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MEASURES FOR FUTURE ENVIRONMENTAL PROTECTION: MONITORING PM10 DUST PARTICLES AND COMPOUNDS – A CASE STUDY OF THE SALONIT ANHOVO CEMENT PLANT

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Abstract The paper deals with the view of environmental legislation regarding ambient air quality. We are faced with different views from the legal, medical and chemical professions on the environmental and health impacts that cement-co-incinerators could have. The emission monitoring of the cement plant must be in accordance with existing legislation and regulations. The co-incineration of waste used as a secondary fuel requires that the cement kiln operates in accordance with "best available technology, BAT" and that it must not exceed the permitted emission values. In addition to the emission monitoring from the cement plant or incinerator, the monitoring of ambient air emissions should also be well established, as it indicates the ambient air quality. The emission concentrations of various pollutants found in the air or on dust particles with a diameter below 10 μm and 2.5 μm (PM10 and PM2.5) are significant. Knowledge about the detailed chemical composition of respiratory dust particles is essential in determining health impacts, as the organism's biological response to aerosols is not always related to the most abundant compounds, but rather to the toxicologically significant ones present in trace amounts.

Keywords
air pollution, dust particles, cement plant, emission monitoring, environmental protection

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1 Introduction

Monitoring air quality is essential to ensure healthy living in a more or less polluted environment. However, decentralised monitoring solutions still suffer from several limitations. On the other hand, polluters usually try to downplay the impact of their activities on the environment. Our attention should be drawn to the nonchalant response of the legal department of the particular cement plant to the statement of a concerned resident living nearby that: "300,000 cubic meters of emissions loaded with poisons will be released" from the plant. The plant's lawyer criticised the negative connotation of the resident's assertions, stressing that all emissions values are within the normal limits. Although there are various substances in the emissions, all of them are below the prescribed limit values allowed by legislation and can reasonably be considered to have no negative effects on health." It is about divergence. The local resident refers to the "emission" values of pollutants in the air he breathes, while the lawyer refers to the "emission" values of pollutants in the emissions of the factory, which are measured and all fall below the prescribed limit values. This shows how contradictory the positions are and how different the views are between civil society, the medical profession, and the legal positions of the particular cement plant:

The thesis of civil society and healthcare: "Large quantities of hazardous substances released from the cement plant and especially from the co-incineration of waste in central Soča Valley affect the health of the already affected population, which can only have even greater adverse effects on their health."[1]

In this regard, it must be pointed out that "The ultimate effect of air pollution[2] on public health is to bring about premature death" (Kelly & Fussell, 2015, p. 633). Moreover, "other than the well-documented effects on respiratory and cardiovascular health, an increasing number of studies have investigated the

[1] EKO Anhovo, the Soča Valley Society and the Medical Chamber of Slovenia, public message. Retrieved from https://www.zdravniskazbornica.si/docs/default-source/tedenski-bilten-fs/557-bilten_eko-anhovo---zdravstvena-in-okoljska-problematika-v-sredni-so%C5%A1ki-dolini.pdf?sfvrsn=224f3036_2 (September 23, 2024).

[2] Air pollution can be defined as the 'introduction by man, directly or indirectly, of substances or energy into the air resulting in deleterious effects of such a nature as to endanger human health, harm living resources and ecosystems and material property and impair or interfere with amenities and other legitimate uses of the environment. See: Convention on Long-Range Transboundary Air Pollution (adopted 13 November 1979, entered into force 16 March 1983) 1302 UNTS 217 (CLRTAP), Article 1(a).

potential of PM air pollution to negatively influence several new health outcomes" (Kelly & Fussell, 2015, p. 635). Thus, it has been consistently evidenced that "a reduction in the level of particulate pollution following a sustained intervention (mainly regulatory actions) is associated with improvements in public health" (Kelly & Fussell, 2015, p. 635).

The anti-thesis of the cement plant: "Investments in state-of-the-art technologies and the responsibility of all employees ensure that the cement plant is among the smaller sources that contribute to air pollution in the Kanal ob Soči municipality. The air composition in Kanal ob Soči is comparable to the air in Bohinj and Bovec. Out of 30 measuring stations in Slovenia, only two report better air quality than the one around Salonit Anhovo. There is not a single piece of data that would indicate reasons for concern. We live in a quality environment."[3]

With such conflicting points of view, the question arises: When and at what point will medicine, law, and society meet and coordinate for the common good?

