Event Report

EPPA

Regional Workshop on Ambient Air Quality Directive

Current status, new developments

24 – 25 September 2019, Podgorica, Montenegro

This Project is funded
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The project implemented by the Consortium of NIRAS (lead)
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TABLE OF CONTENTS

ANNEXES

Annex 1: Agenda (provided as a separate document)
Annex 2: List of Participants (provided as a separate document)
Annex 3: CSO involvement in air quality
Annex 4: "Air quality issues in Montenegro: from CSO perspective"- Green Home (Montenegro)

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1 Introduction

The regional workshop

The regional workshop on the *Ambient Air Quality Directive - Current status, new developments* took place on 24 – 25 September 2019, in Podgorica, Montenegro. The workshop was organized in cooperation with TAIEX, and under the EPPA project work programme, activity 4.1 "Air Quality Directive capacity building".

The participants of the workshop came from the relevant authorities of the EPPA beneficiary countries. They represented the beneficiaries' hydrometeorological institutes, environmental protection agencies, ministries of environment (departments/units for air quality), and laboratories dealing with air quality. Civil society was also represented by the NGO Green Home from Montenegro. More details are available in the list of participants (Annex 2).

The presentations will be available at both the TAIEX website[1] and the EPPA project website.

Seeking to both pass knowledge and experience from EU Member States and the EU in general, the speakers chosen brought forward their countries' approach to the AAQD, namely Austria, Croatia, Finland, and Poland. In addition, there were speakers from EU bodies, the European Environmental Agency (EEA) and the Joint Research Centre of the European Commission (JRC), who contributed with the latest state of play regarding the technicalities of reporting air quality and use of sensors to measure pollutants.

The Ambient Air Quality Directive

The Ambient Air Quality Directive (AAQD, Directive 2008/50/EC, amended by Directive (EU) 2015/1480) regulates ambient air concentrations of air pollutants to protect human health and the environment and covers the following pollutants: sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and other nitrogen oxides (NO_x), particulate matter PM_{10} and $PM_{2.5}$, lead (Pb) in PM_{10}, carbon monoxide (CO), benzene (C_6H_6) and ozone (O_3).

The AAQD stipulates limit values[2] and for some pollutants target values[3]. The limit values have to be complied with throughout the territory. As regards the target values, all necessary measures not entailing disproportionate costs have to be implemented to reach compliance.

The AAQD furthermore includes requirements for the assessment of ambient air quality in the Member States, applying fixed measurements, indicative measurements, objective estimation and modelling. These requirements on measurements include macro- and microscale siting criteria for different types of air quality monitoring stations as well, as requirements for quality assurance and quality control for all of the assessment methods.

According to Article 23 of the AAQD, Member States are required to draw up air quality plans in case of an exceedance of the limit or target values.

The minimum content to be reported in these plans is laid down in Annex XV of the AAQD. Member States have to report specific elements of their programmes to the European Commission. This is done with the help of the e-reporting system established under the Implementing Decision 2011/850/EU. The plans, as well as other information (see in particular Annex XVI of Directive 2008/50/EC) also have to be made available to the public.

In addition to the AAQD, further pollutants (heavy metals, polycyclic aromatic hydrocarbons) are regulated in Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air, the so-called 4th Daughter Directive.

[1] https://webgate.ec.europa.eu/TMSWebRestrict/resources/js/app/#/library/detail/68934

[2] for SO_2, NO_2, NO_x, PM_{10}, $PM_{2.5}$, Pb in PM_{10}, CO, C_6H_6

[3] for O_3, $PM_{2.5}$; 4th Daughter Directive pollutants: arsenic, cadmium, nickel and polycyclic aromatic hydrocarbons

2 Objectives of the training and expected results

The aim of the workshop was to strengthen national capacities of the beneficiaries of the Environment Partnership Programme for Accession (EPPA) to effectively address the large number of implementation challenges regarding the Ambient Air Quality Directive.

In particular, the workshop sought to provide an overview of the elements of the directive: Air Quality (AQ) assessment, AQ management, AQ plans, information and reporting. The technical expositions were complemented with examples of EU best practices on national, regional and local air quality modelling processes, as well as AQ measures at these different governance levels and the key sources/sectors of air pollution. Finally, the workshop also allowed the beneficiaries to share experiences on their current implementation levels, existing capacities, challenges, and plans for the full transposition and implementation of the directive.

The expected results were 1) increased knowledge of the AAQD and its implementation, resulting in better administrative capacities to continue the alignment process in this sector of the acquis, and 2) the reinforcement of cooperation between the beneficiaries in tackling air pollution.

3 Highlights from the workshop

3.1 Welcoming remarks and introduction to the workshop

The workshop was opened by a representative of Montenegro, as the host country. The speaker welcomed the participants and established the relevance of the topic for the beneficiaries. The Western Balkans have noticeable problems with air quality, especially during winter, when the prevailing meteorological conditions hinder the dispersion of airborne pollutants, especially by domestic heating. Also, in the EU, many Member States are faced with infringement cases related to air quality, which shows the complexity of AQ management. Accession countries face even more challenges to achieve limit values.

Montenegro considers it has done good progress in the sector. The AAQD directive was transposed in 2010 and complemented in 2012 with the relevant bylaws. In 2009 the Environmental Protection Agency began monitoring of air quality. The monitoring station network grew from the original five stations to 10, currently. Montenegro also has an accredited reference laboratory. The territory is divided in three zones. In 2013 the country started implementing air quality plans for its major municipalities and in 2014 it started to report air quality data on-line in nearly real time, which had the positive effect of raising public awareness about air issues. In 2017, the country benefited from an Instrument for Pre-accession Assistance (IPA) project (now in closing phase), that enlarged its monitoring station network and helped revise the air quality zones.

Montenegro's remarks were followed by a contextualization of the workshop within the EPPA project delivered by the Team Leader. He highlighted cooperation with TAIEX, financing and logistically organizing the workshop, with the aim of bringing the EU's experience to the beneficiaries.

