

CONVENTION ON LONG-RANGE TRANSBOUNDARY AIR POLLUTION

International Co-operative Programme on Effects on Materials, including Historic and Cultural Monuments

Minutes of the 30th Meeting of the Programme Task Force

April 23-25, 2014, Swerea KIMAB, Stockholm, Sweden

Prepared by the Main Research Centre

Swerea KIMAB AB, Sweden

The thirtieth meeting of the Programme Task Force of the International Co-operative Programme on the Effects on Materials including Historic and Cultural Monuments was held in Stockholm, Sweden, on April 23-25th, 2014. The meeting was organized by Swerea KIMAB AB.

The meeting was attended by representatives from the following Parties to the Convention on Long-Range Transboundary Air Pollution: Czech Republic, Finland, Germany, Italy, Norway, Poland, the Russian Federation, Spain, Sweden, Switzerland and the UK.

1. Opening of the meeting

Johan Tidblad introduced the meeting, and firstly discussed the venue and the host city, followed by practical arrangements for the meeting including the excursion planned for 25th April 2014. All delegates then introduced themselves for the meeting.

2. Information from the local organizers

Eva Lindh-Ulmgren, of Swerea KIMAB gave a welcome address and presentation which gave details of the company and its activities.

3. Approval of the Draft Agenda

Johan Tidblad presented the draft agenda and it was approved.

4. Introduction

All participants had introduced themselves previously. A contact list was passed around to the delegates for approval/update.

5. Discussion of the 2013 work plan

- a) *Johan Tidblad* presented ICP Materials Report 72, Results of Corrosion and Soiling from the 2011-2012 Exposure Programme for trend analysis. No comments were given on this report and it was agreed that it could be published.
- b) *Stefan Doytchinov* presented ICP Materials Report No 73, Pilot study on inventory and condition of stock of materials at risk at UNESCO cultural heritage sites, Part III economic evaluation. This report has already been published on the ICP materials

website. After discussion related to calculation of pH effects (6a below) it was agreed to issue a corrigendum to the report.

Terje Grøntoft commented that the costs given in the report could be overestimated as the degradation rates were based on the DRF using data from the first year of exposure, which is known to give a higher rate of degradation.

Stefan Doytchinov agreed that the costs will be overestimated by using this assumption, and also that the cost model used was based on replacement of materials and not simply maintenance. Perhaps a steady state degradation rate could be used instead; however more accurate maintenance or replacement costs are not available at this time.

Johan Tidblad commented that the DRF's have been developed based on data from 1 year of exposure, and that whilst errors in the calculations must be recognised the DRFs are good enough for calculation of corrosion costs.

The report was approved by all.

- c) *Johan Tidblad* presented ICP Materials Report No 74, Results of the Exposure on Modern Glass 2008-2012 and Soiling Dose-response Functions, on behalf of *Aurélie Verney-Carron* who was unable to attend the meeting.

This report is not yet published on the ICP materials website as a scientific report will be published by *Aurélie Verney-Carron* first.

There were no suggestions for changes to this report.

6. Info from Working Group on Effects (WGE) and common work plan items 2014

Johan Tidblad introduced *Anna Forsgren* of the Swedish Environmental Protection Agency, which fund the ICP materials work carried out in Sweden. *Anna Forsgren* commented that generally there is now less money budgeted for environmental monitoring so that these activities are being streamlined. It is important to coordinate this streamlining across the EU so that the monitoring networks remain useful and accessible to all.

- a) Further implement the Guidelines on Reporting of Monitoring and Modelling of Air Pollution Effects. Priorities of monitoring and inventory tasks; status of mandatory and optional parameters.

Pasquale Spezzano presented information on pH, with respect to data taken from limestone exposure. After a discussion on possible change of status from mandatory to optional it was agreed to keep the status of pH as a mandatory parameter. Furthermore, calculation of $[H^+]$ from pH values should be explicitly explained in the mapping manual since the unit used for $[H^+]$ is not the commonly used.