2 Ambient Air Quality

The Slovenian Environment Agency (ARSO), therefore, on the initiative of the "Danes" Civil Initiative, the EKO Anhovo and Soča Valley Society and the Kanal ob Soči Municipality, carried out extensive measurements of the ambient air quality in Deskle from mid-December 2020 to mid-January 2022. The purpose of the measurements was to check the quality of the ambient air to which the residents are exposed, as residents suspect they are subjected to excessively polluted air due to emissions from the Salonit Anhovo cement plant.

Findings of the study on air quality measurements: In Deskle in 2021, there were no exceedances of limit values for pollutants based on real-time data availability. One-year air quality measurements in Deskle, except for elevated ozone levels in the summer period and the achieved target value for benzo(a)pyrene, did not indicate excessive air pollution with pollutants according to ambient air quality standards. The ARSO also stated that based on the presented results, the influence of Salonit

[3] Naš list, no. 31, p. 3. Retrieved from https://issuu.com/salonitanhovo/docs/nas_list_31_v3?utm_medium=referral&utm_source=alpacem.si (September 19, 2024).

Anhovo cannot be ruled out and that the origin of the dust particles is not clear. Therefore, in the study, they concluded that the one-year air quality measurements in Deskle did not show excessive outdoor air pollution in relation to the outdoor air quality standards.[4] This does not mean that there are no releases of substances harmful to health from the nearby industrial plant. Emissions from industrial plants may contain pollutants that are not covered by legislation and for which there are no prescribed values. They also suggest checking the latest European standards for emission limit values and technologies. In the case of stricter requirements, Slovenian legislation should be harmonised with them, amended accordingly, and an independent method for monitoring the operation of industrial facilities and ensuring compliance with the requirements of the environmental protection permit should be established.[5]

"International law on (transboundary) air pollution is heavily fragmented" (Yamineva & Romppanen, 2017, p. 191), with transboundary air pollution being addressed in a number of different documents of different legal powers. "The fragmented state of international law on air pollution results in significant gaps in geographical coverage, regulated activities, regulated substances and, most importantly, applicable principles and rules" (Yamineva & Romppanen, 2017, p. 191). The EU's air policy is in line with the applicable international instruments and conventions. The policy aims to implement international obligations in the field of air pollution and integrate these requirements into policies for sectors including industry, energy, transport, and agriculture. Overall, the EU's air policy is a well-established and coherent environmental policy area. EU air policy and law have undergone significant revision in recent years, resulting in decreased emissions of anthropogenic air pollutants and measurable improvements in air quality" (Yamineva & Romppannen, 2017, p. 195). In the Republic of Slovenia, air quality is regulated by the Environmental Protection Act (Zakon o varstvu okolja),[6] as well as the Regulation on the assessment of ambient air quality (Pravilnik o ocenjevanju kakovosti zunanjega zraka).[7] The Environmental Protection Act's rules on air quality are linked with, *inter alia*, waste disposal (Article 22), environmental impact

[4] Agencija Republike Slovenije za okolje, Poročilo o meritvah kakovosti zraka v Desklah v občini Kanal ob Soči v letu 2021. Retrieved from https://www.gov.si/assets/organi-v sestavi/ARSO/PR/Porocilo_Deskle_2021.pdf (March 12, 2024).
[5] See also Vončina, 2021, p. 744–752.
[6] Zakon o varstvu okolja (ZVO-2 - Uradni list RS, št. 44/22, 18/23 – ZDU-10, 78/23 – ZUNPEOVE, 23/24.
[7] Pravilnik o ocenjevanju kakovosti zunanjega zraka (Uradni list RS, št. 55/11, 6/15, 5/17, 44/22 – ZVO-2).

assessments (Article 89), environmental quality monitoring (Article 146), the responsibility for preventing and remedying environmental damage (Article 161), and emissions trading schemes. Moreover, the Regulation on the assessment of ambient air quality contains provisions on the methods and criteria for assessing ambient air; obtaining air quality data to support the reduction of air pollution and nuisance effects, and monitoring long-term trends and improvements due to measures at the local and national levels, as well as European Union measures; and the method of regularly informing the public about air quality (Article 1).

