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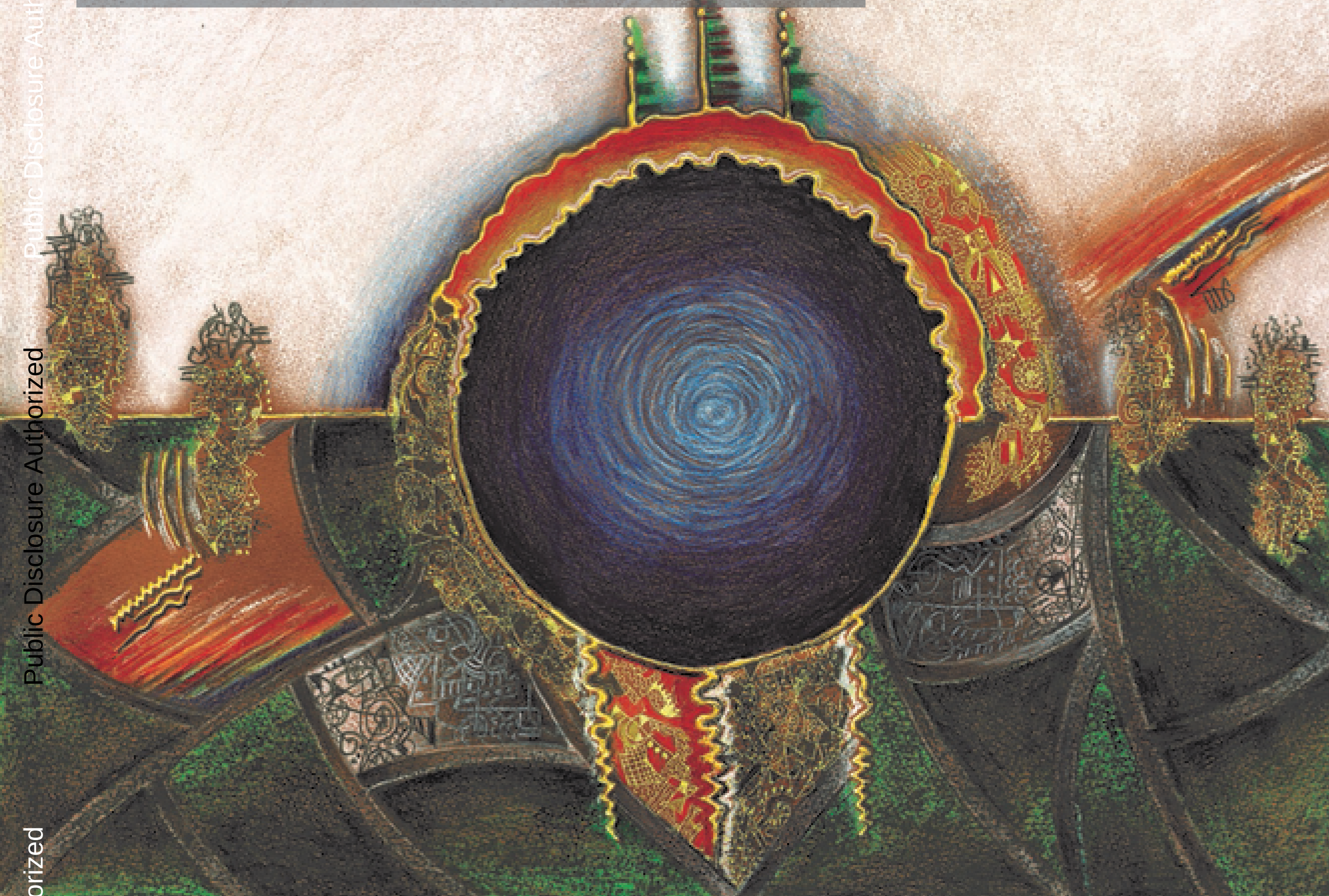
No.17 | Spring 2020

The Economic and Social Impact of COVID-19

AIR POLLUTION CHALLENGES



"You and me" by Tanja Burzanovic (Montenegro)

The RER No. 17 is a collection of notes on the Economic and Social Impact of COVID-19 that will be published in three parts. The first part was launched on April 29 and focused on the macroeconomic impact of COVID-19. This second part shows how the macroeconomic impact affects the people in the region. It discusses the social impact of COVID-19 in the Western Balkans in six separate RER notes on poverty and welfare, labor, health, education, air pollution, and social protection. The third part, to be launched in early June, will focus on specific economic policy response areas—fiscal, external, and financial sector—and the crisis impact on the private sector as reported by firms.

How COVID-19 Could Magnify Air Pollution Challenges in the Western Balkans[1]

- Emerging evidence suggests that Ambient Air Pollution plays a role in the spread and impact of the COVID-19 pandemic.
- The Western Balkan countries are particularly vulnerable as many countries suffer from air pollution, especially during the winter months where extremely high, toxic peaks of air pollution from residential heating dominate.
- The transition into the more polluted winter season could trigger outbreaks and higher peaks of COVID-19 infections in the Western Balkans.
- Households that may experience economic hardship through the loss of direct and indirect income, may substitute higher-grade fuels for cheaper more polluting fuels, which could exacerbate air pollution.
- Countries with high air pollution should enforce regulations and introduce measures that improve air quality to reduce the exposure of people in the upcoming winter.