The European Delegation to Montenegro was also represented and delivered an introductory note on the importance of managing air quality to ensure public health, with the corresponding EU policy framework in existence. The representative mentioned the major sources of air pollution in the beneficiaries as domestic heating and industry, but she also called to attention that there are data gaps that need to be addressed. The Montenegro IPA project was mentioned as a good example of how the EU is assisting the beneficiaries to improve their monitoring infrastructure and processes.

Finally, the EPPA air quality key expert presented the agenda, the logic behind its structure, and the objectives and expected results of the workshop. He also enumerated the future, planned workshops, and asked participants to freely provide input to the project team in order for activities to be adjusted to the beneficiaries' needs.

3.2 Tour de table on current status of the implementation of the AAQD and the 4th Daughter Directive in the EPPA countries

The beneficiaries were asked to present their status of implementation of the AAQD and to comment on next steps needed.

Albania

Albania has a monitoring network consisting of 5 fixed stations and one mobile station. The Environmental Agency does the monitoring and reporting. The major difficulty is lack of maintenance of the network due to shortage of available funds. Recently, the country adopted a national action plan for air quality providing for one agglomeration and 3 air zones. Budgetary allocation for the plan's implementation still must be done.

Bosnia and Herzegovina

There are two responsible institutes for air quality monitoring and reporting in Bosnia and Herzegovina. In the Federation it is the hydrometeorological institute. There are five monitoring stations in the Federation, and twenty in total throughout the country. However, the stations cover a small area. There is a need to expand the network. The data trend is getting better, but there is a need to ensure quality assessment and control, and proper network maintenance. There is an ongoing project with the Swedish EPA to develop maintenance protocols. Bosnia and Herzegovina is reporting its data to EEA.

Zones and agglomerations are not yet defined, but there is work in progress which might result in their definition by next year. There is no accredited national reference laboratory, but there are plans to establish one in each Entity.

Kosovo*

The Kosovo EPA is responsible for monitoring and reporting. It does so based on 11 fixed stations and 1 mobile station established two years ago. The network is fully automated, with online data transmission. There have been some malfunctions with the stations. The data is used to report on air quality to the Government and to EEA.

There is an air quality law under preparation, which will include a strategic plan for air quality. It is expected to be approved by parliament in the short-term. At the moment, Kosovo has only one agglomeration defined (Pristina), where there are air quality problems that need to be addressed.

The national reference laboratory is not yet in place. The hydrometeorological institute is planned to take that role.

Montenegro

Montenegro referred to its opening remarks. It added that extra monitoring equipment is still needed to fulfil all reporting obligations. Montenegro offered to share its experience with the siting of its monitoring stations and the establishment of air quality zones according to the directive's requirements.

North Macedonia

The Ministry of Environment and Physical Planning is the responsible entity for air quality monitoring. The first automated monitoring stations were established in 1997. The first air quality law dates from 2004. Currently, North Macedonia considers that the AAQD is 90% transposed. The country's monitoring network consists of 17 fixed stations complemented by one mobile. The calibration laboratory is not accredited, but the procedures are well developed. Accreditation is held back due to lack of funding and lack of human capacity. The country uses a data management software (Airviro).

PM_{10} and $PM_{2.5}$ are the most critical pollutants in the country, with the limit values exceed in the urban sites. However, trends are stable. Extreme concentrations tend to happen in winter. Heavy metals and monitoring is not constant since only non-regular indicative measurements are conducted, preventing a clear analysis. Heavy metals concentrations are below the limits, but PAH concentrations during winter are believed to be critical.

North Macedonia also applies dispersion modelling for vehicle traffic and stationary sources, CAR-FMI, UDM-FMI. The model SILAM is used for modelling on regional scale. Activity data was used from the Ministry of Interior. Forecasts are made with SILAM (3 days). The country also does PMF (Positive Matrix Factorization) modeling for biomass burning, one of the biggest sources of pollution in the analysed site (Karpos UB, Skoje).

There are a number of national and local air quality planning documents, including a national plan for ambient air quality, a national programme for reduction of emissions, a plan for clean air, three municipal plans and for the Skopje region agglomeration. The country also has an inter-sectoral working group on air quality to improve internal cooperation.
The country reports its air quality data in daily, monthly and yearly reports and through a web portal with up-to-date data. Reporting is also done to EEA. It engages in public awareness campaigns.
The country is divided in two zones and one agglomeration since 2008.
The main problems identified are lack of capacities at local and central levels, limited budget for the monitoring network, and no national budget for performing indicative measurements and source apportion studies, calibration laboratory is still not accredited, air quality and short term plans are prepared only for 4 cities, measures defined in air quality plans are only partly implemented, measuring sites for HM and PAHs have not been determined per zone/agglomeration, and lack of equipment, among others.

Serbia
Serbia presented the national authorities responsible for the transposition and implementation of the air acquis, which are the Ministry of Environmental Protection, the Serbian Environment al Protection Agency (SEPA), the Accreditation body of Serbia (ABS) - Laboratory department, the Provincial Secretariat for Urban Planning and Environmental Protection and the Local self-government units.
Serbia made a preliminary air quality assessment in 2010. The administrative districts were selected as a unit for the spatial assessment due to lack of defined air zones. The data used was from 2005-2009 (manual measurements). Currently there are defined 3 air zones and 8 agglomerations for which an automatic monitoring network is in place operated by SEPA with 34 stations and one mobile station. The network is complemented by 36 urban monitoring sites operated by Public Health Institutes using manual methods (indicative, non-reference methods). Further assessment is needed to determine a minimum number of stations. The manual stations also need equivalency testing and field tests.
Modelling is not used much so far, the but first steps are done. There was a pilot study on SO_2 in Belgrade (AERMOD) and PROKAS in Novi Sad. More capacity is needed for broader use of modelling and forecasts.
The main pollution problems detected are PM_{10} and $PM_{2.5}$, related with domestic heating in winter.
The AQ plans are adopted by the autonomous province and local self-government units in zones and agglomerations with III category of Air Quality. There are 5 plans adopted so far, 2 in progress. 1 short term action plan exists for the agglomeration of Uzice. However, there are funding problems and lack of capacities to implement the plans.
The Air Protection Strategy will be developed until 2021 within the IPA project *Additional development of EU Environment approximation for Air, Chemicals and Horizontal acquis* and will define air quality goals and measures, will provide basis for further development and adoption of lower level documents and continuation of directive implementation. In addition, development of an Implementation Plan for Air Quality Directives will further guide implementation of EU requirements in order to ensure clean air and healthy environment (within the same IPA project).
SEPA, the autonomous province and local self-government units are responsible for providing information to the public and to report to the appropriate organizations as required by law.
Currently the major challenges for Serbia are the development of strategic documents and transposition of the acquis, reassessment of the monitoring infrastructure, equivalency testing, use of modelling, administrative capacities, financing of AQ plans at local level and monitoring of its implementation.

