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Independent monitoring of air pollution calls for urgent action in the Balkans

In spite of growing evidence of air pollution from coal combustion and mining, and continued public protests in Balkan countries, air quality has not been treated as a priority issue on a regional policy-making level. At the same time, new lignite capacity is being planned and promoted by the region's governments.

The latest air quality report by the European Environmental Agency indicates¹ that air-quality policies in the European Union have delivered, and continue to deliver, many improvements. Reduced emissions have improved air quality in Europe, and, for a number of pollutants, exceedances of European standards are rare. This is a direct result of consolidated legislative efforts towards curbing air pollution and ensuring a level playing field for pollution standards across the Union. However, a large proportion of European populations and ecosystems are still exposed to air pollution that exceeds European standards and, especially, World Health Organization (WHO) Air Quality Guidelines.

The air pollution problem requires action and cooperation at global, European, national and local levels, which must reach across different sectors of the economy and engage the public. Solutions should involve technological development and structural and behavioural changes.

In most countries in the Western Balkan region air quality data is either unavailable to the public or unreliable. Metering stations are placed in irrelevant locations, or certain substances are simply not monitored.

CEE Bankwatch Network and partner organisations from the region have embarked on an independent particulate matter monitoring adventure. Between October 2016 and April 2016, our Environmental Dust Monitor (EDM 164) travelled to four selected locations in Western Balkan countries, plus two more in Bulgaria and Romania. What all these places all have in common is that they are home to ageing coal power plants and open-cast lignite mines, which play an important role in aggravating air quality. Worryingly enough, plans to build even more coal capacity are being promoted by the governments in most of these towns.

The monitoring data has been gathered for at least 30 continuous days from each location². It is therefore indicative and is not intended to replace stationary long-term monitoring, but the results do help understand the intrinsic relation between coal combustion and mining and high levels of PM 10 and PM 2.5 (dust so small it enters deep into our lungs and stays there).

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CEE Bankwatch Network is today the largest network of grassroots, environmental groups in countries of central and Eastern Europe and a leading force in preventing dubious public investments that harm the planet and people's well-being in this region and beyond.

Operating since 1995 in countries that have undergone significant social and economic transformation, we have the know-how to effectively work in unpredictable environments from North Africa to Central Asia.

www.bankwatch.org

¹ <https://www.eea.europa.eu/publications/air-quality-in-europe-2016>

² With the exception of Bitola, Macedonia, where the machine broke down very soon after installation due to clogged filters and contamination of the measuring chamber, and Pernik, Bulgaria, where measuring was carried out for 19 days before the filter clogged and monitoring was interrupted.

Description of selected locations for PM monitoring

Tuzla, Bosnia and Herzegovina



The town is notorious for its poor air quality, with locals taking to the streets in recent winters to complain about the heavy levels of fine dust in the atmosphere. The state-owned electricity company plans to build a new 450 MW lignite-fired unit at the Tuzla power plant. This would only replace two of the four remaining units, increasing the overall capacity. The main causes of the problem with polluted air are perceived to be the thermal power plant (4 units), traffic and individual heating, but what the local authorities fail to determine is the contribution from each sector. The concentration of PM_{2.5} is up to 300 micrograms/m³ and more, along with high concentrations of SO₂, making air pollution in Tuzla worse than in other cities in Bosnia and Herzegovina. The lack of interest from the responsible cantonal ministry and inadequate plans for emergency measures, and additionally incomplete federal legislation (there are no defined maximum concentrations of PM_{2.5}), resulted in no warning or measures related to this pollutant despite the fact that concentrations reached twelve times more than the WHO guidelines of 25 micrograms/m³ for 24-hour averages in previous years. The monetised impact on public health of the planned 450MW unit was estimated by a recent HEAL study to be between 4–12 million EUR/ year³.

Drmno, Serbia

The village of Drmno is sandwiched between the Kostolac B power plant and the Drmno open-cast lignite mine which supplies its fuel. A new 350 MW lignite plant is planned at the Kostolac complex, on top of the existing 4 units. The current ash dump is a constant source of PM pollution, particularly in the dry and windy season, with the north wind blowing in the direction of the inhabited areas around, while new planned one is placed in the opposite direction, practically surrounding the villages with constant pollution. The existing units are not in compliance with the Large Combustion Plants Directive emissions levels; moreover the oldest two units (A1 and A2) are expected to keep operating with reduced operating hours until 2023 without any pollution filtering improvements.

Kostolac B1 power plant, near Drmno



A report by HEAL⁴ shows that in 2010, more than 10,000 people in Serbia died prematurely from particulate matter (PM) and ozone exposure. It is the second highest rate of premature deaths due air pollution in Europe.

³ http://env-health.org/IMG/pdf/factsheet_bosnia_en_web.pdf

⁴ Idem.

Pljevlja, Montenegro

Pljevlja is located at around 720 metres above sea level and suffers from particularly serious smog due to its location surrounded by hills. In spite of the alarming levels of officially measured PM emissions the Montenegrin authorities are adamant that the main source of pollution is the combustion of lignite and wood in individual stoves, failing to address the fact that the existing power plant is not compliant with either the Large Combustion Plants Directive (LCPD) or the Industrial Emissions Directive (IED). There are no serious plans in the short term to tackle the pollution, and the long-term solution offered by the government is to construct another unit at the power plant. In 2016 the two main financiers withdrew their support to the project, signalling the lack of financial economic sense of the project. However, the government is determined to go ahead with this project.

