

The health harm of air pollution in SOFIA

How coal power generation contributes to poor air quality and health risks



Air pollutants, gases and particles in the atmosphere strongly affect human health, the climate and the environment. The air in Bulgarian cities is usually dense with exhaust fumes, industry smoke or soot from coal power plants, especially during the fall and winter season. Air pollution is the single greatest environmental health risk and one of the main causes of death and disease globally and in the region. Poor air quality is also a leading risk factor for major chronic diseases in adults, including heart and lung disease as well as cancer. While each one of us is threatened by poor air quality, some groups in cities, including children, the elderly and those already suffering from disease, are particularly vulnerable.

Lowering air pollution levels, by following the World Health Organization recommendations, could prevent a significant number of chronic diseases and early deaths in cities each year. Decision-makers should be more ambitious in implementing long-standing commitments to improve the quality of

ambient air. This series of HEAL briefings aims to showcase the sources of air pollution in 4 cities in the (Western) Balkan region, and highlight why a phase out of coal power generation and end to using fossil fuels would be beneficial especially for city residents.

Sofia is located in the Sofia Valley with an altitude of about 550 meters on a territory of 1,311 square kilometers, of which populated areas and urbanized territories occupy 245,5 square kilometers, divided into 24 districts¹. According to 2019 data, 1,2 million permanent residents live on the territory of Sofia. The average age of residents in urban area is 43,9 years².

Poor air quality is a consistent problem throughout the year and for pollution peaks. Sofia mostly experiences air pollution peaks during the autumn and winter time. In 2020³ peak pollution saw NO₂ concentrations of 203,47µg/m³, PM₁₀ concentrations of 218,27µg/m³, PM_{2.5} concentrations of 93,75µg/m³ and SO₂ levels of 250,77µg/m³.

¹ Sofia municipality, 2021, <https://www.sofia.bg/en/web/sofia-municipality/geographical-feature>

² Population and demographic processes in 2019, National Statistical Institute https://www.nsi.bg/sites/default/files/files/pressreleases/Population2019_en_XE8MEZL.pdf

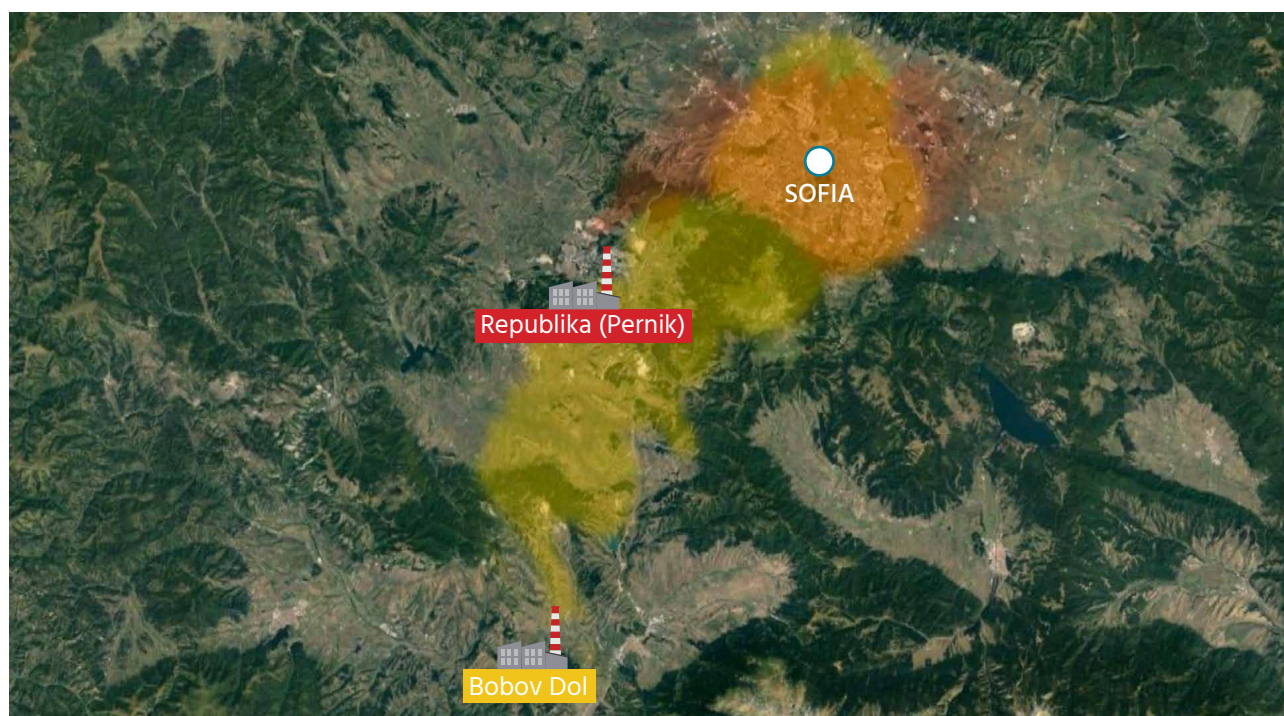
³ "Годишен бюлетин за качество на атмосферен въздух (КАВ) за 2020 г.", Изпълнителната агенция по околна среда, 2021, http://eea.government.bg/bg/dokladi/God_bul_KAV/index

How do coal plants contribute to poor air quality in Sofia?