Turkey
Turkey plans to have the CAFE directive (AAQD) fully transposed until the end of 2019. There is a national reference laboratory, that monitors air quality and reports to EEA. The country has nearly 350 monitoring stations that are functionally segragated to monitor traffic, industry and domestic pollutions sources.
In 2015 the country established 8 regional clean air centers, 7 of them are fully operational, corresponding to the air zones, in addition to having local clean air action plans for 64 agglometations.

The clean air action plans are monitored via a software developed by the Ministry of Environment and Urbanization. Turkey is also in the process of establishing low emission zones.
The country uses an emission management portal which lists emission sources, GIS based, for each city. It is integrated with on the US EPA software CMAQ for air quality modelling together with an emission inventory compilation tool. Currently, there are 3 regions completed with 2 km resolution AQ maps. Turkey will be fully mapped by 2023. The software can be used to analyse scenarios, source identification and modelling. It takes into account natural emissions and atmospheric composition.

3.3 Current air quality related developments in the EU

The presenter explained the European Environmental Agency role regarding air quality monitoring and reporting as established in the relevant acquis. It then provided a clear framework of concepts on what and how data should be collected by the responsible national agencies in order to ensure data quality. The presentation then expanded on the rules for the reciprocal exchange of information and reporting on Air Quality (Implementing Decision (IPR) 2011/850), including the data sets and information to be reported, the format, the deadlines, and final data repository (EIONET Central Data Repository, CDR) and the responsibility of each actor during the data chain of custody. In order to give an idea of the complexity and size of reporting needed, the presentation gave a brief overview in numbers: considering the 39 countries participating to the reporting, there are a total of 450 reporting obligations established resulting in approximately 20 000 time series of individual measurement data plus and additional 60 000 records of other data and meta-information per year. At the moment, there are 2 500 000 000 measurement data and statistics in the database. The validated data is used in the Annual Air Quality assessment report, for indicators, for country factsheets, human health assessments and data viewers and other products.

3.4 Assessment of ambient air quality – current developments, best practices

The presentation brought to the fore an example of assessment of ambient air quality of a EU Member State, Austria. It started with a brief explanation of Commission Directive (EU) 2015/1480, which amended the AAQD, followed by the case study of its implementation in Austria and the practices of monitoring evaluation in the country.
As a result of the Directive, Austria embarked on a review of the quality assurance and quality control of its monitoring system. Audits took place in situ based on EN ISO/IEC 17025. In addition, Austria also obtained accreditation for proficiency testing (Environment Agency Austria, Umweltbundesamt, UBA) according to EN ISO/IEC 17043 for gaseous air pollutants and PM, does field comparison exercises for PM regularly, does interlaboratory comparisons, and thoroughly documents station site selection.
The results showed that quality monitoring is well established, but there are bottlenecks with personnel and improvements can be made to data collection, averaging and uncertainty.
The main reasons for success with quality assurance of monitoring are the regular exchange of information between National Reference Laboratories (NRL) and the monitoring networks, calibration workshops, enough annual budget for the monitoring networks, trained and experienced staff, and regular information exchange on air quality issues by national & regional government and Umweltbundesamt.

3.5 Low cost sensors

The presentation started with a technical explanation of existing sensor technology (electrochemical, resistive, optical particle counters, photo ionization) and by discussing the pros and cons of each. It also discussed the difference between sensors (the measurement technology) and sensor systems (an integrated system of the measurement technology with other capabilities like data processing, transmission, etc), including sensor systems data processing and data policies (open source vs. black box).

The presentation then moved on to a scientific literature review of sensor evaluation, the objective of which was to understand what the quality of existing sensors is, how they perform and at what cost. The study noted that there is no common metrics to evaluate sensors and was seeking to establish an evaluation protocol. R^2 was identified has the most common variable, but it has limitations. The main conclusions are that sensors have hidden costs (installation, maintenance), the same sensor can have bad/good results depending on (atmospheric) conditions and users. Therefore, data quality must always be verified. More evaluation of sensors is needed in general. CEN WG42 is working on a protocol for sensor evaluation and is seeking to classify sensors based on performance requirements as needed by EU Directives.

As a rule of thumb for practitioners, the selection of sensors for monitoring networks should be guided by multiple criteria to identify the most suitable sensor for the intended use. For instance, target the best sensor system by agreement with reference systems, number of measured pollutants, openness and price.

The presentation concluded with the AirSensEU. It is a technology-developing initiative which aims at diminishing development and user cost of sensors. The AirSensEU is a demonstration sensor system that includes a CPU host controlling a sensor bus with shields, electrochemical sensors and T/RH/pressure board, OPC, MOx, OPC-N3, Plantower PMS5003, CO2 and radon sensors. There are currently field studies for the AirSensEU.

The presentation raised a number of questions regarding the use of cheap sensors by unqualified users. The availability of sensors makes using them cheap and easy. However, a user without training cannot understand the failings and variability of sensors, running the risk of using the data output without verification and quality assurance. It was believed this can lead to misunderstandings between the state authorities and civil society deploying such sensors. The presenter offered that it is a trend difficult to evade. The sensors are available and will be used, and it is inevitable biased results will be floated by unskilled stakeholders. The best solution is to make sure the official monitoring network is well documented and reliable, but to also engage civil society, and provide education on the topic.

