

ICP Materials

Progress in activities in 2020-2021 and main messages

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

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

Contents

- Progress of current work plan items
 - Trends in corrosion, soiling and pollution
 - UNESCO cultural heritage sites
- ICP Materials web page update
- ICP Materials meeting 2022
- Proposed 2022-2023 work plan
- Summary of main results and messages (in format as text for minutes)

Progress in work plan items, ECE/EB.AIR/144/Add.2: 2020–2021 workplan for the implementation of the Convention

- 1.1.1.5 Impact of corrosion and soiling including trends
 - Environmental data report (2020) – [published on web page](#) as Report 87
 - Report of trends in corrosion, soiling and pollution 1987–2019 (2020) – [published on web page](#) as Report 88
 - Technical Manual 2017–2021 (2021) – [published on web page](#) as Report 91
 - Revision of the Mapping Manual to include soiling (2021) – proposal new Chapter 4 [published on web page](#) and ready to be submitted to CCE for processing
- 1.1.1.6 Policy-relevant user-friendly indicators (UNESCO sites)
 - Report focused on the relative importance of individual pollutants regarding the cost of damage for selected UNESCO sites (2020) – [published on we page](#) as Report 89
 - Report on application of models with increased resolution (1km x 1km) at selected UNESCO sites (2021) – [published on web page](#) as Report 90

Monitoring and assessment of
the impact on the environment
of corrosion and soiling effects
on materials and their trends

Exposure for trend analysis
2017-2021



Exposure for trend analysis 2017-2021

- Proceeds according to plans
- Samples to be removed end 2021 (1- and 4-year samples)
- First results presented 2022
- New trend report including environmental data 2023



Aspvreten exposure rack with samples 2021-02-01

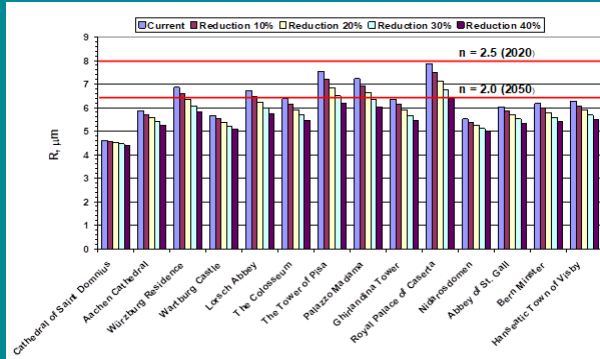
Revision of the Mapping Manual to include soiling – dose-response functions

- Non-transparent materials
 - Functions for painted steel, white plastic and polycarbonate membrane
 - Evaluation of reflectance
- Transparent materials
 - Functions for modern glass
 - Evaluation of Haze

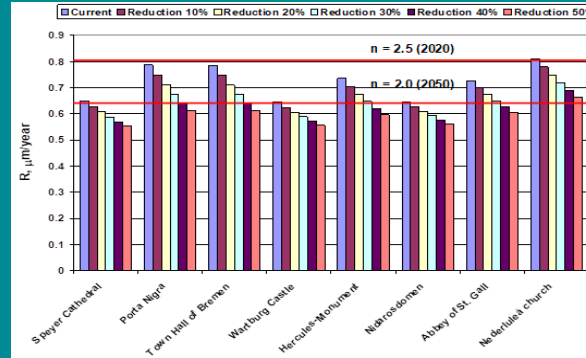
Revision of the Mapping Manual to include soiling – threshold levels

- For non-transparent materials (white painted steel and plastic, and polycarbonate membrane the lifetimes are calculated until 30% loss of reflection, for a selected PM10 background scenario, and it is suggested to use threshold cleaning intervals of 10 years (in year 2020) and 15 years (in 2050).
- For the soiling of transparent materials, it is recommended to use a threshold lifetime for 2050 calculated from a haze value of 1% for cultural heritage (and in sensitive situations), and from a haze value of 3% for technical constructions and the general stock of buildings.

