being implemented by international and national actors, notably in Kazakhstan, Kyrgyzstan and Uzbekistan. The focus of most of these projects is to strengthen regulatory and monitoring capacity of Automation of air pollution monitoring in Uzbekistan.

14 https://webgate.ec.europa.eu/life/publicWebsite/index.cfm?fuseaction=search.dspPage&n_proj_id=7009#EI

15 https://balkangreenenergynews.com/sarajevo-canton-to-ban-coal-use-in-2021-amid-extreme-air-pollution

16 https://www.matchup-project.eu/news/air-pollution-in-skopje-how-citizens-spurred-policymakers-towards-the-change/

17 https://unece.org/convention-and-its-achievements

18 https://unece.org/DAM/env/documents/2010/eb/eb/eb%20decisions/Decision_2010.17.e.pdf

- Joint UNEP Europe Office-UNDP Country Office for Kyrgyzstan's Assessment of Air Pollution and its impacts on Human Health in the Kyrgyz Republic.
- Building Air Quality Management Capacity in the Kyrgyz Republic and Kazakhstan and supporting action on air pollution in Central Asia.

Application of Best Available Techniques (BAT) for large combustion plants and industrial sectors.

BAT reference documents (BREFs)[19] are adopted under the European Union Directive on Industrial Emissions (Directive 2010/75/EU); they include a detailed description on what constitutes best available techniques for the prevention and reduction of emissions into all environmental media. The BREFs cover more than 30 types of industries. These BREFs provide general information on the respective industrial sector, the industrial processes and techniques used within this sector, data and information concerning the environmental performance of installations, emissions, consumption and nature of raw materials, water consumption, use of energy and the generation of waste. Furthermore, they present information on emerging techniques. BREFs are complemented by BAT conclusions, which have a legally binding character: BAT conclusions describe the reference for setting emissions limit values and permit conditions for major industrial activities, which have to be properly reflected in the environmental permits of individual installations. Stringent application of the BAT conclusions – in particular implementation of the lower emission levels associated with BAT – result in remarkable emission reductions across industrial sectors.

Coal ban in Dublin; ban of solid fuels in Krakow and Małopolska

The prohibition on bituminous or "smoky coal" was introduced in Dublin in September 1990 after several years of severe winter smog resulting from the use of coal for home heating. Over the years, the ban has been extended to other cities and towns throughout Ireland. In September 2015, on the 25th anniversary of the initial ban, the Minister announced plans to extend the ban on smoky coal nationwide, which took effect from 1 September 2020[20].

Krakow is one of the cities, and southern Poland is one of the regions, in Europe that experience the highest PM levels. Household stoves burning coal are responsible for an estimated 88 per cent of the country's non-industrial air pollution. In Lesser Poland (Małopolska), low-stack emission (combustion of solid fuels in household boilers) contribute 55 per cent to PM10 and over 70 per cent to benzo(a)pyrene concentrations. Since 1 September 2019, Krakow and Małopolska regulate the burning of solid fuels (coal and wood) in boilers, stoves or fireplaces via the "anti-smog-resolution"[21] (Karamfilova, 2021, Nagl, Spangl, Buxbaum, 2019, IIASA, 2018). In addition to banning solid fuels and mandating the replacement of coal-fired stoves, Krakow's air pollution reduction programme also aims to expand the city's gas distribution network, modernize its district heating system and promote renewable energy sources for household heating, among other measures. Also, a European Union LIFE project "Implementation of Air Quality Plan for Małopolska Region –Małopolska in a healthy atmosphere"[22] was established to support the implementation of the measures.

Since 2017, Krakow has also taken action to eliminate low-efficiency solid fuel devices. This applies to combustion sources with a thermal capacity of up to 1 MW in apartment buildings and in the service and trade sector, as well as in small and medium-sized enterprises.

Import ban of old vehicles and inspection of vehicles

Traffic is a major source of air pollution in many cities. The import of high emitting vehicles can contribute to this problem[23]. Import bans of vehicles below a certain standard or an outright ban of the import of old vehicles have been implemented inter alia in Bosnia and Herzegovina, Serbia and Turkey (Velten, Brauer, Thie, 2019) (see table).

In addition, a functioning system of regular inspections of vehicles is crucial to detect malfunctioning or tampered vehicles.