The current generally prescribed set of measurements of air quality parameters cannot exclude the influence of individual pollutants and cannot be the only criterion for the assessment of ambient air quality. In the design of the study of the air in Deskle, it was not planned to measure a single parameter or compound that could be considered to have its origin in the spread of flue gases from cement plant emissions, only generally prescribed emission parameters were measured. The set of investigations should also be extended to determine marker compounds, in this case, a cement plant or an incinerator; although their concentrations in the air are not yet legally regulated, they can pose a health hazard. Of course, they need to be recognised, defined, and measured, which has not been done so far. National legislation should provide at least initial research in the field of emissions and ambient air quality. In this way, the national legislation would be a credible interlocutor to the arguments of the cement plant or future incinerators, as well as to the arguments of civil society. The expectation that the cement plant itself will research and inform the public outside of the legally prescribed protocol for controlling its emissions is illusory. Cement plant Salonit Anhovo, now known as Alpacem Cement Plant Slovenia, addresses the following question on its website: What is the health risk of environmental impacts? "Environmental legislation considers that the emission of substances into the environment is acceptable for health and the environment, as determined by the limit values for individual substances. This means that emissions that are below the limit values are acceptable. At Salonit Anhovo, we have achieved that our emissions are far below the limit values through technological updates and adaptation to the best available techniques. The second criterion regarding the impact on health is the emission measurements (ambient air quality), which we also monitor in cooperation with the Slovenian Environment Agency and the National Institute of Chemistry. Concentrations of particles in the air (PM10) have been decreasing over the years; other measurements

(benzene, NO_2, dioxins and furans, organic substances) also showed very low concentrations and are significantly below the limit values.[8]

2.1 Cement Plant Emissions

The cement plant in the Soča Valley is otherwise fully compliant with the legislation of the Republic of Slovenia and, of course, the European Union. It is one of the best in Europe. But is it sufficient for chimney emissions to comply with regulations while we know so little about the air we actually breathe? The medical profession should have data on the content of compounds in the air, both for those that are legally regulated as well as for those that are not yet regulated and may be dangerous to human health. Dust particles are harmful and measuring only the mass concentration of dusty PM10 particles in the ambient air (immission) is not sufficient. Curiosity and thus the question of what constitutes dust particles and what represents a danger to human health and the environment should be allowed.

The emission monitoring of the cement plant must be in accordance with existing legislation and regulations. The co-incineration of waste used as a secondary fuel requires that the cement kiln operates in accordance with the "best available technology, BAT" and that it must not exceed the permitted emission values for ten parameters, which are: total dust, nitrogen oxides, sulfur dioxide, hydrochloric acid, hydrofluoric acid, a sum of metals Sb+As+Pb+Cr+Co+Mn+Ni+V, a sum of Cd+Tl, mercury (Hg), polychlorinated dibenzodioxins and dibenzofurans and ammonia. The cement plant is one of the best in achieving all these emission values and operates in accordance with the prescribed limit values.

As for cement plant emissions and operational monitoring, the question is whether to use the upper or lower limits of achievable BAT-AEL emission levels. Member States can decide for themselves whether to use the upper or lower BAT-AEL limits when issuing permits for industrial activities. The competent authority may set an emission limit value anywhere within this range (or even below the minimum) but may not set a limit value that is above the range. The risks are calculated, but the

[8] Miuc, A. et al.: Composition of Organic Compounds Adsorbed on PM10 in the air above Maribor, Acta Chim. Slov. 2015, 62, 834–848.

question is whether all possible dangers have been assessed reliably. This is an ethical issue because, on the one hand, it is desirable to protect society from hazards, but on the other hand, banning technology outright may also be undesirable. Much of the ethical debate on this issue should focus on the precautionary principle. National emission standards, expressed as numerical values, only reflect the available control technology (BAT) and practical requirements to limit air pollution by hazardous substances, be it for cement plants, waste incinerators or other thermal technologies, which is not enough. The lack of data must not lead to overlooking a pollution source category that could pose a significant risk.

ARSO is a body within the Ministry of Natural Resources and Spatial Planning of the Republic of Slovenia. The ARSO's duties are also to ensure monitoring of the state of soil, water, and air, as well as perform state tasks related to operational monitoring, except for monitoring for the purpose of reducing the risk to the environment. ARSO should therefore monitor the state of all elements in our environment. Quality data serves as the basis for analysing the situation, which, in turn, forms the foundation for information and potential action. With the help of analysis and evaluation of this data, they prepare assessments of the problem, issue various warnings and inform the competent services (environmental inspection, agricultural inspection, health inspection, National Institute of Public Health) and also have the power to prescribe stricter measures in operational monitoring and define a more appropriate set of monitored measuring parameters. This approach does not solely focus on operational emissions monitoring but equally ensures the adequate protection of residents through detailed and appropriate emission monitoring of the environmental impacts of a cement plant or incinerator. Measurements of the concentrations of various substances in the air are the most reliable indicator of the state of ambient air quality in a certain area. The Slovenian Environment Agency, as a part of the national network, carries out emission measurements of the ambient air quality at various measuring points throughout Slovenia.

