

ICP Materials

Contribution to the review of sufficiency and effectiveness of the Protocol to Abate Acidification, Eutrophication and Ground-level Ozone

Seventh Joint Session of the EMEP Steering Body and Working Group on Effects, online

13 September (15:00) - 16 September (18:00) 2021

Questions relevant for ICP Materials

- 2.5 a. What is the observed and projected trend in damage to materials and cultural heritage due to air pollution above critical levels and loads?
- 2.7 Is the monitoring and modelling system of the Convention sufficient to observe, assess and project air pollution and its effects related to the Gothenburg Protocol in the ECE region? If no, what are the main challenges and what is needed to meet them?) – discussed separately
- 2.8 What are the expected impacts of new scientific findings on environmental and health effects assessments
- => summarized in p36 in the draft report
- => technical annex prepared and available at request

Observed trends in pollution - decreasing

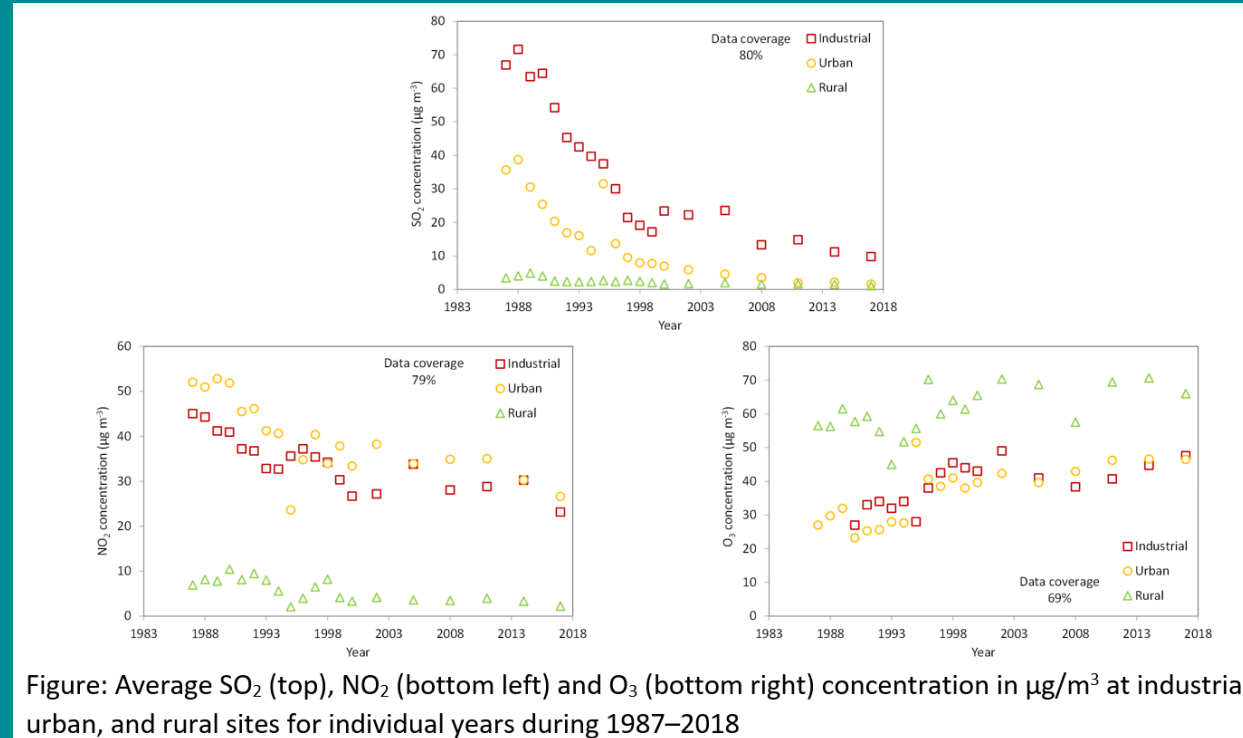
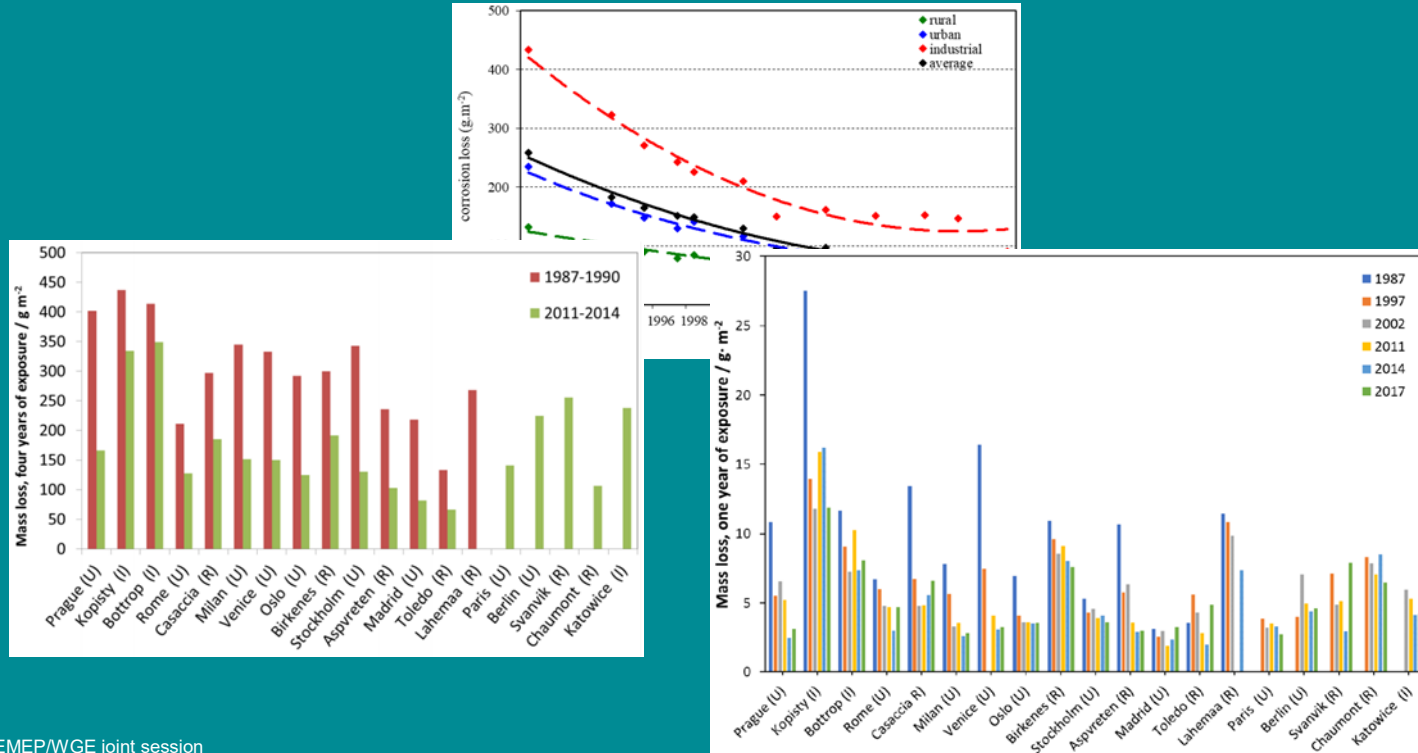