Environmental parameters are measured based on legislation, so collected data can vary between urban and rural sites for example. It was agreed by all that PM10 should be an optionally reported parameter as often the data is collected at remote sites which

could influence the results. Sulphates and nitrates could become optionally reported parameters, but chlorides should remain a mandatory parameter.

In conclusion, the following changes are proposed regarding the status of reporting environmental parameters:

- Add PM10 as an optional parameter
- Change status of sulphate in precipitation from mandatory to optional
- Change status of nitrate in precipitation from mandatory to optional

- b) Enhance the involvement of countries in the Eastern Europe, the Caucasus and Central Asia, EECCA.

Vladlena Nikolayeva introduced the Scientific Research Institute (SRI) of St Petersburg. SRI has installed a materials test site, and there is a possibility to install a new test site in Moscow also.

Johan Tidblad commented that contact has already been made with Mr Romanov of SRI regarding possible involvement of Russia, and discussions should be continued regarding for example the possibility of translating some of the most important ICP materials documents into Russian to allow easier communications with EECCA countries.

It was commented that if EECCA countries were to become involved with ICP materials it could be difficult to maintain effective communication without interpreters at the meetings. For this reason, it would be beneficial for all delegates from EECCA countries to be English speakers if possible.

Tim Yates queried as to whether any EECCA countries were already active in atmospheric corrosion research, *Vladlena Nikolayeva* agreed to find out and report on any ongoing activities. A specific workshop could be setup to find out what they are currently doing and at the same time to inform and transfer knowledge on our methodology. Since the timescale is to start the next trend exposure in October 2014 it was agreed that there is insufficient time to try and get any other countries other than Russia involved in this year's exposures.

- c) Co-operate with programmes and activities outside the ECE region and provide information on them.

1. Information on standardisation within ISO TC 156 / WG4 (*Katerina Kreislova*).

Katerina Kreislova presented a review on methodologies and work on corrosion mapping methods. It is possible that this work will be published in the future (see 10.2). She furthermore informed about the upcoming new work item proposal on a technical specification of mapping procedures within ISO TC 156 Corrosion of metals and alloys.

2. Information on standardisation within CEN TC 346 (*Tim Yates*)

Tim Yates presented work that has been carried out by the CEN TC 346 on cultural heritage conservation, outlining the importance of common language within standards in order to enable effective communication between users.

- d) Information on the outcome of the 2013 ICP review and discussion of our response
(*Johan Tidblad*)

Johan Tidblad gave information about the ICP review as well as the recommendations which were:

- increased cooperation with ICP mapping & modelling;
- direct communication with other ICP groups;
- maintain focus on economic effects of air pollution on a regional scale;
- consider common workshops with other ICP and CCE groups.

Discussion took place over the interpretation of these four recommendations and what was best way to reply to them. Focus was mostly on the third point regarding economic effects of air pollution – one common suggestion was to create more maps relating corrosion to costs. Such maps could be combined with those originating from other ICP groups which could perhaps then assist in policy making for specific regions.

It was agreed that although the group communicate fairly regularly with ICP mapping, less communication is carried out with the other ICP groups. This is mainly due to the fact ICP materials have more in common with ICP mapping. Especially communication with EMEP could be worthwhile to improve.

Experience of meetings with other ICP group members within specific countries (Germany, Spain, Czech Republic or Italy) was shared, but the conclusion was that despite the meetings being interesting not much advantage was gained and the common issues to discuss between ICP Materials and the other groups were not many and therefore they have not taken place regularly.

7. Discussion of 2014 work plan

The document ECE/EB.AIR/2013/6: Draft work plan for the implementation of the Convention for 2014-2015

- (a) Quantify multi-pollutant effects on the corrosion and soiling of selected materials under different environmental conditions:

1. Report No 75 Environmental data report. October 2011 to November 2012
(*Terje Grøntoft*);

Terje Grøntoft presented Report 75, describing how several stations were missing certain data. Of interest were the SO₂ data which were consistently lower from IVL sensors than from independent monitoring stations.