1. Introduction

Ambient air pollution (AAP) is the main environmental death and disability risk in the Western Balkan region, with cities as the key hotspots. As the COVID-19 pandemic has emerged, several links between the pandemic and air pollution have been observed. At first, strict government "stay-at-home" orders improved air quality, though with notable differences depending on location and air pollution sources. Then, the global discourse of those links swiftly homed in on the hypothesis that populations exposed to more polluted air and therefore with compromised respiratory health are more vulnerable to the virus, and heightened morbidity and mortality. Even though these early observations were made outside of the Western Balkan region, the combination of these effects could have very negative consequences for morbidity and mortality in the region. Without an effective vaccine or treatment, the COVID-19 pandemic may likely continue or recur next winter, once again drawing attention to links between air pollution and the socioeconomic effects of the pandemic.

This note discusses possible links between air pollution and COVID-19 that could emerge for the Western Balkans.[2] It covers how the expected economic effects of the pandemic could aggravate the already severe environmental degradation from air pollution and the associated morbidity and mortality impact of COVID-19, and proposes initial

1 This note was prepared by Klas Sander of the World Bank environment team in the Western Balkan, with contributions from Simon D. Ellis, Michael Toman, Urvashi Narain, Nagaraja Rao Harshadeep, Yewande Awe, Sameer Akbar, Juan Jose Miranda Montero, Camilla Erencin, Sasa Eichberger, and Hrishikesh Prakash Patel. Additional guidance was provided by Kseniya Lvovsky, Gallina Vincelette, Enrique Blanco Armas, Marc Schiffbauer, and Edith Kikoni.

2 This note builds on extensive World Bank analytical work on AAP and Air Quality Management published in 2019 for Bosnia and Herzegovina, Kosovo, and North Macedonia. Individual country reports and a regional summary note are available at https://www.worldbank.org/en/region/eca/publication/air-quality-management-in-western-balkans; http://documents.worldbank.org/curated/en/330811585586168639/pdf/Regional-Note-on-Air-Quality-Management-in-the-Western-Balkans-Bosnia-and-Herzegovina-Kosovo-and-North-Macedonia.pdf

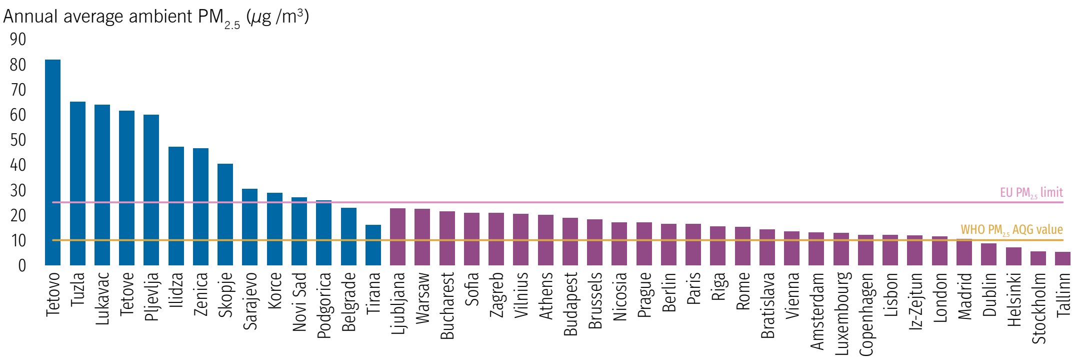
interventions to mitigate the most severe impacts. Because of the spread and containment of the virus, many links are also still uncertain, especially for the Western Balkans.

2. Ambient Air Pollution in the Western Balkans

Throughout Eastern Europe, including the Western Balkan region, air pollution is commonly the main environmental influence on death and disability, especially in cities and urban centers where concentrations of air pollution are very high.[3] Although formal air quality standards in Bosnia and Herzegovina (BiH), Kosovo, and North Macedonia are fairly well aligned with European Union (EU) air quality standards, people in the region typically breathe air that is more polluted by toxic particulates than their neighbors in Western Europe (Figure 1). $PM_{2.5}$ concentrations exceed World Health Organization (WHO) recommendations by a margin wide enough to make them comparable to those observed in cities like Beijing, Mumbai, and New Delhi. In Skopje, North Macedonia, $PM_{2.5}$ levels are more than four times the levels the WHO considers safe; in Tetovo, North Macedonia, eight times the safe level; and in Sarajevo, BiH, three times the safe level.[4]

Capacity constraints and governance issues to implement comprehensive, cross-sectoral air quality management programs are the main underlying reasons high air pollution persists in the region. Inadequate laws and insufficient enforcement of the laws combined with shortages of technical capacity, such as incomplete emissions inventories and lack of proper air quality monitoring are typical problems. Further, limited institutional capacity, especially vertical and horizontal institutional coordination, makes it difficult for a country to respond appropriately when air pollution cuts across sectors.

Figure 1. Air Pollution, Selected Western Balkan and European Cities



Source: WHO Ambient Air Quality Database.

3 About 91 percent of the world's population lives in areas where ambient air pollution is above the limit that WHO considers safe. Worldwide, every year, air pollution accounts for an estimated 4.2 million premature deaths, primarily from respiratory diseases or related illnesses like COVID-19; the estimated welfare cost us US$5.7 trillion, equivalent to 4.8 percent of global GDP (2016). Most of this health burden is attributed to fine particulate matter less than 2.5 micron in size ($PM_{2.5}$), which comes from a variety of sources. Policy recommendation and mitigation investments need to be carefully tailored to the emission sources, which respond to very different measures.