Figure: Average SO₂ (top), NO₂ (bottom left) and O₃ (bottom right) concentration in $\mu\text{g}/\text{m}^3$ at industrial, urban, and rural sites for individual years during 1987–2018

Observed trends in corrosion - decreasing



Observed trends in soiling – no trend

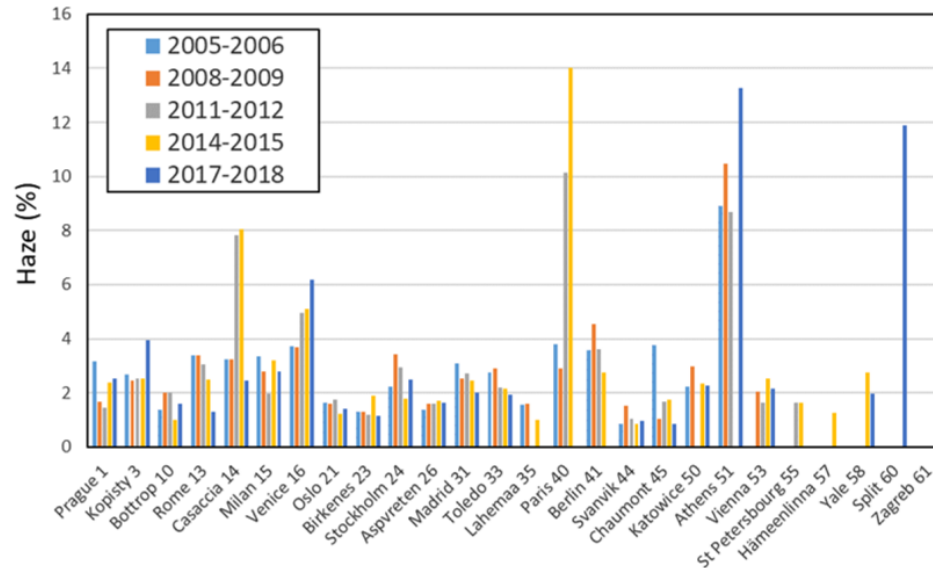


Figure: Comparison of haze (%) of modern glass for different exposure periods

2.5 a. What is the **observed** trend in damage to materials and cultural heritage due to air pollution above critical levels and loads?