Bitola, Macedonia



In Bitola, the vicinity of the thermal power plant and the ash deposit play a significant role in the PM 10 pollution, however the source of pollution is officially still unclear. For two consequent years, the Ministry for Environment in Macedonia has been claiming that a chemical analysis as well as a study about the sources of pollution was underway, but no results have been published so far. Environmental NGOs have notified the Ministry for the last 3 years about the risks to human health and about the measures needed to prevent air pollution, but without success. In 2015 the Ministry drew up several urgent measures to decrease pollution levels, but the Government refused to undertake any of them.

Rogojel, Romania



Villager of Rogojel looking out his property at a coal crushing equipment

The village of Rogojel near the exiting Rovinari TPP, Pinoasa and Rosia lignite mines has been exposed for years to extreme air pollution, originating from the power plant, the open-pit mines which surround it and illegal coal storage depot nearby. Results of our independent measurements point to levels of PM10 thirty times above the legal limit, of over 1500 micrograms/m³ for several hourly averages. The coal dust is blown both from the coal deposits in the area and from the conveyor belts that are neither covered, nor have water sprinklers. On its surface, the earth in the area is not soil but rather a layer of coal dust deposited there. The villagers from Rogojel complain that they are not able to rear animals or grow crops because the soil is poisoned by coal dust. Their request to be relocated filed back in 2007 has been ignored by the company and government.

Pernik, Bulgaria

Official air quality data is not available in the public domain and the measurement stations are often wrongly placed, moved away from the site of severe pollution. The independent measurements conducted show big differences in the PM levels between daytime and night-time, pointing to the fact that the dust filters may have been turned off. Bulgaria is already subject to an infringement procedure due to systematic non-compliance with the Air Quality Directive, and our monitoring will support the local campaign aiming to shut down the non-compliant units.

Summary of results – Western Balkans

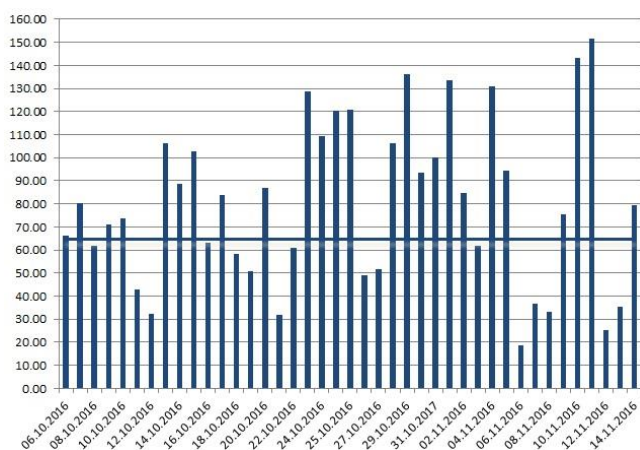
In two of the selected locations – Tuzla in BiH and Drmno in Serbia – the official monitoring stations do not measure either PM 10 or PM 2.5, while monitoring of the latter – particularly relevant for coal combustion – does not happen in any of the four sites. In all locations there are existing coal power plants, open-cast lignite mines and ash disposal sites, whose contribution to dust emissions is indisputable. Moreover, in all four monitored sites, new coal units are planned. Our results have indicated worryingly high levels of both PM 10 and PM 2.5 and it is questionable why the responsible authorities, such as the local environmental inspections or agencies, do not prioritise such locations when placing the official monitoring stations. Both types of PM should be attentively monitored, but much greater stress should be put on PM 2.5 which is the more harmful of the two, as PM 2.5 particles are lighter and go deeper into the lungs, causing greater long-term damage. They also stay in the air longer, for days or weeks, and travel farther – up to a few hundred kilometres⁵.

Tuzla, Bosnia and Herzegovina.

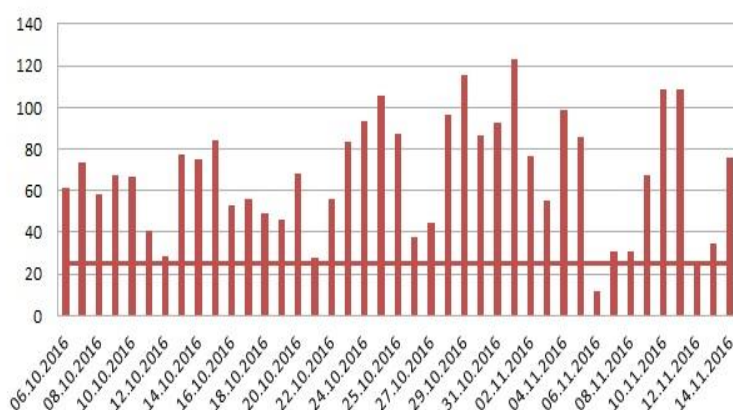
Monitoring period: October 6th – November 14th, 2016

In Tuzla, the average pollution levels for both PM 10 and PM 2.5 were constantly above national and EU limits. The 24 hour averages of the dust pollution levels show how the legal limit for PM 10 in Bosnia and Herzegovina was exceeded on 25 days out of 41 days monitored (or 61 percent). As compared to the 24-hour PM 10 limit of 50 micrograms/m³ in the European Union, the Federation of Bosnia and Herzegovina has a more lenient standard, of 65 µg/m³. In the EU, in the course of a year, there should be a maximum of 35 days on which the average concentration exceeds the legal limit for PM 10. It's almost impossible to imagine that this limit will not be breached in Tuzla.

There is no limit for PM 2.5 in the law of the Federation of Bosnia and Herzegovina, therefore the graph below compares the measured values with the EU limit for the annual average.