2.1.1 Compounds on PM10 Dust Particles in the Air Near the Cement Plant

"Particulate matter (PM) pollution includes particles with diameters of 10 micrometres (μm) or smaller, called PM10, and extremely fine particles with diameters that are generally 2.5 micrometres (μm) and smaller. Particles <10 μm in

diameter (PM10) after inhalation can invade the lungs and even reach the bloodstream" (Manisalidis et al., 2020, p. 5). Ahead, "it is worth noting that people with asthma, pneumonia, diabetes, and respiratory and cardiovascular diseases are especially susceptible and vulnerable to the effects of PM" (Manisalidis et al., 2020, p. 5). The harm of environmental pollution is not limited to human health but extends to the environment as well, with its most important environmental effects being, inter alia, acid rain, haze, ozone, global climate change, burdened wildlife and eutrophication (Manisalidis et al., 2020, p. 5-6).[9]

Emissions from the cement plant have a direct impact on the air quality in the immediate vicinity and, thus, on the emission concentrations of various pollutants found in the air or on dust particles with a diameter of less than 10 μm and less than 2.5 μm (PM10 and PM2.5). Determining the mass concentration of dust particles means they are treated as "equally toxic" regardless of their origin or chemical composition. Of course, air dust particles vary according to their chemical composition, their solubility and reactivity, mass, size, number, shape, and surface, depending on their origin and atmospheric transformations. All these properties can have an impact on health.

There are two measuring points in the vicinity of the cement plant, the measuring stations Gorenje Polje and Morsko. Stationary measuring points, owned and operated by Salonit Anhovo, were selected and included in the national measuring network based on computer simulations, rather than by measuring the actual compounds released by the cement plant into the environment. These points were positioned to cover the immissions in the area influenced by the cement plant, according to varying wind conditions as indicated by the "wind rose". For many years, they have been regularly submitting the data to ARSO monthly. The respirable PM10 dust particles at these measuring points are usually between 10-20 $\mu g/m^3$. Average annual values are among the lowest in Slovenia. With moderate wind, the measuring point detects the effects of the cement plant only on the windward side.

Only with simultaneous measurements at both measuring points, considering the wind conditions (Gorenje Polje and Morsko), can we properly trace the emission effects of the cement plant on the air in the nearby environment. We can ask

[9] For more on the legal framework regarding air pollution by PM 10 particles see Sancin et al. (eds.), 2014.

ourselves what the contribution of the emissions of the nearby cement plant is to this result and how we can distinguish between the influences of the wider urban and industrialised hinterland, such as the air masses over the Po Valley and the influence of the Anhovo cement-co-incineration plant. Knowledge about the detailed chemical composition of dust particles is essential in determining health impacts, as the organism's biological response to aerosols is not always related to the most abundant compounds, but rather to the toxicologically significant ones present in trace amounts. After the gravimetric determination of PM10 dust particles in the air, it would also be necessary to determine the chemical composition of organic compounds adsorbed on the dust particles and to find those that, by their origin, belong to the emissions of the cement plant and whose releases pose a certain risk to the environment and human health. We live in a time when analytical chemistry has reached such a level of development that the determination of regulated compounds and, of course, also unregulated compounds in the air is completely within the domain of routine, standardised laboratory work, and therefore there is no excuse for intentional or unintentional ignorance of the type of air we breathe.

What can be determined from the results of such an investigation, and can we hold accountable the person responsible for the measurements in the extended immission plan near the cement plant? Of course, this cannot be just a cement plant itself, but it is better to find a truly independent laboratory service that works for the good of people and is independent of the interests of capital.