3.6 Analysis and reporting of air quality data – current developments, best practices

The presentation gave the Croatian case study regarding the reporting of air quality data and air quality plans. It started with an analysis of the EU legal framework for air quality, focusing on the common standards and methods for assessing air quality and prescribed obligation to identify zones and agglomerations according to pollution levels in order to introduce a more appropriate air quality management system and implement the necessary protection measures.

It then demonstrated, step by step, how the assessment of air quality works in Croatia. It exemplified how data is collected and validated in Croatian monitoring stations, and then aggregated to reference values, and uploaded to EIONET CDR. It also demonstrated the use of data in EIONET from the uploading country perspective.

The presentation also explained the process of developing and monitoring implementation of air quality plans in Croatia. Some lessons from special report Air pollution[4]: Our health is still insufficiently protected were given regarding the effectiveness of Air Quality Plans (AQP) because the same also goes for Croatia:

- weak governance (for example, a lack of coordination between national and local authorities)
- lack of information about the real impact of measures taken on air quality
- AQP not targeted and could not be implemented quickly for the areas where the highest concentrations were measured
- AQP could not deliver significant results in the short term because they went beyond the powers of the local authorities responsible for implementing them or because they were designed for the long-term
- AQP were not supported by cost estimates or were not funded
- AQP privilege quantity over the quality of information (some AQPs over 200 pages long)

[4] https://www.eca.europa.eu/Lists/ECADocuments/SR18_23/SR_AIR_QUALITY_EN.pdf

Finally, the presenter explained in detail the functioning of the national reference laboratory in Croatia, including competences and role in the air monitoring system.

3.7 New approaches and new tools in source apportionment and air quality modelling

The presentation clarified the use of source apportionment and air quality modelling in Finland. Source apportionment (SA) is the practice of deriving information about pollution sources and the amount they contribute to ambient air pollution levels. The presentation focused on receptor oriented models (RMs), that find pollution sources from pollution time series measured at the receptor site, used in Finland. The model outputs the source chemical profiles and its contribution to pollution levels.

The presenter gave the concrete example of the model deployment in Tornio, a small village neighboring a large steel factory. The study at Tornio revealed that 75% of total PAH mass and 85% of benzo(a)pyrene mass was originated from biomass burning, while, in average, 43% of PM_{10} mass was originated from the steel factory. Other examples were given of the model being used in Karpos, North Macedonia, where the results showed the main sources of PM_{10} are biomass burning for domestic heating (32%), traffic (19%) and industry (18%).

The presenter also demonstrated the SILAM AQ assessment and forecasting platform which is open source and free to be used by any interested party. SILAM is used in Finland to create national, European and global projections with varying resolutions (2.5 km, 10 km, 20 km respectively).

The presentation was concluded with a dispersion modelling example of Helsinki (ENFUSER), capable of resolutions down to 10 m. The tool is used for public information, health monitoring, GPS-based tracking of personal exposure levels. Other uses are also possible, like building exposure profiles of real estate.

3.8 Air quality management in the EU, current developments, best practices

The presentation listed the main air problems in the EU, the most recent measures by the Community, problems with vehicle emissions, research projects relevant to air quality, UNECE activities and case studies from around the EU.

The main AQ problems relate to NO_2 in cities due to diesel vehicles, PM (Poland, Northern Italy, South-Eastern Europe), and O_3. Cooperation between authorities on different governance levels is crucial to successfully address these pollutants. In addition, the AQP and its underlying data should be coherent with other policies and strategies for climate change, transport, energy, noise etc. Public and strong political support are crucial for implementing efficient measures.

At EU level, several measures were implemented as a result of the review of the AAQD, namely the Medium Combustion Plants Directive, Industrial Emissions Directive, Ecodesign regulations and changes to vehicle legislation. The latter was also triggered by the failure of diesel passenger cars to comply with emission limit values under real world driving conditions and the VW diesel scandal. The speaker highlighted that both inspection of vehicles is and will be crucial, and that an import ban of used diesel vehicles should be considered.

The so-called air implementation pilot project brought together 12 European cities, EEA and the EU Commission to discuss challenges and ways forward. The project concluded that different solutions are necessary for different cities, integrated approaches instead of single measures should be used, citizen involvement and collaboration are crucial for successful AQ improvements.

Within various LIFE projects such as AIRUSE guidebooks were developed that can be useful sources of information. In addition, a wealth of information on transport measures is available on a platform[5] for Sustainable Urban Mobility Plans.

Measures to reduce emissions from domestic heating and agricultural sources were both addressed by the so-called Clean Air Outlook by the European Commission and at the Saltsjöbaden VI workshop. The latter also covered clean air in cities and globally, challenges within the eastern region of the UNECE LRTAP convention and shipping emissions.

[5] https://www.eltis.org/

A further instrument on EU levels are petitions that EU citizens can forward to the European Parliament in case there might be a problem with the national implementation of EU law. Air quality related petitions and best practices were recently analysed for the European Parliament[6].
Finally, the speaker presented three examples of local measures in Berlin, Madrid and Sweden. The mobility law of Berlin is a successful example for the shift of urban traffic planning focused on cars towards general mobility, safety, quality of life. The city of Madrid implemented a low emission zone and redistributed public space. Currently, there is a political and legal struggle to upheld these measures. Environmental zones for trucks and buses were implemented in several cities in Sweden already in 1998. The framework law allows for a long-term planning as it sets a timetable for different Euro vehicle standards to be allowed to enter these zones.