- When looking at observed trends, corrosion and pollution have decreased significantly since the early 1990s and a shift in the magnitude was generally observed around 1997 from a sharp decrease to a more modest decrease or to a constant level without any decrease. SO₂ levels, carbon steel and copper corrosion have decreased even after 1997, which is more pronounced in urban areas, while corrosion of the other materials shows no decrease after 1997, when looking at one-year values.
- For soiling, there is no decreasing trend after 1997 and consequently larger areas in Europe are above acceptable levels, therefore the focus of future development of the programme is on exposure of new soiling materials, for example coil coated materials and stone materials. The main pollutant responsible for soiling of materials is particulate matter.

Projected trends

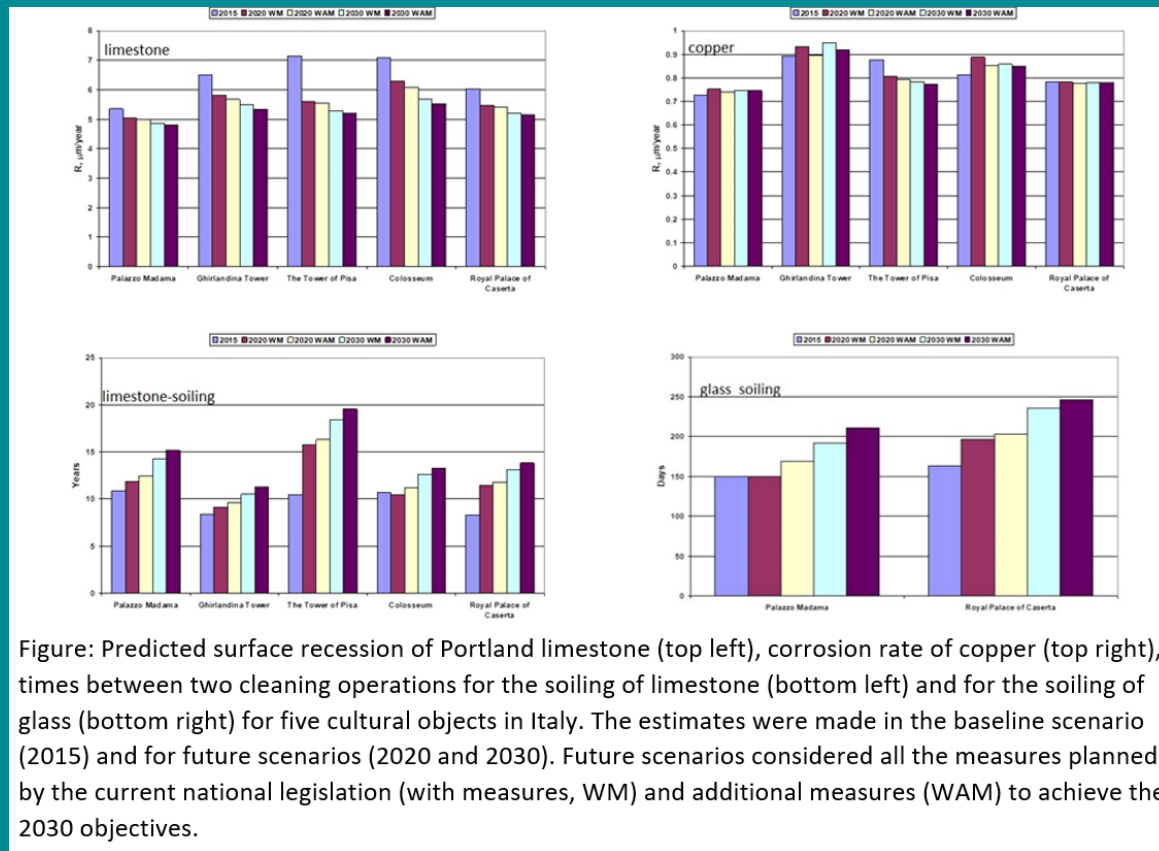


Figure: Predicted surface recession of Portland limestone (top left), corrosion rate of copper (top right), times between two cleaning operations for the soiling of limestone (bottom left) and for the soiling of glass (bottom right) for five cultural objects in Italy. The estimates were made in the baseline scenario (2015) and for future scenarios (2020 and 2030). Future scenarios considered all the measures planned by the current national legislation (with measures, WM) and additional measures (WAM) to achieve the 2030 objectives.

2.5 a. What is the **projected** trend in damage to materials and cultural heritage due to air pollution above critical levels and loads?

- It is possible to use ICP Materials dose-response functions to evaluate trends in damage, as has been demonstrated using air quality projections obtained with the Italian national model AMS-MINNI for the scenario years 2020 and 2030 performed on five historic and cultural monuments in Italy.
- If new official data is provided ICP Materials can make further analysis of projected trends in damage to materials.