



Under the Convention on Long Range Transboundary Air Pollution

*Case Studies on Armenia and Montenegro:  
Technological Pathways toward the Amended Gothenburg  
Protocol Ratification*

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# Overview

- Approach used
- Summary results
- General conclusions

# General approach used

For each country: Serbia, Georgia, Kazakhstan, Moldova, Armenia, Montenegro

- Status of ratification of the Convention and its Protocols, and strategic plans
- Assessment of air quality
- Assessment of the main sources of SO<sub>2</sub>, PM, NO<sub>x</sub> and VOC
- Assessment of current regulations implemented for activities covered by annexes IV, V, VI VIII, X and XI
- Assessment of programmes to reduce air pollution and to develop policies and measures related to activities covered by Annex IV (SO<sub>2</sub>), Annex V (NO<sub>x</sub>), Annex VI (VOC/solvents), annex VIII (mobile sources), Annex X (PM) and Annex XI (solvent in paints and varnishes)
- Discussions with the country experts from the Ministries of environment
- Recommendations for technological pathways

Work done in full transparency with help of the country experts from the Ministries in charge of environment

# Armenia and Montenegro: Status of ratification and strategic plans

- ✓ Both countries ratified the Convention and the EMEP Protocol
- ✓ Montenegro ratified the heavy metal Protocol in 2011 and the POP Protocol in 2012
- ✓ In 2011, Montenegro established a Law on the approval of the Gothenburg Protocol of 1999
- ✓ Montenegro developed a National Air Quality Management Strategy 2021-2029 which was approved in 2021 by the EU (as a part of accession program) (some gaps in the implementation are noticed)
- ✓ Armenia prepared a “National Action Plan for ratification of CLRTAP Protocols and meeting of correspondent commitments” in 2014. A reviewed and updated plan was prepared in 2019
- ✓ A Comprehensive and Enhanced Partnership Agreement (CEPA) between the European Union and the Republic of Armenia signed in 2018 and entered into force in 2021 with an agenda for legislative approximation to EU norms in many subjects among them many directives of interest to combat air pollution (Air quality, Industrial Emission Directive, Sulphur in fuels, Petrol station, solvent in products)

# Air quality in Armenia and Montenegro

## **Air quality:**

- Both countries face air quality problems due to Particles:
  - PM10 and PM2.5 concentrations still too high in Montenegro
  - Dust (Total suspended particles) concentrations monitored in Armenia with high concentrations
- In terms of air quality monitoring:
  - Air quality in Montenegro is monitored in accordance with European standards since 2009
  - Armenia has its own air quality standards. Through the CEPA, the provisions of EU Directive 2008/50/EC on ambient air quality and cleaner air and EU Directive 2014/107/EC shall be implemented from 2021 to 2029

# Mains emission sources in the two countries

## **Emissions:**

- The energy production sector presents large emissions of SO<sub>2</sub> and NO<sub>x</sub> in Montenegro (use of national coal without efficient abatement options used up to now)
- Industrial activities are not key sources of emissions of SO<sub>2</sub>, NO<sub>x</sub> and PM in both countries, but may impact air quality locally
- Road transport is the main source of NO<sub>x</sub> in Armenia and Montenegro
- In both countries, residential activities (domestic heating using solid fuels) are the largest source of emissions of PM<sub>10</sub> and PM<sub>2.5</sub> (however some missing activities in the emission inventories were noticed)
- In both countries, “solvent uses” is not the main source of VOC emissions (however some missing activities in the emission inventories in both countries were noticed)

# National regulations and programmes to improve them

## **Regulations and programmes for their improvement and alignment with key EU directives:**

- The regulations of Montenegro are consistent with ELVs of IED and BREF documents are taken in account for permitting
- For industrial plants and large combustion plants, Armenia has its own regulations, not yet in total agreement with limit values of the AGP technical annexes
- Armenia shall adopt provisions of the EU Industrial Emission Directive in its national policy framework through the CEPA agreement, from 2024 to 2027

# National regulations and programmes to improve them

## Regulations and programmes for their improvement and alignment with key EU directives:

- The sulphur content of gasoil is not yet 0.1% (annex IV) in Montenegro and Armenia (but to be further confirmed)
- For quality of petrol and diesel (requirements of annexe VIII)
  - Armenia in the scope of the CEPA, shall implement provisions of Directive 93/12/EEC (or the directive amending this directive) relating to the Sulphur content of certain liquid fuels from 2020 to 2023
  - In Montenegro, the new Regulation on limit values of the content of polluting substances in liquid fuels of petroleum origin ("Official Gazette of Montenegro", no. 17/17) is compliant with Directive (EU) 2016/802 on the reduction of content of sulphur in certain liquid fuels



# National regulations and programmes to improve them

## **Regulations and programmes for their improvement and alignment with key EU directives:**

- For petrol distribution, stage I and stage II the situation is as follows:
  - Armenia in the scope of the CEPA, shall implement provisions of stage I (Directive 94/63/EC) from 2026 to 2029. No action is foreseen for stage II
  - Montenegro already adopted stage I. Stage II is to be further investigated