The sources of air pollution that impact air quality in this city include industrial activities, transport, energy production, energy and heat generation for households, agricultural activities and landfills. Sofia is the capital of Bulgaria, a city close to the coal industry that has burdened public health, the economy and the environment for decades.

A particular concern for health protection in Sofia are the emissions from two coal power plants

Bobov Dol and Republika (Pernik), located about 70 and 30 kilometers from the city center. In 2019, Bobov Dol and Republika (Pernik) have together released 2,630 tons of sulphur dioxide (SO₂) and 1,185 tons of nitrogen oxides (NO_x)⁴. The Europe Beyond Coal shows that both coal power plants were responsible for 68 premature deaths in 2016 worldwide, as well as 33 cases of chronic bronchitis, 53 hospital admissions, 17,397 lost working days and a total health cost of 105,427 EUR⁵.



Regarding other pollution sources, the latest data on newly registered and deregistered cars shows levels of use has jumped from over 500 cars per 1,000 people at the end of 2016, to over 660 in 2020, an increase of almost 30%. In comparison, many rates of car use in many major European cities are

below 450 cars per 1,000 people⁶. Most vehicles still run on diesel and gasoline engines. In the suburbs, a large number of households burn coal and wood for heating and cooking during the late autumn and winter, while intensive agricultural burning activities are present in the autumn.

⁴ European coal plant database, Europe Beyond Coal, 2021, https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKewiYw6SQ74j0AhU2g_OHHU1QBPo4ChAWegQIDRAB&url=https%3A%2F%2Fbeyond-coal.eu%2Fwp-content%2Fuploads%2F2021%2F07%2F2021-04-20_Europe_Beyond_Coal-European_Coal_Database_hc5n.xlsx&usg=AOvVaw1Gn8ELKnH-kkhriYt-gnpi

⁵ European coal plant database, Europe Beyond Coal, 2021, https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKewiYw6SQ74j0AhU2g_OHHU1QBPo4ChAWegQIDRAB&url=https%3A%2F%2Fbeyond-coal.eu%2Fwp-content%2Fuploads%2F2021%2F07%2F2021-04-20_Europe_Beyond_Coal-European_Coal_Database_hc5n.xlsx&usg=AOvVaw1Gn8ELKnH-kkhriYt-gnpi

⁶ "Fighting air pollution: there are more cars in Sofia than the average for the EU's largest cities", European Public Health Alliance, 2021 <https://epha.org/fighting-air-pollution-there-are-more-cars-in-sofia/>

The health impacts of air pollution

The World Health Organization (WHO) says that no level of air pollution can be considered 'safe' and the link between air pollution and respiratory and cardiovascular diseases is well established. Particulate matter with a size of 10 micrometers (PM_{10}) or 2.5 micrometers or less ($PM_{2.5}$) leads to the greatest health burden. Annual mean PM concentrations in

Sofia⁷ are significantly higher than what the World Health Organization (WHO) recommends⁸. In 2020, the annual mean for PM_{10} was almost two times higher compared to the WHO guidelines.

There is no continuous monitoring for PM, data not available⁹.

Figure 1 Annual mean of particulate matter concentrations in Sofia in 2020, compared to WHO recommendations



⁷ "Годишен бюлетин за качество на атмосферен въздух (КАВ) за 2020 г.", Изпълнителната агенция по околна среда, 2021, http://eea.government.bg/bg/dokladi/God_bul_KAV/index

⁸ WHO Global air quality guidelines, World Health Organization <https://www.who.int/news/item/22-09-2021-new-who-global-air-quality-guidelines-aim-to-save-millions-of-lives-from-air-pollution>

⁹ "Годишен бюлетин за качество на атмосферен въздух (КАВ) за 2020 г.", Изпълнителната агенция по околна среда, 2021, http://eea.government.bg/bg/dokladi/God_bul_KAV/index

Breathing in particulate matter, even at low levels, can lead to physiological changes in the body that damage health. When inhaled, particles travel into the bloodstream and cause harm to our lungs and heart. They can cause strokes and lead to premature death. Studies also link particulate matter with harm to the healthy development of children, and diseases such as obesity. Poor air quality is also linked to chronic and acute respiratory diseases, which significantly degrades quality of life, such as bronchitis and the aggravation of asthma. Scientists continue to identify new ways that air pollution can harm our health, for example, there is increasing evidence linking air pollution to dementia and new evidence has shown that particles of air pollution travel through the lungs of pregnant women and lodge in their placentas, harming babies before they are born.

Newest studies show that even low levels of air pollution can lead to health damage. Based on that new scientific knowledge, WHO has very recently revised their air quality guidelines. New Air Quality guidelines¹⁰ recommend lower values for several pollutants, most notably for particulate matter PM_{2.5}, which causes the greatest health burden, for which a new annual concentration of 5µg/m³ is now recommended, for nitrogen dioxide (NO₂), which has come under intense scrutiny in discussions on road transport and inner-city driving bans, a new annual concentration of 10µg/m³ is now recommended (from previously 40µg/m³).