3.9 Air quality assessment and management in Germany

The presentation offered the case study of air quality in the heavily industrialized area of North Rhine-Westphalia, the German centre of coal and steel. In the past, the region was highly polluted by PM and SO_2 originating from industrial sources. There was high mortality, with a significant increase during smog episodes, damage to vegetation and ecosystems. A change in public policy in the 1950's, followed by stronger enforcement and new technical regulations, led to a remarkable change in the state of air quality. Domestic heating was also an important source of PM, which was tackled by mandatory chimney sweep inspections, adoption of technical developments in boiler technology and structural change to private heating infrastructure (replacement of coal by gas and oil and use of central heating). As a result, the pollution in North Rhine-Westphalia was reduced dramatically (e.g. SO2 levels were reduced by 90%). However, there are still continuing problems: limit values for NO_2 are often exceeded in street canyons (hot spots), road traffic being the main source, and there is a growing importance of wood burning and agriculture for emission of PM_{10}. The exceeding of limit values requires actions and plans for abatement measures (air quality plans).
The current status quo requires strict monitoring. The presenter gave a detailed explanation of how the environmental agency is setting up and maintaining its monitoring network according to EU requirements. Special attention was given to the siting of monitoring stations, resulting in the identification of pollution hotspots where abatement measures are needed. The agency also provides reporting to both the public, administration bodies and the federal environmental agency.
The Agency takes part of the air quality plans as a monitoring body, but holds no responsibility in the definition of measures, which is a political decision. AQP have been subject to judicial challenges by civil society, which claims that the plans are not sufficient to achieve compliance with limit values.
The presenter gave an overview of the quality assurance protocols deployed in the monitoring network of North Rhine-Westphalia, which include type testing/type approval, National Reference Laboratories, Round Robin Tests and Validation of measurement techniques.

3.10 Air quality assessment and management in Krakow - Malopolska region

The round of case studies from EU Member States was concluded with the Malopolska region of Poland. The region is one of the most polluted in Poland, mostly due to the use of solid fuels in old boilers used for domestic heating. The problem is compounded by lack of human resources at municipal level, low public awareness of the problem in the public and decision makers, lack of coherence between local planning documents, lack of cooperation with the central government and lack of cooperation across borders.
The region is implementing a LIFE project aimed at improving the air quality. It runs until 2023 with a budget of almost 17M€. The partners include the municipalities of the region, NGOs and the Ministry of Environment of the Czech Republic and the Slovak Hydrometeorological Institute. Among some of the activities the project is promoting, there are study visits to foster cross-border understanding of the issue, creation of an international database of pollution sources in the region, and the deployment of

[6] http://www.europarl.europa.eu/RegData/etudes/STUD/2018/604988/IPOL_STU(2018)604988_EN.pdf

ecomanagers in municipalities that inform the public about the problem and offer potential alternatives. Another important measure to tackle the problem was Krakow's initiative to subsidize solid fuel boiler replacement between 2013 and 2018 and the passing of a total ban on using solid fuels in boilers and space heaters from September 2019 onwards. The Malopolska region also adopted a similar ban for new solid fuel boilers and a requirement that all existing boilers need to be replaced until 2022.

3.11 General discussion and working groups

In order to better reflect on the content of the workshop, and to more clearly have the perspective of the beneficiaries, the work for the remaining of the available time was structured in working groups. The attendants were divided in four groups, according to their interests. Each group had 8 to 10 members, elected a rapporteur and discussed a set of questions. Their conclusions were the reported back in plenary. The working groups, and their respective topics were:

- Air quality sensors
    - What could be the main messages from the EPPA network (based on existing fact sheets, studies from EU Commission, JRC, LANUV-NRW)?
    - What are the main missing pieces of information?
    - How can the EPPA project support you?
    - What is the scope for a regional cooperation?
- Domestic heating, vehicle emissions
    - What could be the main messages from the EPPA network?
    - What are the main missing pieces of information?
    - How can the EPPA project support you?
    - What is the scope for a regional cooperation?
- Air quality data reporting
    - What are the main further needs for information?
    - What would be the most important support in general?
    - How can the EPPA project support you?
    - What is the scope for a regional cooperation?
- Topics for next EPPA TAIEX Air Quality Directive workshop October 2020
    - What would be useful topics for day 1?
    - What would be useful topics for day 2?
    - Where and when should it take place?
    - Which kind of interactive elements do you prefer?

The conclusions of the working groups are presented, in a summarized way, in the section below: "Conclusions".

4 Conclusions

The workshop succeeded in increasing the knowledge of the AAQD and its implementation in the EU, resulting in know-how transfer to the beneficiaries, thus benefiting their alignment process. It was also visible that the participants placed high importance on regional cooperation to tackle air pollution, including appeals to increase cross-border cooperation in the area.

As a result of the discussions, there were other key points identified that need to be considered when reflecting on air quality policy and implementation measures:

1. The beneficiaries recognized the unreliability of some sensors used in the region, and lack of funding for proper maintenance of monitoring stations.
2. The priority in the region is to have reliable sensors to detect major sources of pollution, including $PM_{2.5}$, SO_2 for coalmines, NO_2 for traffic and O_3 at rural sites.
3. The use of air quality sensors by untrained stakeholders can lead to misundertsandings in air quality policy implementation. It is important to make sure stakeholders understand the limits of available cheap sensors, the complexities of siting, the measurement methodologies and calculation of data collected into reference values.

4. Domestic heating, based on biomass, is a problem in the region, driven by socio-economic reasons. It was considered that public education campaigns are a necessity to help tackling the problem, as well as assistance to the development of programmes to reduce pollution from this source.
5. The definition, and later evaluation and possible redefinition, of air quality zones and agglomerations is an important area to continue to exchange experiences with Member States and within the region.
6. Some beneficiaries would welcome assistance with the accreditation of national reference labs.
7. The beneficiaries suggested that a common database for reporting air pollution in the Western Balkans might be a good way forward, considering the transboundary nature of air pollution.
8. The beneficiaries also need further assistance with the transmission of air quality data to the EEA.
9. The beneficiaries recommended the following topics for the next air-related workshops: PM reduction measures and its legal and financial implications, use of modelling, best practices regarding monitoring and pollution inventories, success stories in air quality management and their ley lessons, incentivizing regional cooperation, and reporting complex air quality to the public.