Most of the detected organic compounds can be attributed to the pollution of the urban atmosphere, and the direct effects of the cement factory are shown by the presence of organic compounds with nitrogen. These compounds form during the thermal processes of the decomposition of urea to ammonia in the hot gases of the cement kiln as by-products during the reduction of nitrogen oxides (NOx). Additionally, the occurrence of ammonia emissions is primarily due to this fact. The inorganic part of detected aerosol compounds belongs to ammonium salts of sulfamic, sulfuric, phosphoric and vanadium acids. The problem is that ammonium salts are soluble in water, greatly increasing their bioavailability. The most problematic compounds are sulfamic acid and the presence of a soluble form of vanadium, as transition metals with their catalytic action can cause the formation of highly reactive oxidising compounds that are harmful to health.

Selective Non-Catalytic Reduction (SNCR) is a technology used in cement kilns to reduce NOx emissions by injecting ammonia or urea-based reagents into the combustion process. Ammonia (NH_3) emissions are comparable to nitrogen oxide (NOx) emissions. Ammonia emissions can pose a serious threat to air quality, given the critical role of ammonia in the formation of a secondary particulate matter, which readily reacts in the atmosphere to form secondary aerosols such as ammonium nitrate and ammonium sulphate, increasing PM2.5 levels. From the review of the literature[4], it can be seen that the amount of injected ammonia for the SNCR process for different cement plants is from 3 to 7 kg/t of clinker, depending on how technologically efficient the cement plants are, the average value being 4 kg/t clinker. The released ammonia emission concentration ranged from 4 to 173 mg/Nm^3. The average value was 35 mg/Nm^3. Another attempt at a hypothetical, theoretical calculation: in the Salonit cement plant, with an annual production of one million tons of clinker per year and an average amount of injected ammonia of 4 kg/t of clinker, 4,000 tons of ammonia per year go into the rotary kiln, and in the form of urea, this figure is correspondingly higher.

It is unrealistic to expect a 100% reduction of all nitrogen oxides, or that no side reactions occur in the furnace. These side reactions can lead to traces of organic compounds containing nitrogen, which are detected on PM10 dust particles, or to the incomplete reduction of NOx, resulting in the formation of dinitrogen oxide (N2O), a prominent greenhouse gas. As this technology is used in cement plants, it is necessary to evaluate the N_2O emissions from the cement industry. The emission from this industrial sector is not negligible, so the concentration of N_2O must be regulated. The process of reducing nitrogen oxides (NOx) with urea is practically the only significant source of "de novo" generated N_2O emissions in cement plants, municipal waste, and biomass incinerators. Dinitrogen oxide is the third most important greenhouse gas after carbon dioxide and methane, contributing about 6 percentage to the greenhouse effect. It represents a minor component of the atmosphere, with concentrations approximately one-thousandth of those of carbon dioxide (CO_2). Nevertheless, it is a much more potent greenhouse gas than CO_2 and methane. Due to its long persistence in the atmosphere (about 120 years) and high global warming potential, it is 298 times more potent as a greenhouse gas than CO_2. Measurement of N_2O emissions in cement kilns during the SNCR process is essential for assessing the environmental impact and effectiveness of NOx reduction technology. Due to its contribution to climate change, it is important to reduce N_2O

emissions. Under the Environmental Protection Act (ZVO-2), the cement plant is exempt from the requirement to realistically measure emissions of fugitive ammonia and the resulting N_2O, provided these can be calculated. In paragraph (2) of Article 11 (Performance of permanent and occasional measurements of substance emissions) the ZVO-2 states that the measurement of substance emissions does not need to be carried out for dinitrogen oxide (N_2O) and ammonia (NH_3) if it is possible to calculate the annual amount of emissions into the air for an individual device based on data on the formation of these substances during the operation of the device and if the performance of substance emission measurements is not specified in the environmental protection permit issued for this device.

3 Emission Monitoring of Ambient Air

The entire theme will be repeated accordingly in the future installation of "mono-incinerators" for municipal sludge or, in the case of an "incinerator" for the thermal treatment of mixed municipal waste, which is not collected separately. All incinerators will have to operate and be controlled in accordance with the best available technology. Additionally, the detailed chemical composition of respiratory dust particles is important for the toxicological assessment of environmental and health impacts.

Determining the composition of organic compounds can help us determine the various sources of air pollution. Whenever air pollution such as smoke, dust, smog, or stench arising from industrial incidents is visible or detected, organic compound determination analyses should be carried out. Unregulated organic compounds are those not subject to specific air quality standards or regulations. This may be due to a lack of scientific data on their occurrence, health effects or challenges in monitoring and controlling their emissions.