4 Breathe Life, based on data from the WHO Global Platform on Air Quality and Health, https://breathelife2030.org.

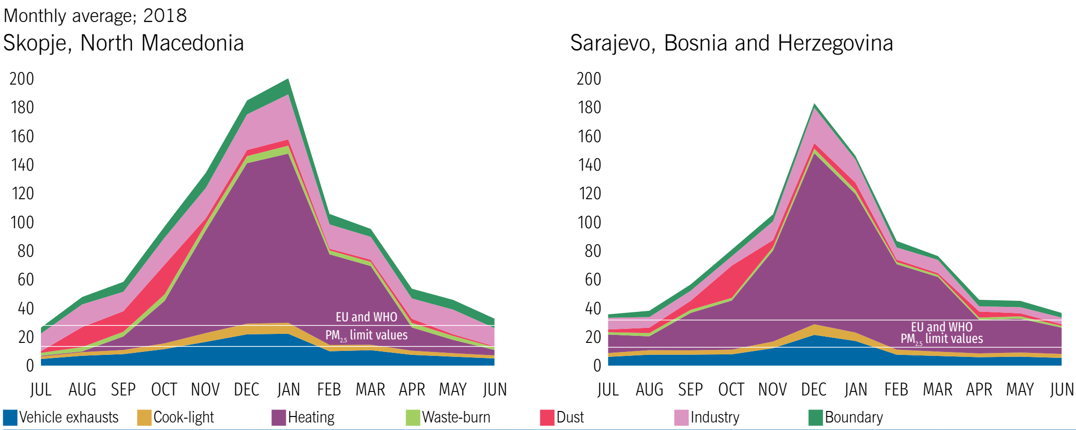
2.1 Pollution Levels and Sources

As discussed later in this note, the spatial, temporal, and sectoral structure of air pollution matters in evaluating the possible links with and impacts of COVID-19. Using the case study examples of Sarajevo and Skopje, Figure 2 illustrates how these three characteristics combined can translate into highly toxic pollution peaks in the winter season in Western Balkan urban centers. Transport-linked nitrogen dioxide (NO_2) pollution is more evenly distributed throughout the year (see Figure 2), but heating-related air pollution is seasonal, with higher peaks as winter temperatures fall, depending on the location and localized weather patterns. The chemical features of pollutants can also be a factor in how air pollution links to COVID-19 and those can vary between pollutants from different emission source (e.g. transport or heating)[5].

For the Western Balkans, residential heating is the largest source of pollution emissions nationally, with frequent extreme and highly toxic pollution peaks during the winter months. These emissions are not expected to decline much as long as the main household heating sources are solid fuels—mainly low-grade wood and (lignite) coal, but also solid waste and rubber pellets, which are illegal for heating homes—and as long as stoves and boilers are inefficient.

The transport sector contributes relatively little to total air pollution, especially if measured at national level, but it is more important when exposure to AAP is considered.[6] Unlike heating-induced air pollution, transport pollution persists throughout the year, especially in cities because vehicle concentrations are magnified by traffic congestion, inefficient transport systems, and aging vehicle fleets.

Figure 2. Source Attributions to Modeled $PM_{2.5}$ Pollution over an Annual Cycle in two Selected Western Balkan Cities

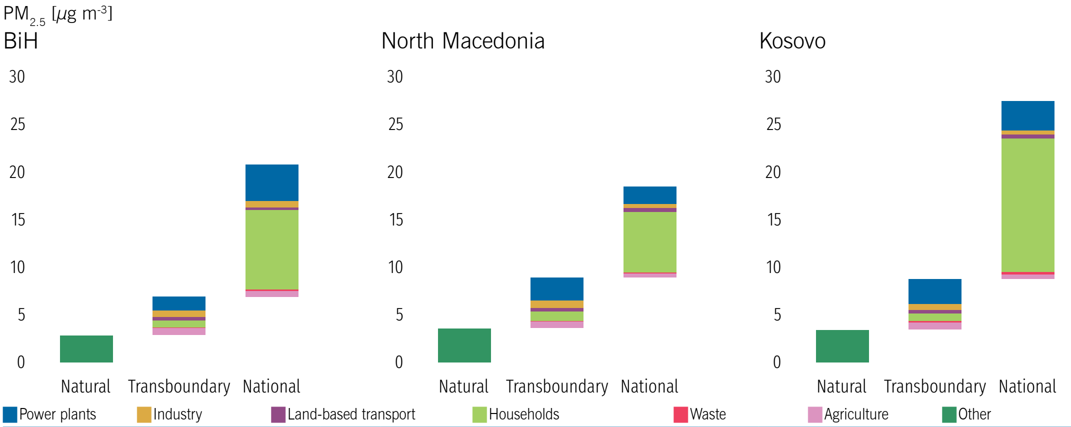


Source: Modeling by UrbanEmissions.info for World Bank, November 2019.

5 For example, The Clean Air Task Force states that "*Diesel particles act like magnets for toxic organic chemicals, many carcinogenic. The smallest diesel particles ("ultrafine particles") can penetrate deep into the lung and enter the bloodstream bringing with them an array of toxins. Diesel exhaust contains 40 hazardous air pollutants (HAPs) listed by EPA, 15 of which are listed by the International Agency for Research on Cancer (IARC) as known, probable, or possible carcinogens*". An Analysis of Diesel Air Pollution and Public Health in America; Clean Air Task Force, June 2005.

6 WHO estimates that, mostly due to diesel traffic, road transport is responsible for up to 30 percent of particulate matter (PM) in European cities and up to 50 percent emissions in OECD countries.