The health toll of this persistent poor air quality is significant: In Bulgaria, PM_{2.5} alone was responsible for 12,500 deaths in 2018¹¹.

¹⁰ WHO global air quality guidelines, World Health Organization
<https://www.who.int/news/item/22-09-2021-new-who-global-air-quality-guidelines-aim-to-save-millions-of-lives-from-air-pollution>

¹¹ Air Quality in Europe, 2020 report: European Environment Agency, 2020
<https://www.eea.europa.eu/publications/air-quality-in-europe-2020-report>

The health impacts of climate change

Climate change is expected to make matters worse: according to the official data¹² average temperatures above the expected have been observed in recent years. The mean temperature in Sofia for the period 1981-2010 was 10,5°C and for 1991-2020 was 10,9°C. In 2020, a strong wind was registered in spring time which led to an increase in the concentration of PM₁₀ in the city of Sofia up to 81µg/m³. In summer 2020, extreme weather events with heavy rains, thunderstorms and solid ice caused floods in many parts of Sofia.

The multiple risks of climate change threaten to reverse the progress of the environment and public health¹³. Tackling climate change requires decision-

makers to provide a coordinated response to ensure a transition to a healthier future¹⁴. The burning of fossil fuels is responsible for more than a half of carbon pollution locked in cities worldwide. Coal is the biggest contributor to anthropogenic climate change.

In 2019, both Bobov Dol and Republika (Pernik) coal power plants had released a total of 1,018,945 tons of CO₂ in the atmosphere¹⁵. An increase in the level of greenhouse gas emissions affects the atmosphere and the surface which later, in turn, leads to climate change. It is well established that during heat waves air pollution goes up as well (e.g. the levels of ozone, which is another health harming pollutant).

Mayors active for healthy cities, clean air and a fossil fuel phase out

Being concerned about the effects of fossil fuels industry, mayors across the Globe in the C40 network have agreed to start “greening” the cities in order to expand uptake and access to clean, affordable electricity for millions of

urban residents¹⁶. Increasing renewables leads to multiple benefits that result in mitigating the effects of climate change and will provide a healthier environment for all.

¹² Годишен хидрометеорологичен бюлетин, Национален институт по метеорология и хидрология, 2021 http://www.meteo.bg/meteo7/sites/storm.cfd.meteo.bg/meteo7/files/godishen_buletin_NIMH_2020.pdf

¹³ The 2021 report of the Lancet Countdown on health and climate change: code red for a healthy future, The Lancet [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(21\)01787-6/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(21)01787-6/fulltext)

¹⁴ Climate change infographic, Health and Environment Alliance <https://www.env-health.org/wp-content/uploads/2019/11/Climate-Change-Health-Infographic-V3.pdf>

¹⁵ European coal plant database, Europe Beyond Coal, 2021, https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiYw6SQ74j0AhU2g_OHHU1QBPo4ChAWegQIDRAB&url=https%3A%2F%2Fbeyond-coal.eu%2Fwp-content%2Fuploads%2F2021%2F07%2F2021-04-20_Europe_Beyond_Coal-European_Coal_Database_hc5n.xlsx&usg=AOvVaw1Gn8ELKnH-kkhriYt-gnpi

¹⁶ C40 Renewable Energy Declaration, C40 Cities https://www.c40.org/press_releases/renewable-energy-declaration

Recommendations

CITY AUTHORITIES



Set up a clean air for health action plan, including the path to reach WHO's air quality recommendations, and tackling the main pollution sources.



Make informed energy choices based on health and environment impact assessments and economic analyses to benefit the Sofia city. Fossil fuel intensive cities are not environment friendly solutions for a healthier future.



Highlight the contribution of coal power plants to poor air quality in Sofia and advocate for a coal phase out. This will lead to public health benefits as well as cost savings.



Establish a multi-agency task force so that all relevant parties can contribute to improving air quality by doing research on health and financial implications making sure that actions will lead to the best outcomes.



Increase air quality monitoring coverage and make data available 24/7 so that citizens can follow the recommendations to avoid health risks. City authorities need to implement air pollution risk management measures to keep citizens safe.



Initiate public campaigns to increase awareness among citizens about the health impacts of air pollution. City authorities should provide information on reducing exposure to air pollution.

HEALTH COMMUNITY



Increase the participation of health experts in decision-making processes to ensure that the implementation of preventive measures is up-to-date. Decisions have to be made in a real-time manner. Timely actions will prevent chronic diseases and premature death.



Highlight the true costs of coal power generation in public health and clean air deliberations and decisions at city level, and advocate towards increasing the public understanding of how public health will benefit in reducing coal's unpaid health bill.



As a health community, provide input in the development of clean air actions, as well as energy and climate policies, and support the implementation of measures to reduce coal pollution.



Communicate to the patients and to the public the links between air pollution and health, and how improvements of air quality will result in better health.



Promote strong climate action in order to minimize the impacts of heat and extreme weather events.

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