Who must monitor the emission pollution of the outside air due to the emissions of the cement kiln or incinerator? Is it non-governmental organisations, governmental organisations, or perhaps the cement plant itself? The responsibility for monitoring and regulating air emissions in the cement kiln, as well as overseeing the emission and immission parameters of the ambient air quality, falls under the jurisdiction of government agencies. Non-governmental organisations (NGOs), however, can play an essential role in advocating for stricter environmental regulations, raising

awareness of air pollution issues, and influencing government and industry to adopt more sustainable practices. However, government bodies are primarily responsible for monitoring and regulating industrial emissions, including those from cement kilns. Government agencies may include environmental protection agencies, ministries of the environment or local authorities, depending on the country's regulatory framework. Their task is to ensure that emission limit values are observed and that all necessary measures to reduce pollution are regularly monitored, including monitoring organic compounds that have not yet been regulated and studying their effects on air quality and public health. The goal should be to establish a regulatory framework that prioritises public health and environmental protection while allowing cement factories to operate responsibly and sustainably. By setting clear standards and enforcing compliance, society can enjoy the benefits of cement production without compromising the well-being of its citizens and the environment.

At the end of his state visit to Slovenia, David R. Boyd, the United Nations Special Rapporteur for Human Rights and the Environment, wrote in his report on air pollution: "Slovenia should ensure that the volume and toxicity of emissions from cement plants and all industrial pollutants decrease over time, giving priority to known pollution hotspots such as Anhovo."[10]

Co-incineration in cement plants should be subject to the same emission standards as waste incinerators, even if this is not mandatory under EU law."[11] He also wrote that one of the obstacles to the proper implementation of environmental regulations is the inadequate level of state investment in environmental protection. The Slovenian Environment Agency also lacks adequate human and financial resources to effectively monitor industrial pollution, which can affect the quality of air, water, and soil. Already in 2016, the Ombudsman recommended that the Ministry of Natural Resources and Spatial Planning develop a systemic solution that would

[10] Boyd, D. R. Slovenia: UN expert to assess effects of environmental risks on human rights. Retrieved from: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.ohchr.org/sites/default/files/2022-09/Slovenia-UN-expert-to-assess-effects-environmental-risks-on-human-rights-Slovenian.pdf (September 19, 2024).
[11] United Nations Human Rights Office of the High Commissioner, Slovenia: UN expert to assess effects of environmental risks on human rights. Retrieved from https://www.ohchr.org/en/media-advisories/2022/09/slovenia-un-expert-assess-effects-environmental-risks-human-rights (September 19, 2024).

enable the measurement of air emissions and ensure independent oversight and financing of these measurements.[12]

The Court of Justice of the EU was faced with the question of the member state's liability for violating the requirements of the Ambient Air Quality Directive.[13] The lawsuit was filed by a Parisian who demanded 21 million euros in compensation from the state for the polluted air in Paris. The Court of Justice of the EU responded, stating:

"- that an individual who falls ill because of polluted air cannot demand compensation from the state but must have the right to demand measures from state authorities, the court did not expressly exclude the possibility that states could be held liable based on national regulations.

- European legislation in the field of ambient air quality is not in itself intended to grant rights to individuals, the violation of which would entitle them to compensation, the judges of the EU court decided.
- They emphasised that, nevertheless, citizens must have the opportunity - including by filing lawsuits with the competent authorities - to get the state authorities to take measures to ensure clean air in accordance with this legislation, according to the court's website."[14]

In Slovenia, the issue of pollution of the Soča Valley due to emissions from Salonit Anhovo is ongoing. At a joint meeting on 20 February 2020, the Committee for Infrastructure, Environment and Spatial Affairs and the Committee for Health discussed the issue of pollution of the middle Soča Valley due to the co-incineration of waste in the Salonit Anhovo cement plant. Among others, they also adopted a resolution calling on the Government to prepare a proposal for amendments to the legislation, based on which monitoring of emissions caused by waste incineration or