Workshop outputs

The workshop's main outputs were:

- Enhanced understanding of the topic, policy and legislation, challenges and current practices
- Enhanced exchange of experiences within the beneficiary region and between the beneficiary region and EU Member states
- Established contacts between air quality practitioners of the beneficiaries, resulting in better cooperation
- Better capacity to deal with the requirements of the air quality EU acquis
- Identified key issues for implementation of air quality requirements in the beneficiaries, as stated above

5 Evaluation

The participants were asked to evaluate the workshop *post-factum*. They received a paper format questionnaire at the end, consisting of six questions along two pages, in order to assess the impact of the workshop in light of the EPPA project objectives. Later, the participants also filled in a second questionnaire circulated electronically by TAIEX, asking them to provide feedback on technical and logistical aspects. This report presents the results of both evaluations.

5.1 The EPPA impact evaluation

The EPPA impact evaluation questionnaire is composed of six questions, the first five looking at the specific impacts of the workshop, and one asking the respondents to offer their opinion on their country's priorities and suggestions for future EPPA events.

The first five questions are "agree/disagree" questions, in a scale from "strongly disagree" to "strongly agree". Each includes a space allowing the respondents to explain or offer more information about their level of agreement. The final question is of open-ended type.

The results of each question are presented here, one by one.

Twenty-seven participants filled in the paper-based questionnaire. The sample offers enough coverage of all project beneficiaries, as it can be seen from the following table.

Country	Nr of answers
Albania	4
Bosnia and Herzegovina	3
Kosovo	3
Montenegro	6
North Macedonia	4
Serbia	3
Turkey	4

Figure 1 - Answers to EPPA evaluation questionnaire per beneficiary

Question 1 - The event agenda, and corresponding outcomes, were relevant to my country's priorities and needs in the given subject

The majority of participants (63%) agreed with the question that the agenda and its outcomes were relevant. The remaining 37% strongly agreed. The numbers indicate a high level of satisfaction with the agenda and how it succeeded in addressing the beneficiaries' needs. In the notes, some indicated that the time allotted to the beneficiaries to explain its own implementation should be longer. It was suggested that future workshops should look in detail to the implementation side.

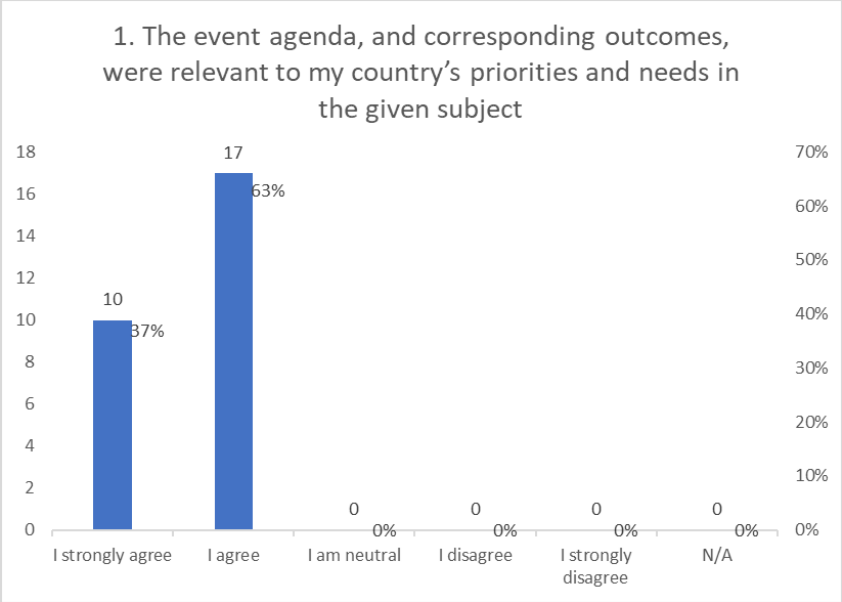

Figure 2 - Agenda and outcomes relevance

Question 2 - My work performance will benefit from the event in terms of knowledge/expertise gained, contacts established, best practices, others.

The majority of respondents considered that the workshop contributed to improve their work performance in the field of air quality. 41% strongly agreed, 56% agreed, and only 4% were neutral. In the notes some of the participants specifically requested that European Commission representatives should attend these workshops in order to be informed about the challenges the beneficiaries face. Others were satisfied with the opportunity to network with AQ colleagues from other countries.

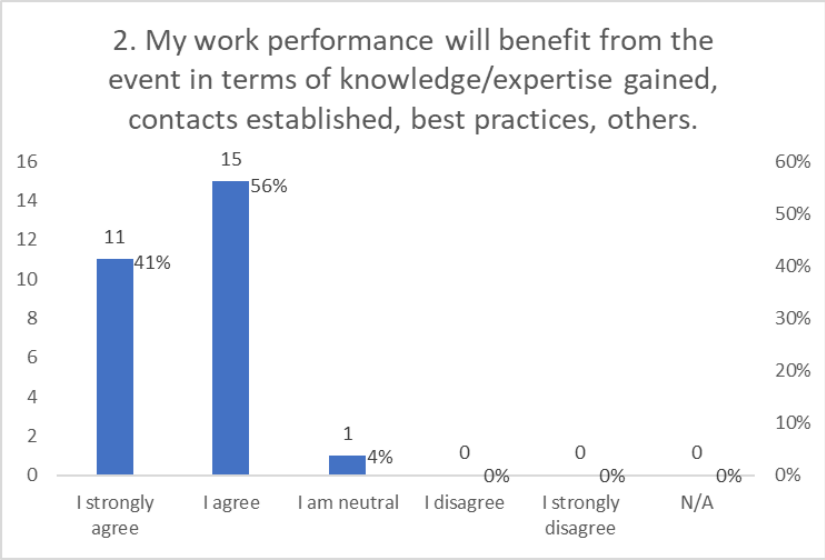

Figure 3 - Better work performance

Question 3 - This event contributed to enhanced regional cooperation in the EU candidate countries and potential candidates in the implementation of the EU environmental acquis

The majority was happy with the workshop's contribution to regional cooperation. In the notes, participants noted that the workshop helped establish a good network of practitioners, which should continue via other meetings, the need to continue cooperating to implement the acquis, using also study visits, and they recommended the use of more working group sessions in the future.