# National regulations and programmes to improve them

## **Regulations and programmes for their improvement and alignment with key EU directives:**

### **Domestic heating with solid fuels**

- The situation is as follows:
  - In Armenia, few actions are implemented. Following a substantial gasification campaign, 96% of the communities have access to pipeline gas. However, a significant number of rural residents are not always able to afford gas, and when price increase, such households reportedly revert to using fuelwood (IEA report Armenia Energy review 2022). There are plans to energy saving in buildings
  - Montenegro has transposed EU regulations on Eco design: technical requirements of eco-design for devices for solid fuel local space heating ( Regulation (EU) 2015/1185) and requirements of eco-design for boilers using solid fuels (Regulation (EU) 2015/1189)

# Technological Pathways to comply with the AGP technical provisions

## **SO<sub>x</sub> Annex IV:**

### **Large combustion plants and industrial plants (For Montenegro only)**

The following secondary measures can be used

- boiler sorbent injection
- dry sorbent injection (DSI)
- spray dry absorber (SDA)
- wet flue-gas desulphurisation (FGD)

possibly associated with the use of low Sulphur content solid or liquid fuels

# Technological Pathways to comply with the AGP technical provisions

## **NO<sub>x</sub> Annex V**

### **Large combustion plants and industrial plants**

A combination of primary and secondary measures

- combustion optimisation
- combination of primary techniques for NO<sub>x</sub> reduction such as air or fuel staging, flue-gas recirculation, low-NO<sub>x</sub> burners (LNB)
- selective non-catalytic reduction (SNCR)
- selective catalytic reduction (SCR)

# Technological Pathway to comply with the AGP technical provisions

## PM (Annex X)

- In all large combustion plants and industrial sectors covered:
- Fabric filters and electrostatic precipitators are the techniques recommended to able compliance with limit values implemented by the Annex
- When desulphurisation is also conducted, the following techniques are also available:
  - wet flue-gas, desulphurisation (FGD),
  - dry or semi-dry FGD system.

The proper sizing of the equipment is essential.

# Technological Pathway to comply with the AGP technical provisions

## PM (Annex X)

A key sector in the two countries, for which only recommended limit values were proposed in the AGP, is domestic heating with solid fuels.

- The role of policies related to energy efficiency and energy saving is crucial
- Use of most advanced appliances,
- The use of Code of good practices for wood burning and small combustion installations developed by UNECE, is recommended

# Technological Pathway to comply with the AGP technical provisions

## **VOC from solvent uses in certain activities (Annex VI)**

### **Industrial plants using solvents**

Depending on activities using solvents, primary measures (reduction of the solvent content of products, increase of efficiency of application devices, changes of products) and end of pipe techniques such as adsorption and oxidation

## **VOC from products (Annex XI)**

Development of products with a reduced solvent content, of products without solvents (water based or solvent free)

# Technological Pathway to comply with the AGP technical provisions

## **Mobile sources (Annex VIII)**

There is no production of vehicles nor of Non Road Mobile Machineries in Armenia and Montenegro

Only vehicles or NRMM compliant with standards enabling the lowest emissions should be imported (at least, equivalent to Euro 6 standards for road vehicles, EU regulation 2016 stage V for NRMM)



# General conclusions

- The technological pathways to comply with the AGP technical provisions are quite similar. LCP for Electricity production in Montenegro is being retrofitted. In Armenia, natural gas is used in large powerplants for electricity production. NO<sub>x</sub> emission reduction techniques could be used.
- Small domestic heating appliances using solid fuels remain a major challenge in the two countries:
  - Technical solutions for appliances exist but are not sufficient. Energy saving and energy efficiency are essential. Links to be made with energy and climate policies
    - Montenegro has transposed several EU directives such as the EU ecodesign and has extensive financial programmes to improve energy efficiency.
    - In Armenia the natural gas network is extended ( 96% of settlements are covered) but natural gas may be unfordable for rural residents.
  - The use of Code of good practices for wood burning and small combustion installations developed by UNECE is recommended

## General conclusions

- The adoption of provisions of several EU Directives such as the industrial emission directive, sulphur in fuels directive, etc. in the national legislative framework should enable the consistency with limit values of the AGP technical annexes for stationary sources IV (SO<sub>2</sub>), V (NO<sub>x</sub>), VI (VOC industry), X (PM) and annex XI (VOC paints).
  - for Montenegro in 2025-2028
  - for Armenia in 2029- 2032 (EU directives not covered by the CEPA agreement should be included additionally (VOC emissions from car refueling, VOC from industrial plants (Annex VII of IED))).
- By the implementation of the provisions of key EU Directives, both countries would be in the condition to comply with the requirements of the AGP technical annexes IV, V, VI, X and XI in particular their ELVs, tentatively between 2030-35, with different timelines according to countries

Thank you very much  
for your attention!  
Questions?

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