[12] Varuh človekovih pravic RS, Annual Report of the Human Rights Ombudsman of the Republic of Slovenia 2016, p. 251. Retrieved from https://www.varuh-rs.si/fileadmin/user_upload/pdf/lp/Porocilo_VCP_2016_koncno_za_www.pdf (September 23, 2024).
[13] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe, OJ L 152, 11.6.2008.
[14] Judgment of the Court of Justice of the European Union of 22 December 2022, C-61/21, *JP v. Ministre de la Transition écologique, Premier ministre,* ECLI:EU:C:2022:1015. The request for a preliminary ruling was made in proceedings between JP, on the one hand, and the *Ministre de la Transition écologique* (Minister for Ecological Transition, France) and the *Premier ministre* (Prime Minister, France), on the other, concerning JP's applications seeking, first, the annulment of the implied decision of the Prefect of Val-d'Oise (France) to refuse to take the necessary measures to address his health problems linked to air pollution, and second, compensation from the French Republic for the damages JP attributes to that pollution.

co-incineration plants in the Republic of Slovenia will be carried out. A study was carried out: *Comparative analysis of the normative regulation, implementation, and practice of operational monitoring of air emissions*[5]. The study was commissioned by the Ministry of Natural Resources and Spatial Planning, and it was carried out by the Legal and Information Centre of Non-Governmental Organisations - PIC. The purpose of the analysis was to find examples of good normative regulation, implementation, and practice of operational monitoring of air emissions, which could be transferred to the Slovenian legal order to improve the existing regulation. The comparative analysis covered the regulation in Slovenia and nearby countries or countries that are often used as models: Austria (for the state of Tyrol), Germany (for the state of Bavaria), Hungary and Croatia.[15]

The analysis does not deal with the limit values of individual emissions or emissions for a specific type of industry or the implementation of regulations for these. It focuses on regulating emissions monitoring to report on operations compliant with the Environmental Protection Permit (EPP) and to control emission limits, namely for devices with an EPD according to the Industrial Emissions Directive (IED devices, ex-IPPC devices). In this way, the analysis presents the legal regulation of emission monitoring by individual countries. The comparative study does not go into the issue of immission monitoring, but in its final conclusions it gives recommendations, of which I will mention only a few. Although operational monitoring is a very technical task and is legally located between substantive normative regulations, technical standards, and technological instructions, it is necessary to understand the issues related to the implementation of operational monitoring in the context of the purpose for which it is carried out, i.e., the protection of a healthy living environment and maintaining its good condition. If all participants follow this purpose, the regulations are implemented in the spirit of it, trust and transparency are established, which are key factors in relation to the issues presented in the introduction. Arrangements for operational monitoring in different countries are comparable. Everywhere, operational monitoring is the responsibility of the device operator, and accredited or authorised measurement providers generally perform the measurements themselves. They also calibrate and test built-

[15] Pravno-informacijski center nevladnih organizacij – PIC, Pravni center za varstvo človekovih pravic in okolja, Primerjalna analiza normativne ureditve, izvajanja in prakse obratovalnega monitoringa emisij v zrak. Retrieved from https://www.gov.si/assets/ministrstva/MOPE/Okolje/Industrijsko_oneznazevanje/obratovalni_monitorint_emisij_primerjalna_analiza.pdf (March 12, 2024).

in devices to perform continuous measurements. The conditions for operational monitoring are determined in national regulations and BAT conclusions and are determined in detail for individual operators in the Environmental Permit (EP). Thus, the operator ensures that they monitor their own emissions, usually with external contractors, and are responsible for keeping them within the limits set by the EP - this is "self-monitoring", because the operator is responsible for it. In no case is this carried out by the state.

In order to improve air quality control measures by the state, according to the existing normative regulation, the state could, in connection with the measurement of immissions at "critical" points near the devices, place a mobile measuring device if necessary and monitor the state of the air breathed by the surrounding residents; based on this, it can take action if it finds that excessive pollution is the result of the operation of a particular device.

According to Article 150 of ZVO-2, monitoring also includes "monitoring of the state of the environment, if the operator directly causes a change in the state of the environment with its emissions (that is, it is monitoring that is the duty, burden and expense of the operator). Therefore, ARSO may also instruct the operator to place measuring points outside (only) smoke devices, in order to monitor how its operation affects the state of the environment. In the Regulation on the emission of substances into the air from stationary sources of devices from 2007, in paragraph 3 of Article 7, it was determined that the evaluation area and measuring points in this area are also determined in the EP in relation to the pollution of the ambient air due to the emission of substances from the device, on which the existing, additional, and total load must be evaluated. This presupposed the installation of measuring devices for monitoring even outside the device itself since the influence of the device extends beyond it. Accordingly, the 2007 Rulebook on Ambient Air Quality Monitoring (Article 17) was updated. The stated provisions are no longer valid. The proposal is to renew these provisions.