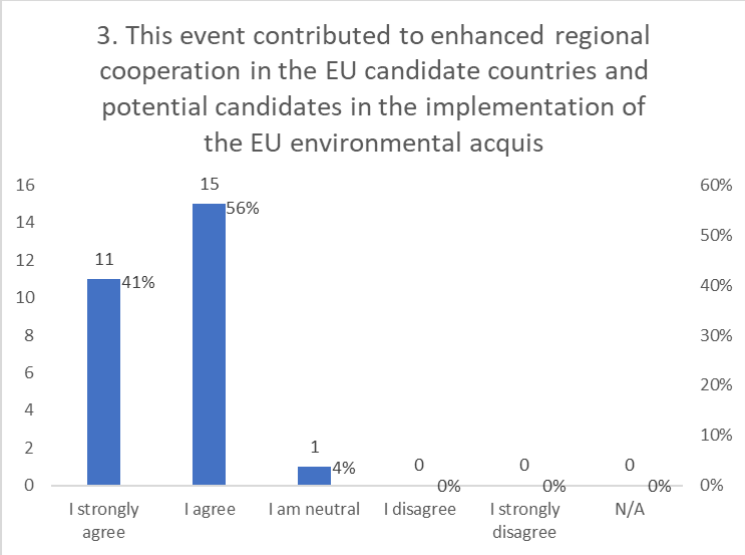

Figure 4 - Regional cooperation

Question 4 - This event contributed to increased alignment of my country's legislation with the EU environmental acquis, and its enforcement.

On whether the workshop payed a role assisting the alignment process, 19% strongly agreed, 30% were neutral or said the question was not applicable and 52% agreed. In the notes, some participants requested that the amendments to the CAFE Directive (AAQD) be the subject of a future workshop, especially looking into how the amendments were transposed.

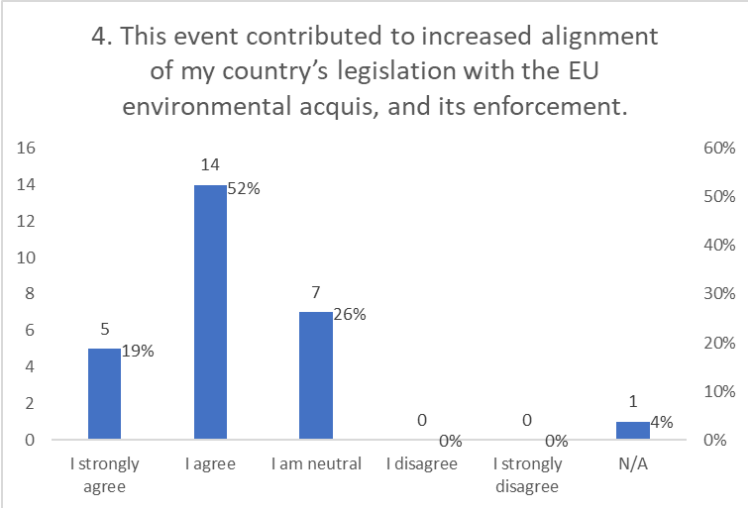

Figure 5 - Alignment with the EU acquis

Question 5 - This event contributed to increased capacity and technical knowledge of my organization to deal with transboundary environmental issues, in line with EU acquis

On whether the workshop increased capacities for transboundary issues related with air quality 85% agreed or strongly agreed. 11% were neutral and 4% disagreed. Although the workshop's contribution to transboundary cooperation was positive, the opinion of those 11% that were neutral and 4% that disagreed should be taken into consideration. In future workshops, the project team will reflect on how to make regional cooperation in transboundary air pollution a more visible component of the agenda and workshop proceedings. In the notes, one participant mentioned how the workshop was particularly useful to understand sensor use and measures for reduction of emissions from household heating.

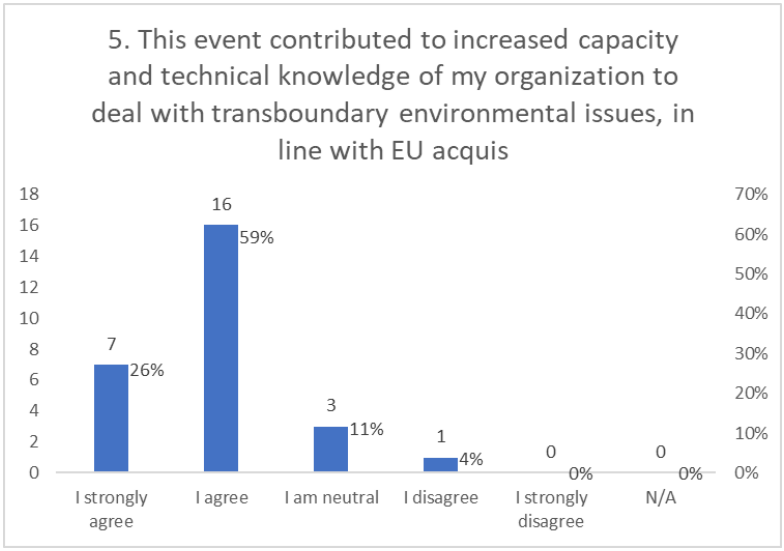

Figure 6 - Capacity for transboundary issues

Question 6 - Do you have general recommendations, for the future, regarding the topic and how best to address your country's needs?