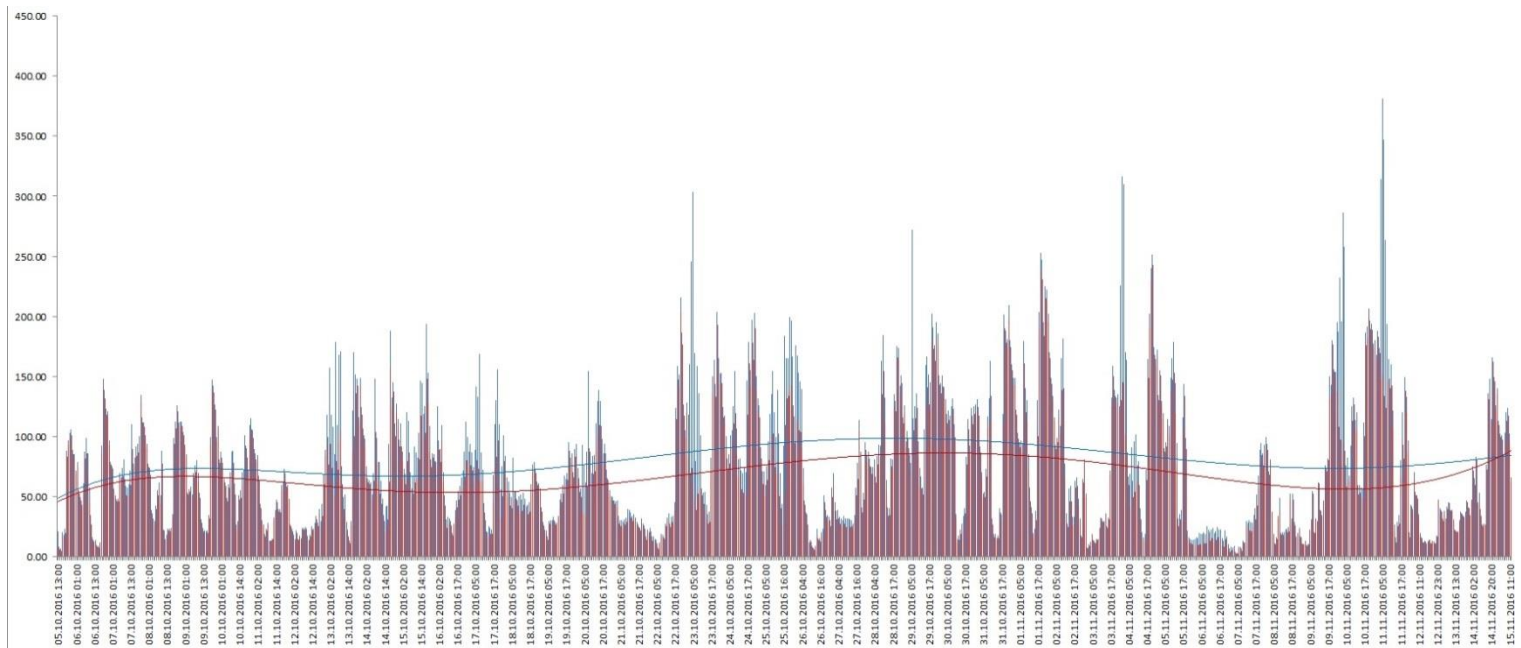
PM 10 levels in Tuzla, 24h averages



PM 2.5 levels in Tuzla, 24h averages

The graph below shows hourly values of both PM 10 (blue) and PM 2.5 (red) in the observation period. The high peaks during night time – a pattern of emissions skyrocketing as soon as it gets dark, after 19:00 local time – suggest that the Tuzla power plant's pollution filters might not function properly or even be turned off during night time.

⁵ https://webcms.pima.gov/UserFiles/Servers/Server_6/File/Government/Environmental%20Quality/Air/Air%20Monitoring/AWhatisParticulateMatter1.pdf



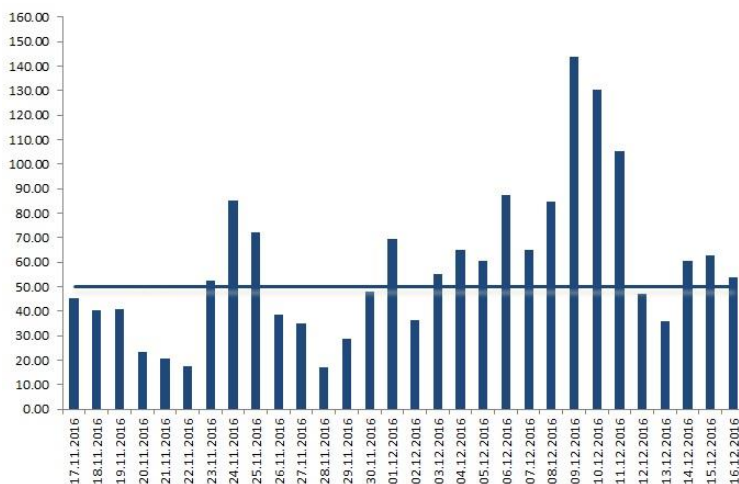
PM 10 and PM 2.5 levels in Tuzla at different times of day. The graph shows enormous increases for both pollutants during night time.

Drmino, Serbia

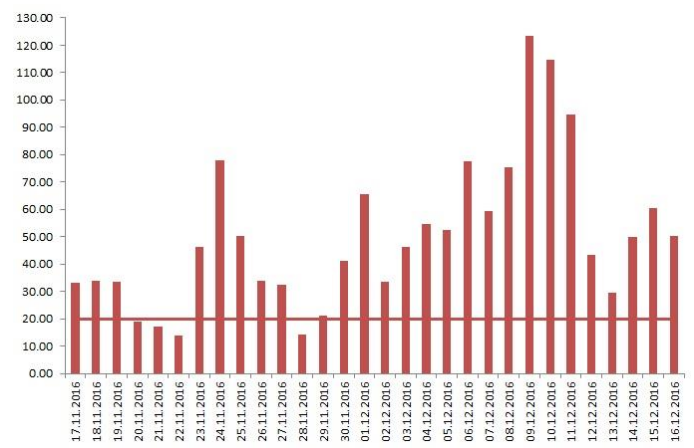
Monitoring period: November 17th – December 16th, 2016

The legal limit for the daily average for PM 10 was breached on 16 days out of 30 days observed. According to Serbian law, the PM 10 limit may be breached on 35 days over the course of one year, just like in the EU's Air Quality Directive limits.