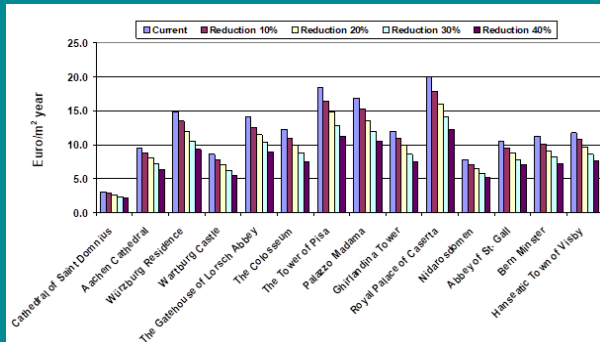
Pollutant reduction: effect on the cost



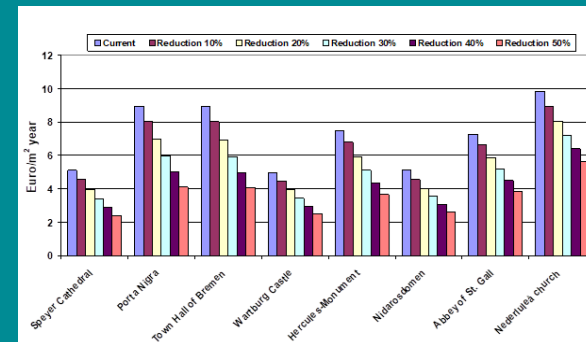
Limestone: surface recession rates reduction



Copper: corrosion rates reduction



Limestone recession: pollution costs reduction



Copper corrosion: pollution costs reduction

Depending on monuments and environmental conditions, 2050 target is achieved by pollutants reduction of 20-50% that allows a saving in maintenance/repair cost due to air pollution of 32-40% for both Limestone recession and Copper corrosion.

Application of models with increased resolution

18th-Century Royal Palace at Caserta with the Park, the Aqueduct of Vanvitelli, and the San Leucio Complex - Archaeological Areas of Pompei, Herculaneum and Torre Annunziata - Historic Centre of Naples - Costiera Amalfitana



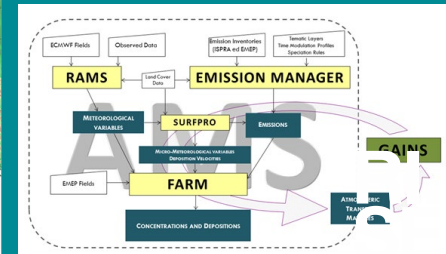
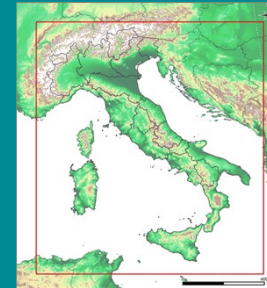
EMEP MSC-W

- ✓ EMEP50 with resolution of 50x50Km
- ✓ EMEP01 with resolution 01°x 01°long-lat (9x11 km at 40°N)