Figure 3. Population-Weighted Annual Mean Concentrations of $PM_{2.5}$, Three Countries, 2015



Source: GAINS model, 2018.

A particular characteristic of the Western Balkan region is the high share of transboundary air pollution. As Figure 3 makes clear, while most $PM_{2.5}$ pollution originates within each of the three countries modeled (BiH, Kosovo, and North Macedonia)[7]—which underscores the need for each government to commit to tackle air pollution, the share of transboundary pollution also demonstrates the need for regional collaboration. Only when all countries improve simultaneously will the situation for each improve.

2.2 Health Impacts and Economic Costs

The causal impact of air pollution, especially $PM_{2.5}$, on cardiovascular (CV) and pulmonary disease is well-documented.[8] Exposure to $PM_{2.5}$ is particularly dangerous to human health because these particles find their way deep into the lungs and the bloodstream resulting in disease and death. Premature deaths and illnesses caused by air pollution can result in heighten health spending and cut into labor productivity; but also affects cognitive learning negatively, a serious threat to children and young adults.

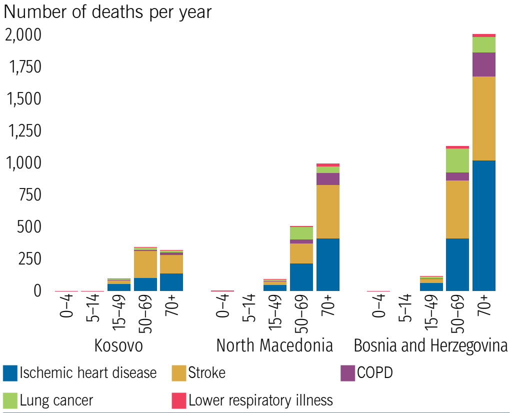
Air pollution is the leading environmental risk factor, contributing most to death and disability in the Western Balkans. It is estimated that because of exposure to ambient $PM_{2.5}$ air pollution, 3,300 people die prematurely every year in BiH; 1,600 people in North Macedonia; and 760 people in Kosovo. Some 80–90 percent of these deaths are from cardiovascular (CV) disease (stroke and ischemic heart disease [IHD]). The majority of air quality-related deaths are of people of productive age, between 50 and 70.[9] The annual economic cost associated with health damage from air pollution in BiH, Kosovo, and North Macedonia, the three Western Balkan countries modeled, ranged between 3.6 and 8.2 percent

7 Although this note builds on World Bank analytics for some countries published in November 2019, it is currently being extended to Serbia, among other countries.

8 As recommended by the WHO, health risk factors are divided into three groups: metabolic, behavioral, and environmental (http://ghdx.healthdata.org/gbd-results-tool). Other risk factors for CV and pulmonary disease include tobacco smoking, alcohol and drug use, dietary risks, and high blood pressure.

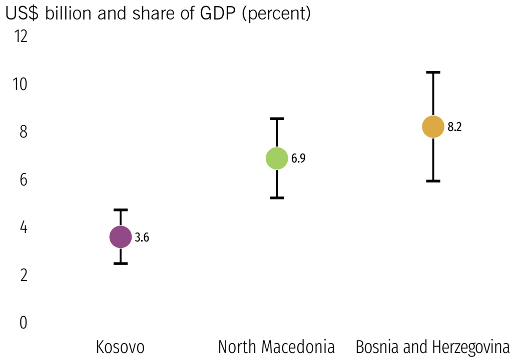
9 Country reports, Regional Air Quality Management in the Western Balkans.

Fig 4. Annual Health Burden of Air Pollution by Country and Age Group



Source: World Bank Country Reports BiH, Kosovo, North Macedonia (2019); see also footnote 2 in this report.

Fig 5. Economic Costs of AAP Damage to Health, 2016



Source: World Bank Country Reports BiH, Kosovo, North Macedonia (2019); see also footnote 2 in this report.

equivalent GDP—in 2016 an average of US$240 million and US$1.38 billion.[10]

The higher prevalence of lung, acute respiratory, and chronic obstructive pulmonary disease (COPD) resulting from exposure to air pollution is the key link why COVID-19 pandemic worsens the health impacts of air pollution. While there are nuances to the association, patients with preconditions, especially chronic lung and heart conditions caused or worsened by long-term exposure to air pollution, tend to be more vulnerable to common diseases and secondary illnesses like flu or infections. As it appears that COVID-19 predominantly affects lungs and other parts of the human respiratory system, people with air pollution-linked diseases are likely to be highly vulnerable to this new disease.

3. Ambient Air Pollution and COVID-19

Although how COVID-19 is spread and contained remains uncertain, scientists are discussing two principal connections between air quality and COVID-19:

1. The reduced economic activity associated with early lockdown measures has curbed air pollution by highly visible rates. The results can be regarded as extreme "pilot testing" of policy reforms often proposed to curb air pollution, especially transport-based emissions.

2. The more prevalent lung and acute respiratory diseases and COPD in populations exposed to air pollution, the more vulnerable they are to COVID-19, which is likely to amplify the pandemic.