The respondents provided a wide range of topical suggestions for future workshops and other capacity building measures:

1. A specific workshop focused on measures to abate air pollution (from traffic, domestic heating, PM reduction) with the definition of indicators and calculations for cost-effectiveness, and identifying possible funding sources
2. Experience of municipalities in air quality management and how they were funded

3. Several mentioned that it is important to have more implementation examples from both EU Member States and beneficiaries
4. More assistance to establish national reference laboratory (including the accreditation)
5. Cross implementation of EU Directives and UN conventions
6. Promote further cooperation related to the problem of domestic heating in the beneficiaries
7. Air quality reporting for data flows B and G
8. Emission inventories - legislation and technical knowledge

There were complimentary remarks regarding the current workshop and suggestions for improvement or continuing to apply a similar approach. Among them was the idea that the use of working groups should be repeated. One participant highlighted how the workshop addressed the needs felt in her/his country, especially the modelling and forecasting modelling, the EU examples of air quality assessment, and the detailed dive into air quality sensors. In general, respondents also asked for more EU Member States speakers, longer workshops (up to 4 days) and the possibility of study visits related to air quality in the EU.
One comment to take note of was regarding the room logistics. Participants prefer the structure of the room to be changed in order to increase face to face contact between participants. A "U" or round-table layout should be used in upcoming workshops. The concern is justified. The arrangement provided by the hotel was a 2+2 seating, resembling a bus, in a long, narrow meeting room. It made interaction difficult. The participants in the back were somewhat isolated from what was happening in the front.

5.2 The TAIEX technical and logistical evaluation

To be completed once TAIEX evaluation data is made available.

6 Annexes

6.1 Annex 3: CSO involvement in air quality

Introduction

The regional workshop on the *Ambient Air Quality Directive - Current status, new developments* covered also aspects of involvement of Civil Society Organisations (CSOs) and wider public – citizens, in various issues related to air quality (e.g. presentations Nagl, Zovko, Leinert, Pietrusiak).

CSO/public involvement – now and way forward

Air quality issues (air pollution in urban areas, agglomerations) with health impacts are becoming more prominent, especially in the WB region where some (winter) air pollution values are among highest in Europe. This was also highlighted by host country CSO/NGO[7] with example of Pljevlja Municipality (among 10 most polluted cities in Europe) where coal power plant and coal combustion in households, combined with weather conditions, results with PM10 pollution 2-5 times higher than AAQD limits.

Air pollution sourced from domestic heating (aside from industrial pollution) was also recognised by majority of EPPA beneficiaries as important AQ problem in their countries[8]. From CSO/public side perspective, the most welcomed presentation was on AQ management issues from Poland (Mr Pietrusiak), which brought practical examples of tackling high air pollution (Krakow, Malopolska region) originating from similar sources as in EPPA beneficiaries (domestic sub-standard solid fuel boilers, coal, high moisture wood and waste burning).

Following to current activities, as well as practical MS examples in AAQD implementation, **further CSO involvement in EPPA beneficiaries** could encompass:

[7] Green Home Montenegro
[8] see main Report/Conclusion 4

1. Targeted public campaigns (general public, educational institutions, local – hot spots) with objective to **raise awareness on air quality** issues.
   See example of Malopolska region/Poland.
2. Stronger **involvement of CSO/citizens** in national **energy policies development** with objective of reducing air pollution.
   This could include actions to reduce use of solid fuels for domestic purposes (heating, cooking).
3. CSOs **promotion of renewable energy sources**, energy efficiency (public, industry and domestic sectors), low-emission urban transport.
   This could be linked with 1.
4. Increased **cooperation with national authorities** in charge for **air quality monitoring**. W*ith objective to increase public awareness and understanding of monitoring data/interpretation (also issues related to indoor vs. outdoor monitoring).*
5. Stronger **cooperation on regional level** on AQ issues due to the transboundary nature of air pollution (*see Poland/Malopolska-Czech Republic-Slovakia example*).

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6.2 Annex 4: "Air quality issues in Montenegro: from CSO perspective"- Green Home (Montenegro)

GREEN HOME
act green

"Air quality issues in Montenegro: from CSO perspective"

For the almost two decades Pljevlja Municipality (26780 inhabitants) has been recognized as one of ten most polluted cities in Europe, since only coal-fired power station in Montenegro is situated in Pljevlja. This is recognised as great challenge for Montenegro in terms of the air quality improvement, social and clean energy transition. In years from 2000-2017 air quality in Pljevlja continues to record chronic pollution with 145 days over the prescribed limit value of PM10 in 2017, 181 in 2016, 189 days in 2015 etc. Daily mean concentration of PM10 exceeded 50 μg/m³ on 64-217 days per year, markedly more often than allowed by EU AQ directive (35 days/year) or recommended by WHO AQ guidelines (3days/year).

Substantial part of the heavily air pollution burden can be attributed to the excessive air pollution occurring in winter months. This can be due to the coal combustion for households heating and to weather conditions in Pljevlja reducing dispersion of the pollution. Coal combustion significantly increases total exposure to air pollution of the residents which are using solid fuel for cooking and heating, due to direct emission of pollutants to indoor spaces. Consequently it results in additional negative health effects. However, there are no official recordings or data on household's indoor pollution and its impacts. That is why Green Home recognizes the importancy of indoor air pollution measurment, and will be developing an analysis of pollution in households in Pljevlja heated by coal, also bringing up negative health effects that coal combustion has.

Although clean energy transition and Roadmap 2050 are integrated in Governmental policies, there are needs for intensifying the dynamic for reducing the CO2 emissions and climate change mitigation. Even though Montenegro gave up on building second block of TPP Pljevlja, there are still plans for district heating system construction, which means keeping the first block operating and prolonging its life, now when most of the European countries announced coal phase out date, which means closing their existing thermal power plants.

Interventions in the field of social and just transition are very much needed. Social dialogue should be held between workers, employers and governments, affected groups and communities should be involved as much as possible in order to accomplish successful social and just transition. Also, raising people's awareness on air pollution issue and presenting the alternative ways of heating, as well as helping Pljevlja citizens financially by offering subsidies to its residents and encouraging them to switch to a cleaner, more energy efficient heating solutions.

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