As far as PM 2.5 is concerned, the results are nothing less than alarming – only on 4 days of the entire 30 days of monitoring was the limit for PM 2.5 not breached. According to Serbian legislation, the maximum allowed annual average for this pollutant was $27.14 \mu\text{g}/\text{m}^3$ for a 24h average in 2016. By 2024 this limit will be tightened to $20\mu\text{g}/\text{m}^3$ which is also the limit recommended by the World Health Organisation and the one used by the Institute for Public Health in Serbia in its communication.

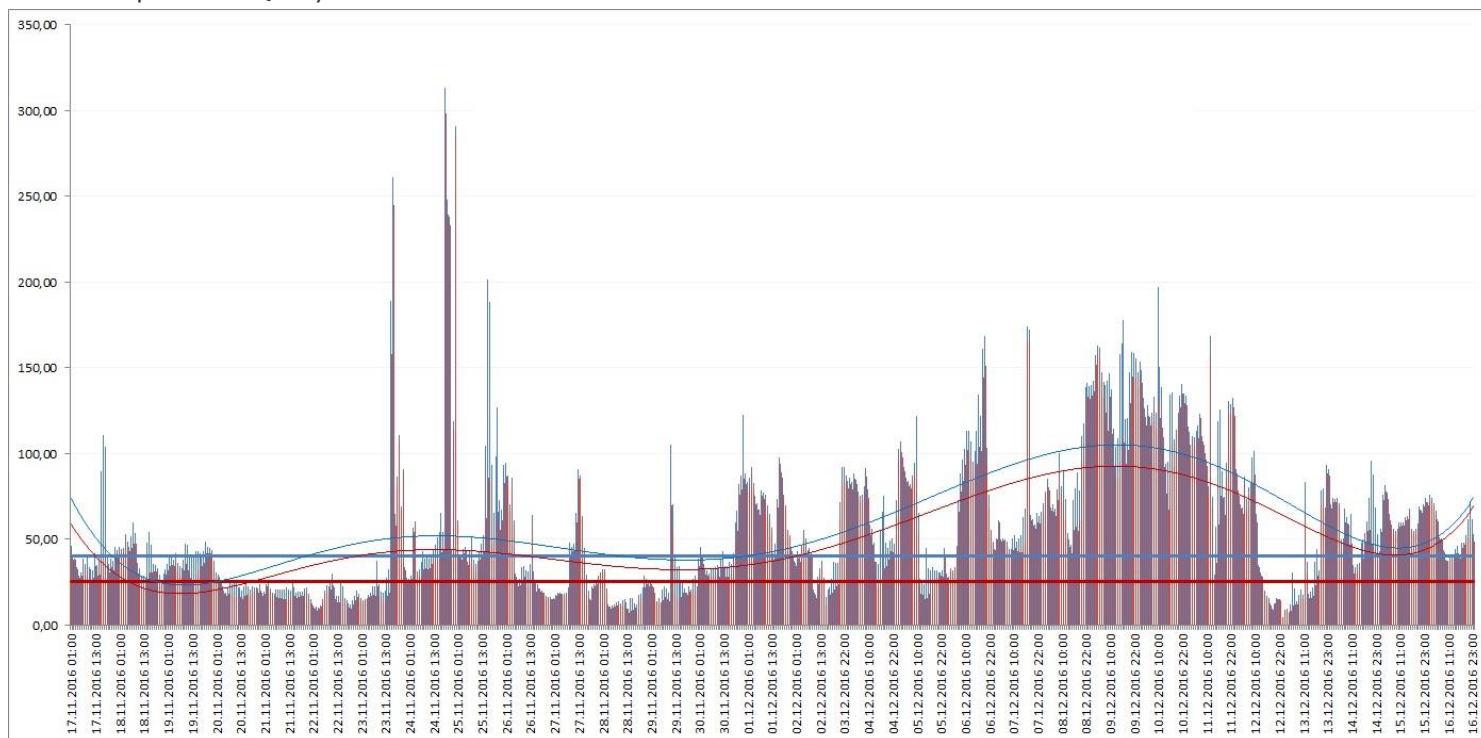


PM 10 levels in Drmino, 24h averages



PM 2.5 levels in Drmino, 24h averages

The graph below shows some very high peaks for PM 10 (blue) hourly values, up to more than 300 micrograms/cubic meter. Also PM 2.5 (red) levels have similarly high peaks and are on average more regularly above EU limits. The curved lines show the trend over the observation period. The straight horizontal lines represent EU level standards as per the Air Quality Directive.

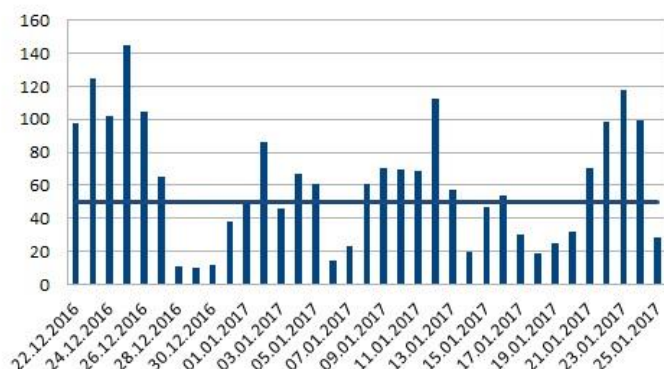


PM 10 and PM 2.5 levels in Drmno at different times of day. The curved lines show the trend over the observation period. The straight horizontal lines represent EU level standards as per the Air Quality Directive.