Another aspect being analyzed is the possibility that aerosols could enable the virus to be carried over longer distances, infecting more people. This type of "hitch-

10 This conservative estimated cost does not include the costs of hospital stays, cost of illness, and loss of workdays. For details of how the costs are calculated, see country reports for BiH, Kosovo, and North Macedonia all published November 2019 at www.worldbank.org.

hiking" between people was observed with previous SARS-type viruses, which were inhaled with pollution particles by individuals exposed to air pollution.[11] Assessing whether this also applies to COVID-19 is difficult at the present time; analysis is needed of, e.g. whether the quantity transmitted from one person to another in this way is large enough to cause the disease, and how deeply it could penetrate into the respiratory tract.[12]

At this point, health-related links between air pollution and COVID-19 have to be further substantiated once additional and more refined data are available and can be analyzed. Until then, analyses from other locations provide a context for discussing possible exposures in parts of the Western Balkan region with high air pollution to strengthen the potential resilience of the region to future outbreaks of similar diseases.

3.1 Air Quality and COVID-19 Lockdown Measures—Policy Lessons

The measures put in place to contain COVID-19 represent a large-scale experiment related to air pollution, especially understanding the effects of much discussed policy measures to reduce transport-based air pollution. To contain the pandemic, millions of people throughout the world were instructed to stay at home, which dramatically reduced road transport,[13] beginning in China, where lockdown measures affected almost half a billion people. Similar measures followed elsewhere, especially in Italy, Spain, France, and Germany in Western Europe and later in the United States, India, and other parts of the world. This primarily reduced NO_2 pollution over cities where pollution can mainly be attributed to cars and smaller industry[14,15]. In northern Chinese cities like Beijing, for example, where much wintertime pollution comes from residential heating, pollution reduction was limited. A differentiated view[16] showed, that transport-based NO_2 emissions did decline, but heating-linked $PM_{2.5}$ emission were unchanged or even increased slightly.[17]

The differentiated impact of lockdown effects in China and Western Europe is important in discussing possible scenarios linking air pollution and COVID-19 in the Western Balkans. Transport is the dominant pollution source where COVID-19-related air quality improvements were observed in Western Europe (see Figure 6b for northern Italy) and the US.[18] An analysis of NO_2 emission reduction for March 15–April 30 in 2019 and

11 Previous SARS-type viruses have been found to "travel" with PM air pollution, but whether the amount transmitted is sufficient to cause an effective transmission has not been confirmed. See, for example, Setti et al. (April 2020). SARS-Cov-2 RNA Found on Particulate Matter of Bergamo in Northern Italy: First Preliminary Evidence. Letter to the Editor. https://www. medrxiv.org/content/10.1101/2020.04.15.20065995v2.

12 Frontera, A. et al. (2020). *Regional air pollution persistence links to COVID-19 infection zoning*. Journal of Infection. Letter to the Editor. March 2020.

13 These assessments have been mainly conducted by using remote sensing methodology and approaches. However, this technology has limitations in assessing AAP levels, especially with regard to exposure of people as the vertical differentiation of AAP can be an important factor and ground-level monitoring (GLM) is needed to provide more reliable data. See, for example, Alvaro et al;. (2019). Evaluating the use of satellite observations to supplement ground-level air. In: Atmospheric Environment 218.

14 https://www.theguardian.com/environment/2020/mar/23/coronavirus-pandemic-leading-to-huge-drop-in-air-pollution

15 https://www.dlr.de/content/de/artikel/news/2020/02/20200505_corona-effekt-auf-luftqualitaet-eindeutig.html

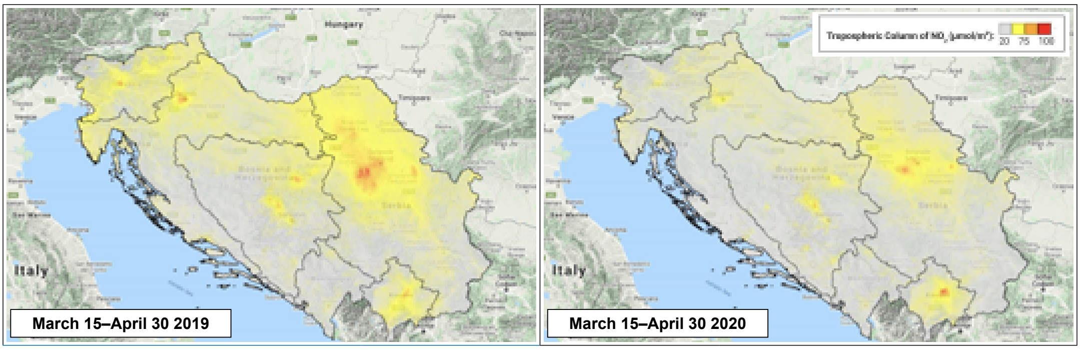
16 http://www.g-feed.com/2020/03/covid-19-reduces-economic-activity.html

17 Also note that the steel industry did not close and emissions continued from that source.

18 According to Web-based publication on March 27, 2020, by the European Space Agency (ESA), based on Royal Netherland Meteorological Institute (KNMI) data from the Copernicus Sentinel-5P satellite monitoring both weather and pollution over Europe, the new images show NO_2 concentrations from March 13 to April 13 2020, compared to the March-April averaged concentrations in 2019. Madrid, Milan and Rome saw decreases of about 45 percent, Paris of 54 percent, coinciding with the strict quarantine measures implemented across Europe. For Washington DC, pollution levels were reportedly the lowest in at least 25 years and ground-based monitoring at a measurement point in DC showed NO_2 levels