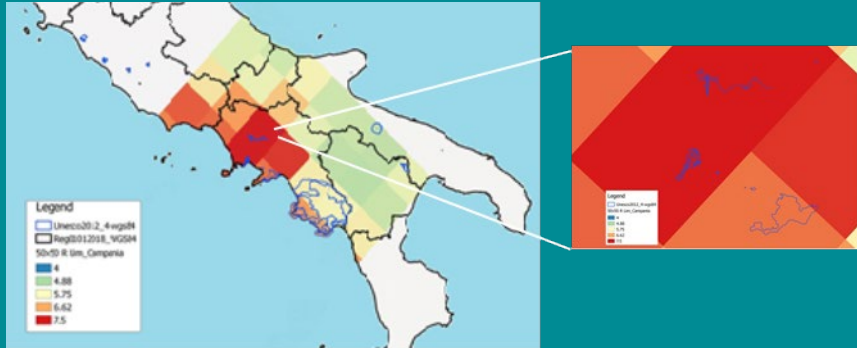
AMS-MINNI Italian national model

- ✓ resolution of 4x4km
- ✓ resolution of 1x1Km

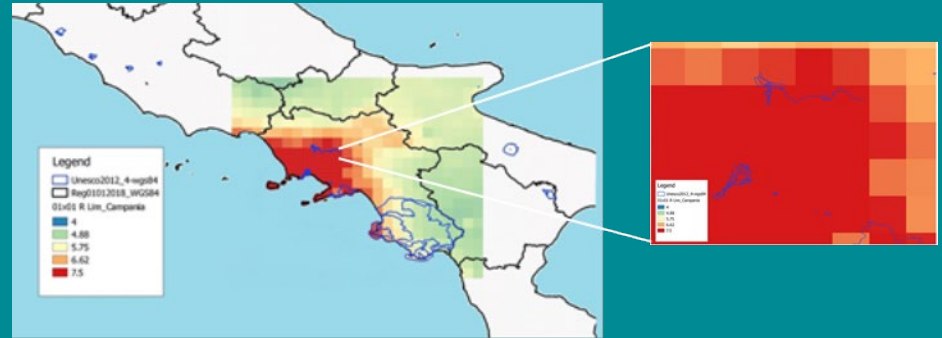


Assessment of air pollution risks to materials

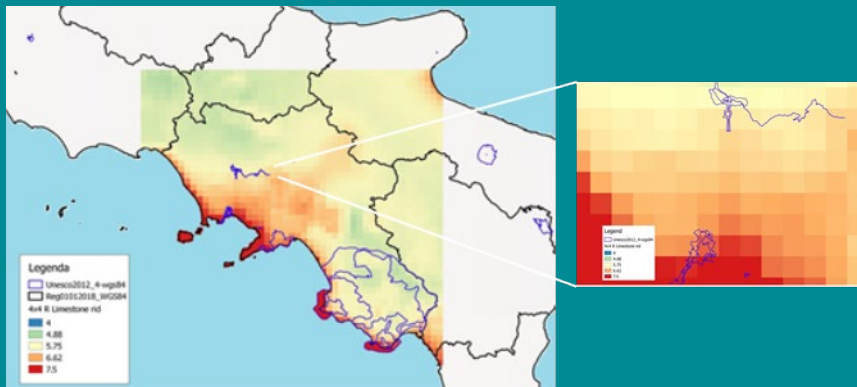
Limestone recession rate, μm , first year of exposure