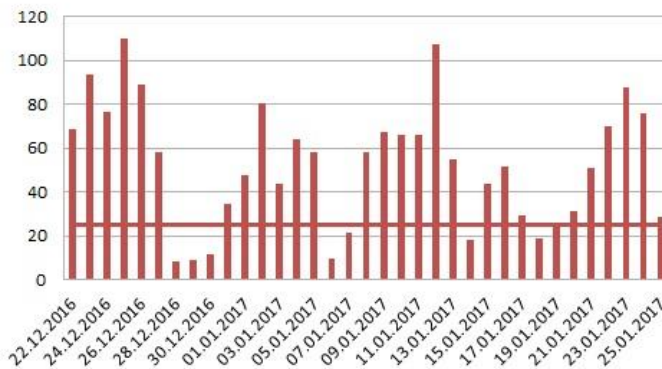
Pljevlja, Montenegro

Monitoring period: December 22nd, 2016 – January 15th, 2017

In Pljevlja, the PM 10 daily average was breached on 21 of the 35 days observed. Over the course of one year, the PM 10 limit may be exceeded no more than 35 times. The EU limit for PM 2.5 was exceeded on 29 of the 35 days observed, or 83% of the time. The EU's directive on air quality, which has been transposed in Montenegrin legislation, does not allow for any exceedance of the PM 2.5 limits.

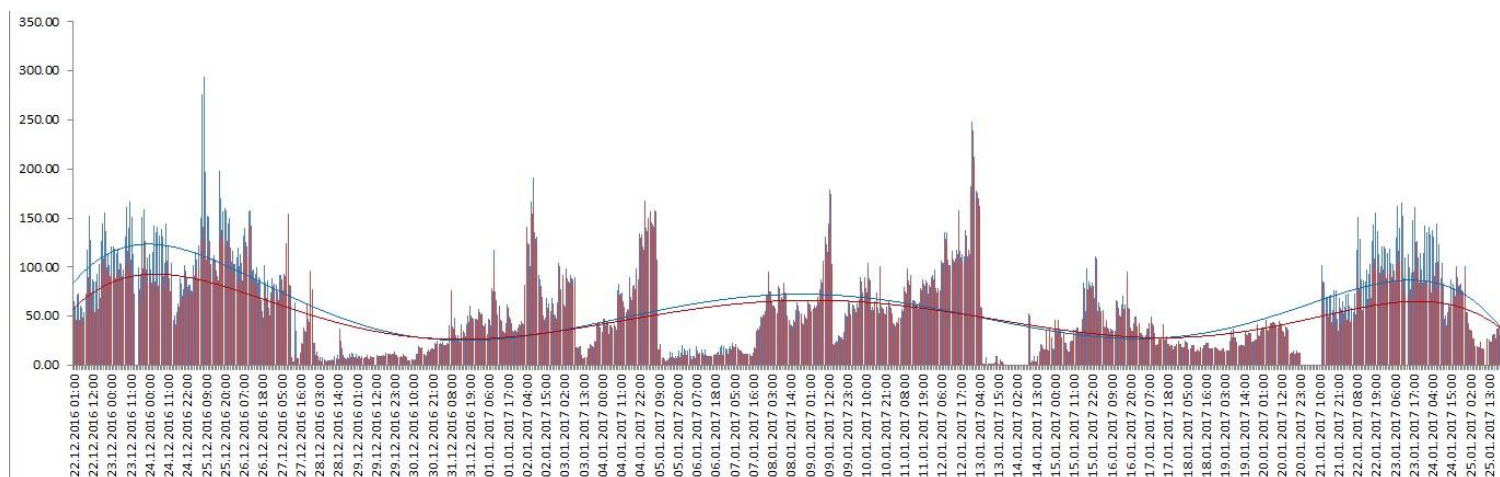


PM 10 levels in Pljevlja, 24h averages



PM 2.5 levels in Pljevlja, 24h averages

The graph of hourly measurements shows high PM 10 peaks, with the highest recorded on Christmas day at eight in the morning, at 294.15 micrograms per cubic metre. Similarly PM 2.5 levels spiked on a number of occasions and are on average above the EU annual limit more often than not. The highest levels of PM2.5 recorded came on 13 January between midnight and one in the morning, standing at 238.85 and 206.16 $\mu\text{g}/\text{m}^3$, respectively.



PM 10 and PM 2.5 levels in Pljevlja at different times of day

Bitola, Macedonia

In Bitola, Macedonia, the pollution levels were so high that after only a few days the machine's filters and measurement chamber were contaminated and it had to be sent for clean-up and re-calibration. Measurements at this location have been resumed at the time of writing.

Summary of results – Bulgaria and Romania

In any EU-level ranking, Bulgaria and Romania are fighting each other for the last position. Air quality is no exception. In 2013, the European Environment Agency's report⁶ on air pollution found that four of Europe's five cities with the most consistently high levels of particulate matter were Bulgarian. The town of Pernik in Bulgaria, where we placed our independent monitoring device, topped the list as the dirtiest one, with too high concentrations of particulates in the air around half of the year. EU law only allows for 35 days of pollution above the regulated limit. A recent ruling of the European Court of Justice⁷ against Bulgaria confirms Bulgaria's law infringement by failing to stay within the allowed limits of coarse particulate matter (PM 10) and for failing to take action to keep the exceedance period as short as possible.