Johan Tidblad reemphasised the importance of reporting all mandatory data from each test station. Each member of the group shall check for any missing data and send to *Terje Grøntoft* if available.

PM₁₀ was discussed and it was agreed that since it now quite a commonly monitored parameter this should also be reported if available and relevant. It is important to both verify the previously developed relationship between PM₁₀ and particle deposition on the IVL sampler as well as investigate the spatial dependence of particle deposition and concentration in order to find out if PM₁₀ data can be taken from a nearby station. *Johan Tidblad* is responsible for this.

The rainfall data from Athens requires to be checked for validity (*Terje Grøntoft*).

It was discussed how the data collection could be improved for the next trend exposure. Generally the environmental data reporting procedure was judged to be good by all.

Martin Ferm was in attendance during the second day of the meeting so that SO₂ variances between the IVL samplers and independent data sources could be discussed. *Martin Ferm* confirmed that checks have been carried out and that there should be no difference. Discussion was had regarding the sampling methods and techniques but no clear conclusion could be reached as to the source of the differences. It was agreed that differences between passive sampler measurements and reported concentrations from other sources should be compared on a site by site basis for the few cases where parallel measurements are available.

2. Report No 76 Trends in pollution, corrosion and soiling 1987-2012 including possibility for a thematic report using the REVIHAAP approach and cooperation with EMEP (*Johan Tidblad*):

Johan Tidblad gave a quick introduction to the REVIHAAP report with its emphasis on policy relevant questions and posed the question to the group of whether it was a good way to report ICP materials activities. The group concluded it was a clear and interesting way to present ICP materials work. Ideas about presenting corrosion rates vs. climate change data were given. It was deemed of importance to have data from real items of cultural heritage not only from samples, in order to deliver a clearer message about ICP materials work but that these data are scarce.

- i. Carbon steel (*Katerina Kreislova*)

SO₂ was shown to still be the dominant factor on the corrosion rate of steel. The corrosion rates of steel and weathering steel were similar for the 1 year data. The DRF was modified in order to make the data fit better, it was postulated that this was required due to the reduced levels of SO₂ which are now reported.

It was agreed that the DRF's may need revising due to reduced or changed level of pollutants, especially SO₂.

- ii. Zinc (*Markus Faller*)

All sites were categorised as being corrosion class C2 or C3 against the zinc data. 38% of samples were shown to be above tolerable corrosion, with 80% shown to be above background corrosion. The DRF did not correlate well with the data. Concerns about the effect the sheltered underside of the samples were raised.

- iii. Copper (*Johan Tidblad/Andrew Gordon*)
4 exposures of copper have been carried out since 1987. Corrosion of copper has been shown to have decreased by 50% since 1987; however, reduction in corrosion since 2000 has been minimal. The DRF was deemed to be ok, but could be improved. Using climate change assumptions of increased temperature, relative humidity and precipitation, the corrosion rate is predicted to increase. However, with decreasing pollutants the corrosion rate will decrease, so assumptions about the effect of climate change must be carefully managed.
- iv. Weathering steel (*Daniel De la Fuente*)
Weathering steel has been exposed two times since 1987, the corrosion rate has decreased by 67% since 1987, but this is based on the 1st year of exposure which is known to be a higher corrosion rate than subsequent years. Pollution can still be seen to effect corrosion rate in the data. Using climate change assumptions the corrosion rate is predicted to increase in the north but decrease in the south.
- v. Limestone (*Tim Yates*)
Generally the recession rate for limestone has decreased over time, and the spread of results over Europe is reducing. Previously SO₂ was the determining factor, but now this has changed to include also precipitation. Previous studies show recession rates of 100µm/yr in the 1950's, to about 8µm/yr in the 2000's. SO₂ concentration has decreased in the same period from around 300µg/m³ to 5µg/m³. However, the benefits of pollution reduction tend to lag by approximately 15-20 years.