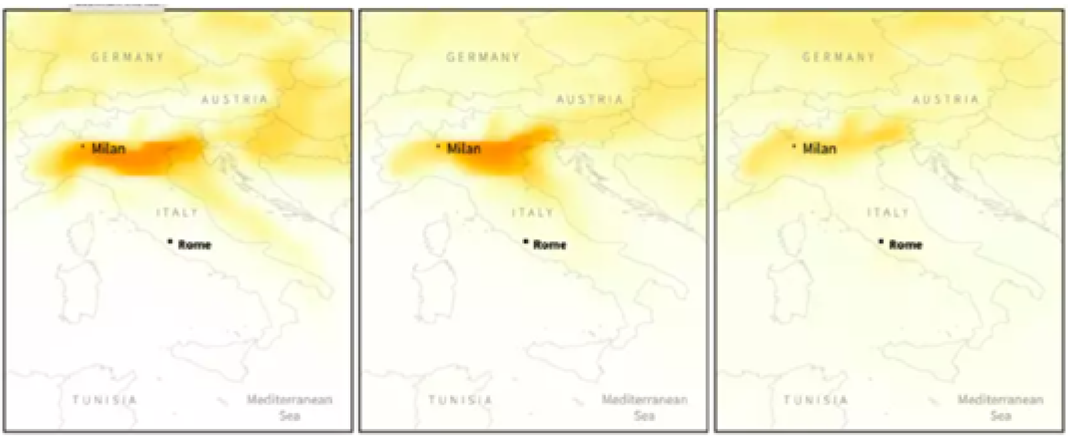
Figure 6. Air Pollution Reductions due to COVID-19 Lockdown Mobility Restrictions observed through remote sensing approaches

6a. Western Balkans



Source: European Space Agency (ESA) data from Copernicus Sentinel-5P and World Bank analysis (May 2020).

6b. Northern Italy



Week 3, January 2020 | Week 3, February 2020 | Week 3, March 2020

Source: Reuters visualizations based on data from NASA's Global Modeling and Data Assimilation published by the World Economic Forum.

2020 confirms similar patterns for the Western Balkans (see Figure 6a). In contrast, because toxic peaks of air pollution in the Western Balkans are mainly triggered by residential heating in winter, transport-focused policies may address only a very limited aspect of air pollution, especially in winter (cf. Figure 2).

Additional aspects that are important for evaluating AAP–COVID-19 links are meteorological factors and transboundary air pollution—both extremely important for the Western Balkans. Spring in the northern hemisphere resulted in the expected air pollution reduction in many regions as seasonal heating activities abated, independent of responses to the COVID-19 pandemic. Further, localized weather patterns are a factor because, e.g., rain and wet weather can reduce AAP and dry weather increases it[20,21]. Similarly,

about 33 percent lower than the 2010–19 average for this time of year (*Washington Post*, April 22, 2020).

19 https://www.weforum.org/agenda/2020/04/coronavirus-covid19-air-pollution-enviroment-nature-lockdown

20 https://www.washingtonpost.com/weather/2020/04/22/washington-dc-air-quality-coronavirus/

21 https://www.nature.com/articles/d41586-020-01049-6

transboundary pollution can diffuse the impacts of local measures that reduce traffic-based air pollution. In several Western European cities, pollution in common AAP hotspots was seen to be as high as usual, or even higher, although lockdown measures had significantly reduced road-based transport.[22,23] The reasons vary, but are largely due to transboundary pollution effects, such as spring-related agricultural activities, but also because of larger weather systems transporting pollutants across longer distances (e.g., bringing Sahara sand to Europe[24]).[25] For the U.S., the situation is less clear; many researchers have seen no statistically significant changes in air pollution in most US cities.[26] Thus, preliminary observations will have to be verified by longer-term data analysis.[27]

These early insights from the COVID-19 lockdowns and their impacts on air quality confirm the complexity decision-makers are confronted with in designing effective and efficient policy actions, targeting investments to improving air quality, and moving to proactive management of air quality. It demonstrates the need to have a thorough understanding about both source attributions and the spatial and temporal distribution of pollution emissions. Policy actions and investments must be tailored to specific pollution sources, the socioeconomic context, and associated behavioral aspects—especially when targeting mitigation measures to the magnifying effect the COVID-19 pandemic may trigger. Decision-makers must also be aware that local measures can be considerably counterbalanced—even if only for a few days—by pollution originating beyond the immediate area where air pollution exposure is concentrated. Public discourse about air quality management needs to be informed by clear and transparent communication about data and analyses of pollution sources, health impacts, and their economic costs, and what results can be expected from the efforts proposed.

3.2 Air Pollution as a Parameter of COVID-19 Vulnerability

More and more people exposed to severe air pollution suffer from diseases identified as heightening vulnerability to COVID-19. There are several nuances to this association, patients with preconditions, especially chronic lung and heart conditions caused or worsened by long-term exposure to air pollution, are generally more vulnerable to secondary illnesses, such as the flu or infections. Two main risk factors in relation to COVID-19 are (1) the risk of contracting the disease faster than healthy people and (2) the risk of having a more severe reaction when the disease is contracted. At this point, the first risk seems negligible, but the second seems to be confirmed. Therefore, lessening air pollution can help the severity of the infection—and any disease with a similar impact profile—for the most vulnerable. Scientists who analyzed the SARS coronavirus outbreak in China in 2003 found that infected