In Rogojel, Romania, things are equally bad. The village, situated near the exiting Rovinari lignite power plant, has been exposed for years to extreme air pollution, originating from the power plant, the two open-pit mines which surround it and the illegal coal storage depot nearby. The locals have been promised resettlement since 2007, but the mining company has not made any progress in this regard, as the mines are not envisaged to expand towards the village, so resettlement is not a priority.

Similarly to the Western Balkan countries, no official measurement stations are present in either Pernik or Rogojel, even though there are clear local sources of air pollution, and PM 2.5 is not monitored at all in either of the two countries.

⁶ <https://www.eea.europa.eu/publications/air-quality-in-europe-2013>

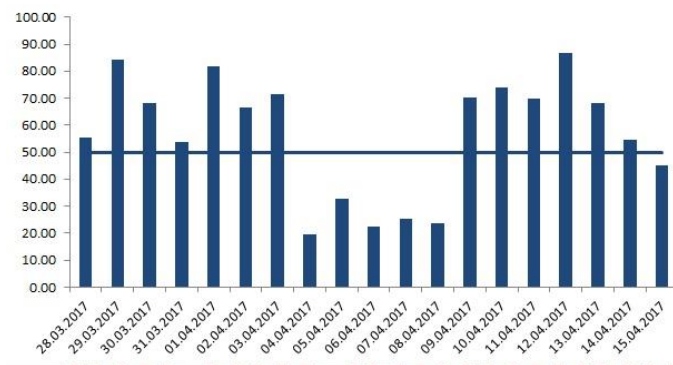
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<https://curia.europa.eu/juris/document/document.jsf?text=&docid=189624&pageIndex=0&doclang=EN&mode=req&dir=&occ=first&part=1&cid=39926>

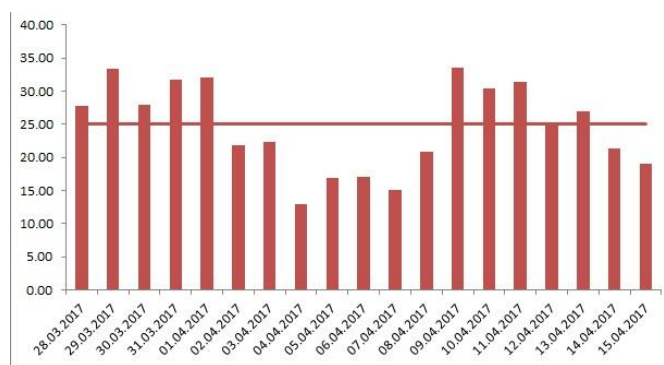
Pernik, Bulgaria

Monitoring period: March 28th – April 15th, 2017

During the 19 days of monitoring PM 10 and PM 2.5 emissions in Pernik, the EU limit on PM 10 was exceeded on 13 days, or 68 per cent of the time. As mentioned above, over the course of one year, the PM 10 limit may be exceeded no more than 35 times. The EU limit on PM 2.5 was exceeded on 10 of the 19 days of monitoring. The PM 2.5 limit is yearly and must not be exceeded at all.

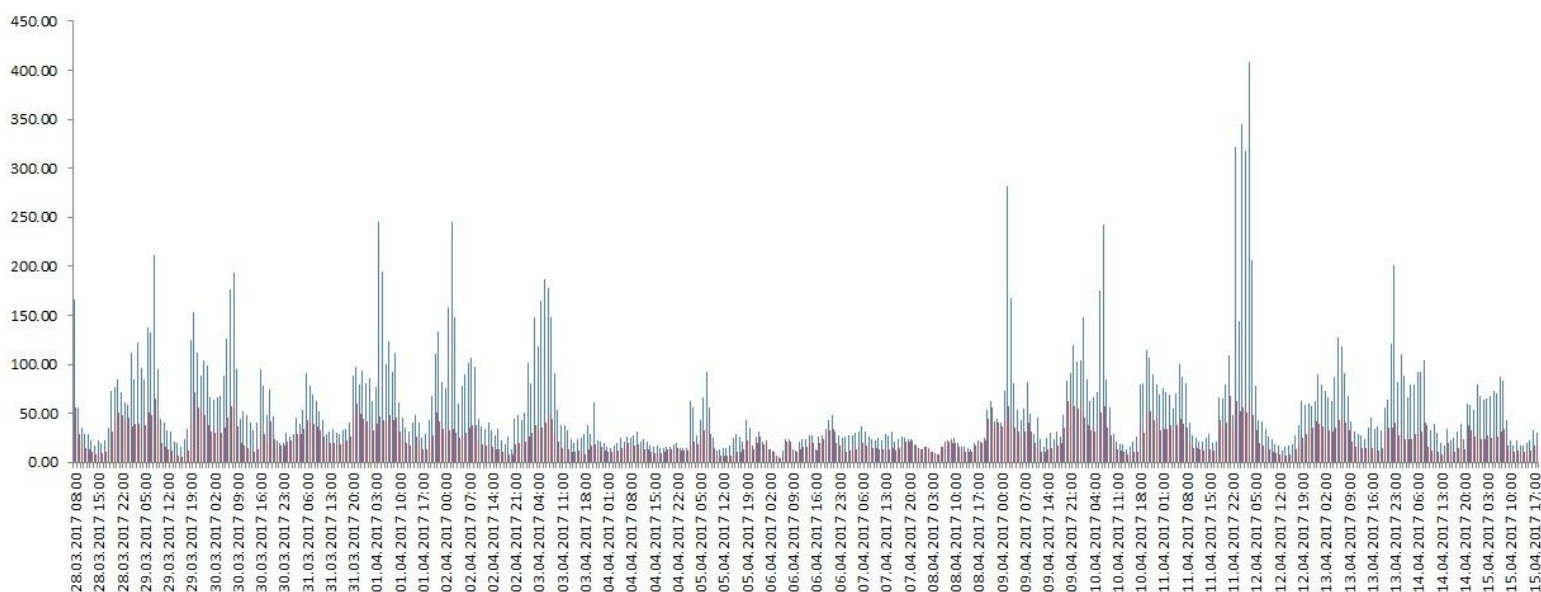


PM 10 levels in Pernik, 24h averages



PM 2.5 levels in Pernik, 24h averages

The graph of hourly measurements shows high PM 10 peaks, with the highest recorded on April 12, at 3AM, with 409 micrograms per cubic metre. The graph also illustrates big discrepancies between the levels recorded during daytime and night-time, which may point to the dust filters of the nearby power plant not functioning properly or at all. The trend over the observed period shows an increase in PM 10 levels every day after 7PM, lasting until 8AM the following morning. PM 2.5 levels spiked on a number of occasions and are on average above the EU annual limit more often than not.