19 https://eippcb.jrc.ec.europa.eu/reference

20 https://www.gov.ie/en/press-release/f15e2-minister-ryan-signs-regulations-to-extend-smoky-coal-ban/

21 https://powietrze.malopolska.pl/en/anti-smog-resolution/, https://powietrze.malopolska.pl/en/anti-smog-resolution/krakow/

22 https://powietrze.malopolska.pl/en/

23 https://www.transportenvironment.org/discover/dirty-diesels-heading-east/

TABLE: NATIONAL REGULATIONS AND TAXES FOR THE IMPORT OF USED VEHICLES.

Country	National regulation for or tax on imported used vehicles
BOSNIA AND HERZEGOVINA	Import ban on passenger vehicles below Euro 3 standard and light commercial vehicles below Euro 5.
FINLAND	Import ban on cars without catalytic converters
HUNGARY	Import ban on used passenger vehicles older than four years and commercial vehicles older than six years. Exemption for specialized older vehicles after passing a special technical test.
NETHERLANDS	Exemption of import duties and reduced VAT of 6 % for vehicles older than 20 years
NORWAY	Taxes on imported vehicles: scrap deposit tax of NOK 2,400 (~EUR 250) plus the GHG tax on air-conditioning systems depending on gas used by the system and weight of the gas in the vehicle. VAT of 25 % applies to the customs value (purchase price, freight costs and insurance costs).
SERBIA	Import ban on passenger vehicles below Euro 3 standard and light commercial vehicles below Euro 5. The government currently considers to ban the import of cars with Euro 3 and 4 standard as well as cars which are older than 10 years.
TURKEY	Import ban on used vehicles

Source: after (Velten, Brauer, Thie, 2019)

The United Nations Environment Programme (UNEP) has recently summarized knowledge about the potential environmental impacts of used vehicles, the trade flows, current restrictions on the export and import of used vehicles, and provides recommendations how the impact of used vehicles can be addressed (UNEP, 2020).

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Annex: Indoor air quality initiatives and resources

WHO has published a number of guidelines to address household fuel combustion and exposure to chemicals. In addition, there are a number of initiatives inter alia by WHO and other parts of the United Nations system, the World Bank and the Asian Development Bank:

- WHO Compendium of WHO and other United Nations guidance on health and environment (WHO, 2021a)
- WHO guidelines for indoor air quality – selected pollutants (WHO Regional Office for Europe, 2010)
- WHO guidelines for indoor air quality: Household fuel combustion (WHO, 2014)
- WHO Household Energy Assessment Rapid Tool (HEART): HEART includes two report templates[24] for Situational Assessment and Stakeholder Mapping, one for energy specialists[25] and one for environmental health specialists[26]
- WHO Clean Household Energy Solutions Toolkit (CHEST)[27]
- Sustainable Energy for All (SEforALL)[28] is an international organization in partnership with the United Nations and various actors aiming towards the achievement of Sustainable Development Goal 7 (SDG7) – access to affordable, reliable, sustainable and modern energy for all by 2030
- Energy Sector Management Assistance Program (ESMAP)[29] is a program of the World Bank and 22 partners that aims to help low- and middle-income countries to reduce poverty and boost growth through sustainable energy solutions
- WHO guidelines for indoor air quality: dampness and mould (WHO Regional Office for Europe, 2009)
- WHO screening tool and course (indoor exposure to multiple chemicals) (WHO Regional Office for Europe, 2020, WHO Regional Office for Europe, 2021a, WHO Regional Office for Europe, 2021b, WHO Regional Office for Europe, 2021c, WHO Regional Office for Europe, 2021d)
- WHO Framework Convention on Tobacco Control (FCTC) guidelines[30]
- A guide to tobacco-free mega events (WHO Regional Office for the Western Pacific, 2010).

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24 https://www.who.int/tools/household-energy-assessment-rapid-tool-templates

25 https://www.who.int/publications/m/item/household-energy-assessment-rapid-tool-heart-for-situational-assessment-and-stakeholder-mapping-energy-specialist

26 https://www.who.int/publications/m/item/household-energy-assessment-rapid-tool-heart-for-situational-assessment-and-stakeholder-mapping-environmental-health-specialist

27 https://www.who.int/publications/m/item/who-clean-household-energy-solutions-toolkit-chest, https://www.who.int/tools/clean-household-energy-solutions-toolkit

28 https://www.seforall.org/

29 https://esmap.org/

30 https://www.who.int/fctc/guidelines/adopted/article_8/en/