The current DRF's do not correlate well with recent data, perhaps due to the reduced pollution. Today it is more common that buildings are soiled via bio growth than pollution effects, and rain is the determining factor in assessing recession rates.
- vi. Modern glass (*Aurélie Verney-Carron/Johan Tidblad*)
The report is not yet published on the website as *Aurélie Verney-Carron* will publish a paper soon. DRF's have been developed from the data generated from the exposures carried out during 2011-12. Some samples were not able to be analysed due to damage during shipment or contamination. Haze and deposition parameters were measured, and the data was fitted to a power law instead of the usual Hill's law. Temporal trends for deposition can be well fitted, and a new proposition for temporal trend of haze has been given.

As short discussion was had on the format of Report 76, and it was agreed that it can be based on the REVIHAAP approach, but still include all the data. The report should be written per policy relevant question, and discuss indicator materials and the possible effect on other materials. The wording of cultural heritage was discussed and it was concluded that it should be defined as being “exposed to outdoor environments” for the report. The effect of climate change was discussed and it was decided that *Terje Grøntoft* could provide valuable input to the selected scenarios, which should be the same for all materials. The report is due by December 2014, but the conclusions should be ready for the WGE’s meeting in September 2014. An outline report should be completed by May 15th 2014, and the SO₂ should be concluded by May 31st 2014.

3. Rules for data release and status of environmental data in relation to the decision to launch a common portal for the ICPs (*Johan Tidblad*). Discussion of possibility for common Meta data descriptions.

ICP materials currently adhere to the guidelines and rules on data availability by publishing all reports on the web page. It was suggested that the data could be presented in a more useable format such as a database, however, there is no requirement to do this and currently resources do not allow this to be done.

4. Update of mapping manual chapter 4 (*Johan Tidblad*).

The costs and stock at risk section need to be updated. “SO₂ and multi-pollutant situation” require to be defined in the manual. It is not simple to define this however, as it can be based on SO₂ concentration in the atmosphere, or when the SO₂ concentration is the most dominant function in the DRF. It was agreed to use multi-pollutant DRF as a default, especially for mapping scenarios in the future. The SO₂ dominating functions could be used when mapping past improvements for Europe or other areas where SO₂ is clearly dominating, but only after assessing this.

For sheltered conditions it was deemed impractical to recommend a suitable DRF due to a lack of data. There were also questions about the definition of sheltered. The manual shall be kept as it is, but the comment that “equations are available” should be replaced with “data is available”.

An acceptable level of O₃ for organic materials, which is mentioned in the manual, has an unknown reference. All delegates agreed to search to try and find where this reference originated from. It is possible it came from the first critical loads workshop in Bath, UK.

Time of wetness maps was deemed to still be useful and was decided to be added as an optional map described in the mapping manual.

- (b) Quantify multi-pollutant effects on the United Nations Educational, Scientific and Cultural Organization (UNESCO) cultural heritage sites (*Stefan Doytchinov/Pasquale Spezzano/Johan Tidblad*)

1. Plan for issuing a call for data on inventory and condition of stock materials at UNESCO cultural heritage sites (*Johan Tidblad*).

Pasquale Spezzano shall prepare a draft document with a description of the UNESCO call for data due by 15th May 2014 and shall be sent to *Johan Tidblad*.

8. Discussion of 2014-2015 work plan:

- (a) Technical manual for the trend exposure programme 2014-2015 (*Johan Tidblad*):

1. Discussion of network of test sites.

The following countries confirmed their participation in the trend exposure: Czech Republic, Germany, Italy, Norway, Poland, Russia, Spain, Sweden, and Switzerland.

The UK is to be confirmed by *Tim Yates*, Finland is to be confirmed by *Kauko Jyrkäs*. Yale University, USA is to be confirmed, *Johan Tidblad* will contact *Stefan Simon*. *Katerina Kreislova* will confirm the participation of Slovakia.

The final list of countries shall be made by 31st August 2014.