22 https://www.spiegel.de/politik/deutschland/deutschland-duenner-verkehr-dicke-luft-das-feinstaub-raetsel-kolumne-a-00000000-0002-0001-0000-000170518549
23 https://www.tagesschau.de/investigativ/ndr/stickoxid-corona-101.html
24 https://europepmc.org/article/med/18854705
25 https://www.theguardian.com/environment/2016/apr/04/sahara-dust-only-partly-responsible-for-uks-worst-pollution-event-in-10-years
26 https://www.nature.com/articles/d41586-020-01049-6
27 For example, Los Angeles, the only city for which significant improvements in air quality were observed during the pandemic, also experienced unusually rainy weather and it is unclear how much of the air quality improvement is due to weather and how much to COVID-19 stay-at-home measures. The situation is similar for Washington, DC, which has a wet and windy spring.

people who lived in areas with more air pollution were twice as likely to die as those in less polluted areas.[28]

While it is reasonable to argue that exposure to AAP and related morbidity exposes populations to more severe courses of COVID-19, the magnitude of this relationship is unknown. A recent study by Harvard University scientists[29] claimed that people living in areas with only a slight increase in exposure to $PM_{2.5}$ were 15 percent more likely to die from COVID-19 but was heavily criticized for its research approach and for findings that seemed to grossly overestimate the risks of COVID-19 mortality from air pollution.[30] Yet a World Bank working paper[31] suggests that $PM_{2.5}$ is a highly significant predictor of confirmed COVID-19 cases and hospital admissions. It found that the relationship is nonlinear and accelerates in concentrations above the WHO guideline of $10\mu g/m^3$, with the number of expected cases doubling, all else constant, when pollution worsens by 20 percent. However, the study could not confirm any causal mechanisms, perhaps because of data issues: air pollution concentrations provide only limited information. A study in northern Italy concludes that people living in areas with high and prolonged pollution are more likely to have chronic respiratory conditions and are more susceptible to any infective agent.[32] Prolonged exposure was found to lead to a chronic inflammatory stimulus, even in young and healthy persons—a possible co-factor for COVID-19 lethality. This effect is of particular concern because it may imply that many people may suffer long-term health damage. Long-term effects of reduced lung and respiratory capacity that affects performance and quality of life are being seen in COVID-19 patients as well.[33]

4. Scenarios for the Link between Air Pollution and COVID-19

In many ways the current crisis is a unique learning experiment. Given the still early research phase, existing scientific findings have more the character of hypotheses than confirmed results. Emerging data, analyses, and knowledge about the COVID-19 will gradually improve the understanding of possible scenarios and countermeasures in specific regions like the Western Balkans.

Projections about seasonal COVID-19 transmission dynamics through the post-pandemic period are highly relevant for the region.[34] As with the flu, current winter outbreaks of the virus are expected, and it is possible that though the virus can proliferate any time of year, there will be lower peaks during winter/spring transitions and higher peaks during fall/winter transitions. Some scenarios modeled also suggest the possibility of

28 Cui, Zhang, Froines, Zhao, Wang, Yu, and Detels (2003): “Air pollution and case fatality of SARS in the People’s Republic of China: an ecologic study”, Environmental Health, 2, 15.; Na, Feng, Fang, Richardus, Han, Cao and de Vlas (2009): “Case fatality of SARS in mainland China and associated risk factors”, Tropical Medicine and International Health, 14, 21-27.

29 Wu, X., Nethery, R.C., Sabath, B.M., Braun, D., Dominici, F. (2020). Exposure to air pollution and COVID-19 mortality in the United States. Harvard T.H. Chan School of Public Health. Harvard University.

30 https://theconversation.com/air-pollution-covid-19-and-death-the-perils-of-bypassing-peer-review-136376

31 Andree 2020. Particulate Matter and COVID-19 Incidence: Evidence from the Netherlands. World Bank, etc.

32 Conticini, E., Frediani, F., Caro, D. (2020). Can atmospheric pollution be considered a co-factor in extremely high level of SARS-CoV-2 lethality in Northern Italy? In: Environmental Pollution (accepted March 24, 2020).

33 https://www.wetnotes.eu/tauchen-nach-covid-19-erkrankung/

34 Kissler, S. et al (2020). *Projecting the transmission dynamics of SARS-CoV-2 through the post-pandemic period.* Science 10.1126/science.abb5793.

resurgence after it may at first seem to have died out.[35] Therefore, the winter weather patterns, air pollution variations, source allocation and seasonality, and, indirectly, the household socioeconomic situations will make a difference in the Western Balkan region. Without effective therapeutic measures or vaccine, the next winter could be critical in determining the medium- to long-term development impacts of the pandemic in the region. How these factors could interact may help policy-makers to formulate measures that reduce vulnerability.

What follows, using a stylized approach, outlines how these factors might interact and lead to an elevated air pollution−COVID-19 impact scenario:

- **The biggest unknown is next winter's weather pattern—an important factor—and the resultant AAP-COVID-19 links:** (1) A long, colder winter could lead to a fall/winter transition with a stronger resurgence of the virus. (2) A colder and longer winter could mean that private households need more heating, the principal source of emissions in many Western Balkan cities. Together, these two factors could heighten the already high number of people suffering from AAP-related respiratory and pulmonary diseases, making them more vulnerable to COVID-19.

- **Policy measures to respond to a resurgence of COVID-19, especially if there are stay-at-home orders, could worsen air pollution.** Daily air pollution levels in winter often jump in the morning when people heat their homes before leaving for work and school; then, after easing during the day, air pollution increase again in the early evening until they go to sleep. If people were at home for the entire day, residential heating would continue as long as they were awake—and residential heating is the main source of AAP.

- **Individual road transport could also trigger additional transport-based air pollution from private cars,** because people may choose individual over public transport due to crowding and social distancing. The result could be more vehicles on the road, more traffic congestion, more transport-based pollution—people being more exposed to air pollution.