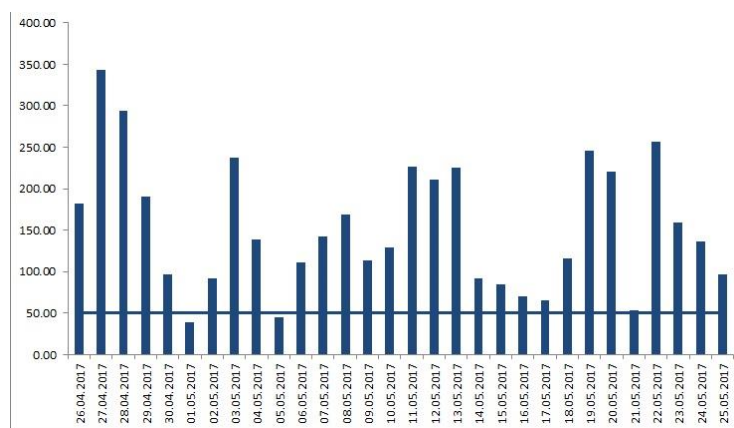


PM 10 and PM 2.5 levels in Pernik at different times of day. The thin vertical bars represent hourly mean values for PM 10 (blue) and PM 2.5 (red).

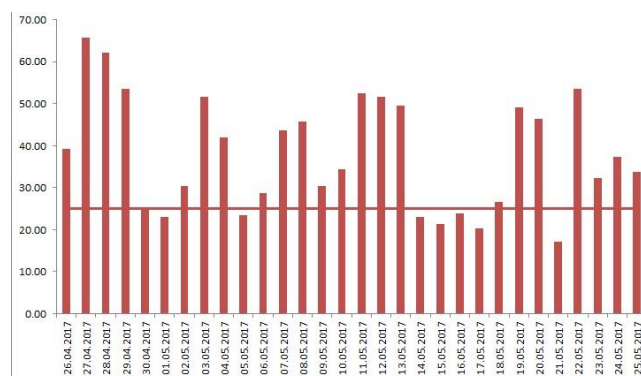
Rogojel, Romania

Monitoring period: April 26th – May 25th, 2017

Over the 30 days of monitoring PM 10 and PM 2.5 emissions in Rogojel, it was only on two days that the EU limit on PM 10 was not exceeded. In other words, for over 93 percent of the time, the PM 10 concentration was above the limit, while on nine of the days monitored, the measured PM 10 stayed four times above the regulated 24-hour average. The EU limit on PM 2.5 was exceeded on 23 of the 30 days of monitoring.