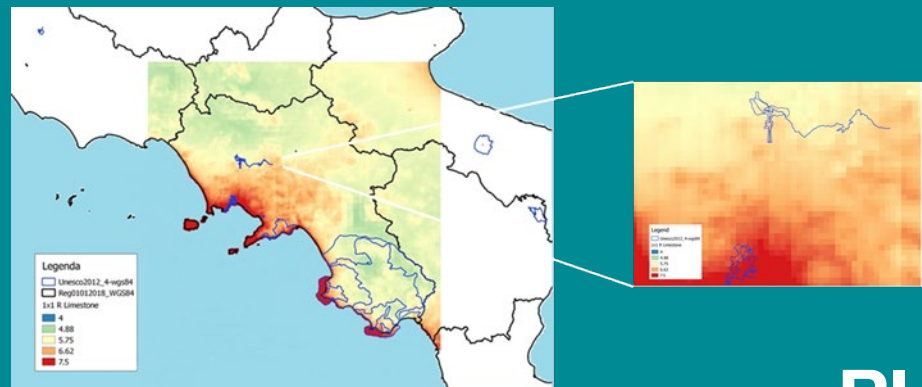
EMEP 50x50 Km Limestone Recession_zoom



EMEP 0.1°x0.1°long-lat Limestone Recession_zoom



MINNI 4x4 km Limestone Recession_zoom



MINNI 1x1 km Limestone Recession_zoom

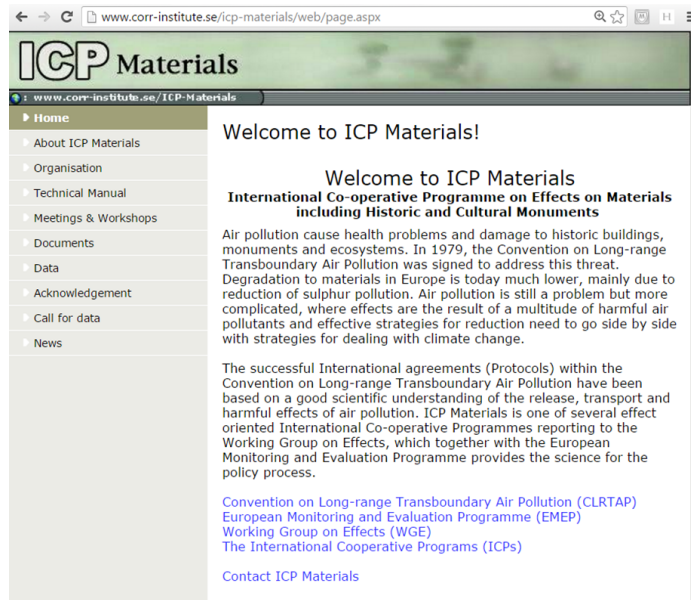
The concentration of a pollutant calculated in a cell of a grid represents the **mean value** of the concentration of that pollutant in the whole area of that cell, reducing the area of the cell improves the estimation of the concentration value of a pollutant in the zone of interest.

An increasing resolution of models permits to have more informations to assess the damage at heritage monuments due to pollutants in greater detail

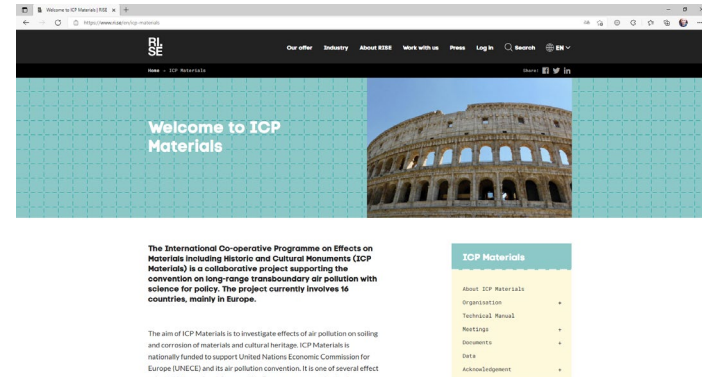
To assess the effect of air pollutants on specific cultural object it would be necessary an improved resolution at **urban scale**, e.g 0.1km, for having more precise estimation.

ICP Materials web page update, now hosted by ri.se

- Old



- New



- Old address still works
- Same content

37th meeting May 5-6, 2021, Teams

There were total of 26 participants from 16 countries, including the chair of the working group on effects.

Separate sessions, general and

- Exposure for trend analysis
- Update of mapping manual
- Update of dose-response functions
- UNESCO Cultural heritage sites





38th meeting
May 4-6, 2022

Welcome to Bochum
and the German
mining Museum!

This meeting was first
scheduled in 2020,
and then in 2021.

Proposal for 2022-2023 work plan

- Monitoring and assessment of the impact of corrosion on the environment and of soiling effects on materials and their trends
 - Report of corrosion and soiling data from the exposure for trend analysis 2017-2021 (2022)
 - Environmental data report (2023)
 - Report of trends in corrosion, soiling and pollution 1987–2021 (2023)
- Gathering information on policy-relevant user-friendly indicators to evaluate air pollution effects on materials by conducting case studies on UNESCO cultural heritage sites
 - Report Call for Data –Part VI: Study on the relationship between the environment and the artefact on selected UNESCO sites (2022)
 - Report on Call for data – Part VII: Application of models with increased resolution on selected UNESCO sites (2023)

Summary of main messages

1. The Head of ICP Materials reported on developments and the outcomes of the progress of activities 2020-2021 including update on the 2017-2021 exposure for trend analysis, status on the case studies on UNESCO cultural heritage sites and the revision of the Mapping Manual to include soiling. All deliverables for work plan items (2020-2021) have been finalized and published for open access at the ICP Materials home page.
2. The exposure for trend analysis 2017-2021 will be finalized this year with report on corrosion and soiling data in 2022 and reports on environmental data and the next major report on trends in corrosion, soiling and pollution in 2023. The next revision of the mapping manual chapter 4 is ready and include soiling of the non-transparent materials painted steel, white plastic and polycarbonate membrane as well as transparent modern glass.
3. Based on the call for data at UNESCO sites it is possible to estimate savings in maintenance / repair costs depending on different pollution scenarios. The estimation will be more accurate using the new models with increased geographical resolution.