In 2021, the WHO updated the annual PM2.5 average air quality guideline to 5 $\mu g/m^3$ in response to the increasing quality and quantity of evidence on the effects of air pollution. This value represents "clean air", as few impacts have been observed below these levels.

4 New Developments

The cement plant in question was also the reason for the proposed change of Slovenian legislation, as it is not only a plant for the production of cement but also an incinerator. The draft of the Environmental Protection Act 2a equates waste incineration and waste co-incineration in industrial furnaces at the system level. The equalisation of standards at the system level is necessary because, according to the proponent, it eliminates discrimination and inconsistencies for the citizens living next to such plants. The current regulation allows co-incineration plants, which also include cement plants, to exert a significantly greater burden on the environment than is allowed for official specialised waste incinerators. Additionally, there is an important difference between the two in the way measurements are carried out.[16] For incinerators, half-hourly emission limit values are prescribed, which means that waste incinerators must ensure the prescribed emission limit values every half hour. For co-incineration plants, only daily average limit values are prescribed, i.e. 24-hour averages, meaning co-incineration plants can emit considerably larger quantities or emissions of harmful substances during the day. In this case, it is only important that the emissions during the day are reduced for some time in such a way that the daily average is evened out and thus ensures compliance with the regulations. In addition, cement plants are also characterised by very large flows of waste flue gases, which means that residents who live near such plants are exposed to even greater burdens than those living near waste incinerators. Among other things, the draft law also introduces a provision requiring the same operational monitoring at all major emission points as at the main outlet. According to the proponent, under the current regulation, a large number of emissions from industrial facilities are uncontrolled, and the public is not even aware of them. Salonita Anhovo's example is cited in the legislative material, stating that the facility has 49 different emitters for waste substances, yet permanent measurements are provided only on the main chimney or one outlet. The draft law introduces an increase in the frequency of reporting on operational monitoring from annual to monthly, which is necessary from the point of view of adequate control and transparency of pollution operations.[17]

[16] Compare Yangyang, 2020, p. 1738-1742.
[17] Report of the Committee for Infrastructure, Environment and Space of the National Assembly of Slovenia to the Draft of the Environmental Protection Act 2a, EPA 1056-IX, Official No. 801-01/23-10, January 1 2024).

5 Conclusion

The intention of the above-mentioned amendment to ZVO-2 is not to increase the permitted emission values for cement factories but to equalise the limits for both basic activities and co-incineration. However, the shift in the field of measurement is obvious, and the work is not yet complete. The problem remains that only substances specified for measurement are monitored, leaving many toxic substances unmeasured. Therefore, chemists, doctors, lawyers and society still have significant work ahead. Analytical chemistry has advanced to the point where determining both regulated and unregulated compounds in the air is entirely within the domain of routine, standardised laboratory work. Therefore, there is no excuse for intentional or unintentional ignorance of the air we breathe. There is no life without a healthy environment.

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Povzetek v slovenskem jeziku

Članek obravnava pogled na okoljsko zakonodajo v zvezi s kakovostjo zraka, ki ga dihamo. Srečujemo se z različnimi pogledi pravne, medicinske in kemijske stroke na okoljske in zdravstvene vplive, ki bi jih lahko imele cementne sosežigalnice. Spremljanje emisij pri cementarni mora biti v skladu z obstoječo zakonodajo in predpisi. Pri sosežigu odpadkov, ki se uporabljajo kot sekundarno gorivo, mora cementna peč delovati v skladu "z najboljšo razpoložljivo tehnologijo, BAT" in ne sme presegati dovoljenih vrednosti emisij. Poleg spremljanja emisij v cementarni ali sežigalnici mora biti dobro vzpostavljeno tudi spremljanje emisij v zunanjem zraku, kar kaže na kakovost zraka, ki ga dihamo. Pomembne so emisijske koncentracije različnih onesnaževal, ki se nahajajo v zraku ali na prašnih delcih s premerom pod 10 μm in manj kot 2,5 μm (PM10 in PM2,5). Poznavanje podrobne kemične sestave prašnih delcev v dihalih je bistvenega pomena pri določanju vplivov na zdravje, saj biološki odziv organizma na aerosole ni vedno povezan z najbolj razširjenimi spojinami, temveč s tistimi, ki so toksikološko pomembne in prisotne v sledovih.