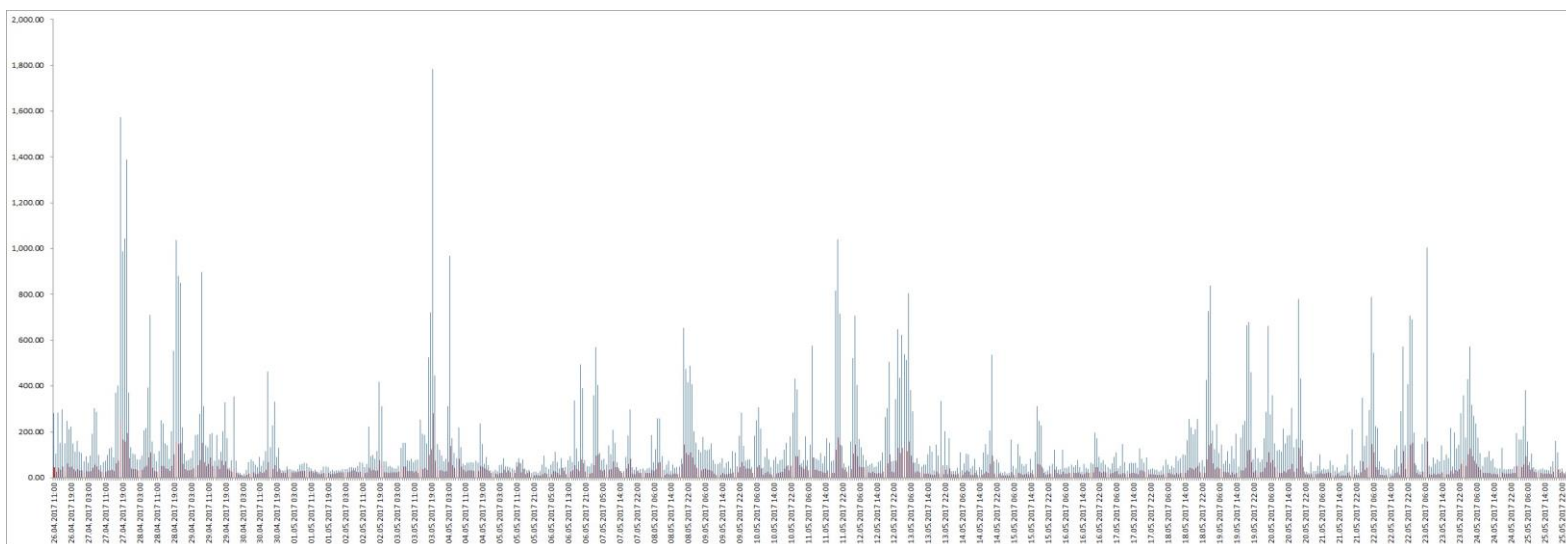
PM 10 levels in Rogojel, 24h averages



PM 2.5 levels in Rogojel, 24h averages

Very distinctively from the previous locations, the graph of hourly measurements shows a large difference between the PM 10 concentrations, and the PM 2.5 ones. In other locations, PM 2.5 represented approximately 75% – 80% of the PM 10 emissions, while in Rogojel this is clearly not the case. The high levels of coarse particles, PM 10, are indicative of its primary sources: the coal mine, the coal deposit, open conveyor belts and unpaved road to the mine. PM 2.5 emissions are linked with combustion processes, that is why it is always important to measure them in places where there are operating coal power plants.

There are several PM 10 peaks, with the highest recorded on May 2, at 10PM local time, with 1783 micrograms per cubic metre. There are seven hours during the observation period, in which the PM 10 concentration has been above 1000 $\mu\text{g}/\text{m}^3$, that is 20 times above the EU limit. The graph also illustrates a pattern when the PM 10 levels peak the most: either around 8AM local time, when work starts at the nearby lignite mine, or around 1PM, when the shifts change. Even though PM 2.5 levels fade in comparison to the PM 10 ones, they have had peaks over 100 $\mu\text{g}/\text{m}^3$ on 43 instances.



PM 10 and PM 2.5 levels in Rogojel at different times of day. The thin vertical bars represent hourly mean values for PM 10 and PM 2.5

Conclusions

Industry, power plants, open-cast mining, transport, agriculture, households and waste management all contribute to Europe's air pollution. Emissions of the main air pollutants in Europe have declined in recent decades, resulting in generally improved air quality across the region. The latest air quality report by the European Environmental Agency indicates⁸ that air-quality policies in the European Union have delivered, and continue to deliver, many improvements. Reduced emissions have improved air quality in Europe, and, for a number of pollutants, exceedances of European standards are rare. However, certain sectors have not reduced their emissions enough to meet air-quality standards or have even increased emissions of some pollutants.

Our independent measurements in coal-heavy locations show how emissions of PM 2.5 are nowhere near the EU's recommended limit and that very high PM 10 concentrations are present in open-cast mining areas.

Our tour of the Balkan countries found that PM 2.5 is not monitored by the official monitoring stations, while PM 10 real-time data is only available in two of the selected locations, namely in Pljevlja, Montenegro, and in Bitola, Macedonia. The village of Drmno, in Serbia, does not have an official air monitoring station, even though it is a large source of particulate matter pollution for the region. Yet, the first step in tackling air pollution should be comprehensive monitoring and establishing of the baseline levels, as well as identifying the main sources.

The paradox of air pollution is that while its sources are easy to identify and locate, exposure to pollution, and particularly to fine dust particles, is not a location-specific problem. Pollutants travel for hundreds of kilometres and affect neighbouring communities and countries as well.

Although European air quality is projected to improve in the future with full implementation of existing legislation in the EU, further efforts to reduce emissions of air pollutants are necessary in the EU's immediate

neighbours in the Western Balkans, to attain compliance with the EU air-quality standards set for the protection of human health and the environment.

When it comes specifically to coal pollution, the cross-border impact of it, be it health or climate, shows why all citizens in Europe and beyond have a shared interest in putting an end to its use, irrespective of where the plant operates. As an example, while exporting pollution associated with 2,500 premature deaths, Germany is at the same time the biggest recipient of coal pollution from abroad, linked to 1,700 early deaths⁹.

Across the board, the local communities we have visited while performing the independent PM measurements all voiced their resettlement as a short-term solution to protect their health. In the medium term, however, they all agree that centrally enforced measures to reduce pollution and tailor made emergency action plans for each location are the way forward. A long term vision would prioritise decarbonised energy generation sectors across the region, putting energy efficiency first, cleaner/alternative fuels for all modes of transportation, and strict enforcement of air quality standards.



REK Bitola power plant, seen from Novaci village, MK

⁸ <https://www.eea.europa.eu/publications/air-quality-in-europe-2016>

⁹ http://env-health.org/IMG/pdf/dark_cloud-full_report_final.pdf, page 16

Recommendations

- **The European Commission** should table a proposal for the adoption of the Air Quality Directive, adapted for network energy, in the Energy Community as soon as practicably possible.
- **The Energy Community** is recommended to adopt and implement this legislation promptly after a proposal is presented by the Commission, in order to avoid further worsening of the air pollution and its deadly impacts on health.
- **The national authorities** in the Energy Community countries are recommended to thoroughly monitor air pollution levels in locations prone to high emissions because of coal mining and combustion activity and to make this data available to the public.
- **The national authorities** would have to design a long term vision would prioritise decarbonised energy generation sectors across the region, putting energy efficiency first, cleaner/alternative fuels for all modes of transportation, and strict enforcement of air quality standards.
- **Environmental authorities** in both the Western Balkan countries, as well as those in Bulgaria and Romania should ensure PM 2.5 monitoring equipment on existing official monitoring stations and should make the measurements available in real-time.
- **Environmental and local authorities** are recommended to draw up/ revise and implement local action plans on air pollution, addressing the local main sources of pollution and set up emergency measures for periods of time when the allowed levels of emissions go beyond the EU limit for 24-hour average.



Protest against air pollution in Pljevlja, Montenegro, December 2015