- **The negative economic consequences of the pandemic are also likely to impact, and even accelerate, air pollution in the Western Balkans, with implications for COVID-19.**[36] Declining economic opportunities mean higher unemployment and fewer income opportunities for households. And remittances, an important source of income in the region, are also likely to decline. Faced with considerably reduced income to meet their needs, households are likely to limit their spending on heating fuels, which have a high price elasticity of demand. Similar patterns have already been seen

35 Carleton, T., Cornetet, J., Huybers, P., Meng, K.C., Proctor, J. (2020): Ultraviolet radiation decreases COVID-19 growth rates: Global causal estimates and seasonal implications; working paper (in draft at time of citation).

36 Compare Regional Economic Report Background Notes 1, "*Setting the stage: The state and vulnerabilities of Western Balkan economies as they face the COVID-19 crisis*", 2, "*Country Notes with extended outlooks, including a discussion on short- and medium-term policies*", 7, "T*he private sector impacts in the Western Balkans*", 8, "*The Poverty and Distributional impact*", and 9 "*Managing the Employment impact.*"

elsewhere when consumers have had to suddenly adjust their spending.[37] Usually, consumers economize on heating costs by using, often illegal, fuels, like trash, rubber pellets, and low-quality wood—all of which will worsen air quality significantly—and even more so in a long, cold winter and households have to stay at home in private, especially single-family, residences.

In such a worst-case scenario, Western Balkan countries may see a surge in COVID-19 cases with severe morbidity and mortality. More optimistically, a best-case scenario of a warmer winter with less demand for residential heating could mean a lighter AAP-COVID-19 impact. There are a few ways to mitigate possible surges in COVID-19 infections and fatalities next winter; they only have to be in place for a few months and could be directed to three goals: (1) avoid aggravation of pollution by, e.g., strictly enforcing and not relaxing current air quality regulations; (2) effectively reduce air pollution itself; and (3) minimize exposure to air pollution.

Quality standards for heating fuels can effectively reduce air pollution in the short-term. More stringent enforcement of fuel-quality standards would eliminate most dirty fuels, especially rubber pellets, poor-quality wood, and burning of household trash and industrial waste. Because this would increase demand for better fuels, especially higher-quality wood, well before winter programs could be initiated to increase the domestic supply of these fuels. With only a few months to prepare for winter, industrial drying of fuelwood may be necessary to meet wood moisture standards. As the costs for quality fuels is higher, governments may also need to adopt social protection measures to compensate households for the higher costs.

5. Reducing the Impact of Air Pollution on Those Vulnerable to COVID-19

Next winter, measures to avoid exposure to air pollution could constitute a short-term intervention to reduce health vulnerability. For example, distributing high-quality facemasks, enhancing access to air purification filters; installing more such filters in kindergartens, schools, and hospitals is one example of how this can be done. However, given still limited understanding of the virus, its impact, and its course in persons with different pre-conditions (or none at all), it is still uncertain how effective these measures could be in reducing the COVID-19 impact.

To avoid a heavy increase in personal vehicles on the roads, municipalities could offer additional bus transport. That would make social distancing possible on public transport and may also motivate more people to use buses. Such measures could be supplemented by regulation of transport through, e.g., restricting circulation of private vehicles in defined traffic zones, especially during air pollution peaks. If municipalities invest in more buses, clean electric buses should be preferred.

In the medium- to long-term, phased investment in air quality management is recommended. Actions should be prioritized based on their cost-effectiveness, institutional feasibility, and targeting of pollution hot

37 https://blogs.worldbank.org/energy/a-ladder-wood-theft-and-sustainability

spots. Considering annual air pollution in Western Balkan cities, reducing the highly toxic pollution peaks in winter should be a high priority. While this will not necessarily reduce COVID-19 infections, it will reduce the impact and course of the disease, especially for people with pre-conditions. This will also require investments in improving residential heating because that will have the most effect on air pollution in winter.

Investment in more reliable and comprehensive data of air pollution is necessary to inform choice of the most effective measures. Though more advanced than countries in other world regions, air pollution data for the Western Balkans are far from optimal. In the longer term, countries need to invest more in their ability to manage air quality, from building technical and institutional capacity to policy and institutional reforms, and investments in infrastructure, especially to make residential and commercial heating systems more efficient.

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You and me
by Tanja Burzanovic (Montenegro)

Dr. Tatjana Burzanovic has a wide experience in the fields of graphic design, graphics in architecture, interior design. She has worked as an art editor, interior designer and graphic designer at various levels. Many of her art exhibitions have taken place at different places. She has received many awards for her arts and literary works. She has published a book with a title The Interrelation between Art Worlds, with the support from the Embassy of India for Austria and Montenegro in Vienna. Her artistic philosophy includes displaying of interrelationship between art worlds (spatial and temporal arts). The artist thus meditates between nature and the sprits and yet stems from the absolute idea and serves the goal of realization of absolute sprit. 'Grasping the meaning through the form' is a task of the art set by a contemporary thinker to demonstrate that building forms and creating sense are two simultaneous, intertwined, and absolutely inseparable processes in Arts. Without that recognition it is not possible to take any further step in investigating the nature of art and literature. She believes that art is a way to search the truth. Art is inseparable from searching the truth.

People forge ideas, people mold dreams, and people create art. To connect local artists to a broader audience, the cover of this report and following editions will feature art from the Western Balkan countries.