Exposures shall start in October 2014.

2. Discussion of included materials

Carbon steel, zinc, weathering steel (for new test sites only), limestone and glass all approved. Copper is to be confirmed by *Johan Tidblad*.

Stainless steel was proposed as a new material and *Katerina Kreislova* will send a list of suggested exposure sites to *Johan Tidblad*. Marking of samples shall be as per the manual, stainless steel shall be marked "S" and 2014-15 trend samples shall be marked with identification numbers 11, 12, 13 in accordance with guidance in the exposure manual. All samples must be at test sites at least two weeks in advance so that exposure can start on time.

3. Discussion of measurement of the environment (*Martin Ferm*).

Martin Ferm presented the alterations to the passive sampler design. *Johan Tidblad* shall distribute prices of the equipment to all delegates.

The possibility of reporting data between the "trend years" was discussed and *Terje Grøntoft* expressed willingness to collect data. However, before that it is proposed that *Johan Tidblad* send an enquiry to responsible sub centres regarding possible interest for this data.

- (b) Further development of activities targeted towards cultural heritage at UNESCO sites (*Stefan Doytchinov/Pasquale Spezzano*);

Updates to pollution data and microclimate effects will be carried out. Paris and Bath shall not be included in the updated report. Further work may include studies of new sites and/or other materials.

A corrosion map over Athens has been produced from environmental and pollution data taken from local air quality monitoring networks. Statistical interpolation methodologies were applied for estimating the spatial distribution of pollutants and the resulting corrosion map for limestone at a 500m² resolution, starting from data provided by a number of irregularly distributed stations.

Data used in the analysis of Berlin was deemed inaccurate; use of data shall be validated by contact with local experts for future work.

Katerina Kreislova shall send a corrosion map of Prague to *Pasquale Spezzano*.

Pasquale Spezzano confirmed that this work shall be report during 2015.

(c) Other special reports;

Johan Tidblad shall contact *Aurélie Verney-Carron* regarding feedback on soiling reports.

(d) 31st meeting of the Programme Task Force.

Johan Tidblad shall contact *Mr Romanov* of SRI in Russia. Proposed meeting dates of 22-24th April 2014 were approved, in either St Petersburg or Moscow.

9. Medium term work plan (2016-2017).

A call for data will continue through to 2016-17. New trend exposure cycle will cover 2014-17.

10. Dissemination of results

(a) Scientific publications:

1. Publication of soiling results (*Aurélie Verney-Carron/Johan Tidblad*).

Aurélie Verney-Carron will publish soiling results.

2. Encouragement of peer-review publication and publication of trend results 1987-2012 (*Johan Tidblad*)

Katerina Kreislova will investigate the possibility of publishing the work on mapping methods.

Stefan Brüggerhoff shall confirm the possibility of publishing recent work carried out regarding traffic risk in Germany that used ICP materials data. This is due to be finished in 2015.

(b) Brochures:

1. UNESCO sites (*Stefan Doytchinov/Pasquale Spezzano/Johan Tidblad*).

Pasquale Spezzano will produce an electronic brochure during 2014 or 2015.

2. Trends in corrosion, soiling and pollution (1987-2012) (*Johan Tidblad*)

Johan Tidblad will produce an electronic brochure during 2014 or 2015, which will be aimed at the Executive Body so that it can be used to aid policy decisions. Hard copies could be printed at Swerea KIMAB.

(c) Workshops and other ways of involving scientists outside ICP Materials;

No further workshops were agreed to be planned at the meeting.

(d) Development of web page:

1. Statistical information on visits (*Andrew Gordon/Johan Tidblad*).

Andrew Gordon presented data about the usage of the ICP materials webpage taken from Google Analytics software.

As during the 2013 meeting, general consent was that the website is outdated in its style and requires upgrading. However, it is unclear what purpose the website should serve: purely as a source of information for interested parties; or to attract interest from the public.

It is likely that soon the Convention will dictate the style of website required by ICP groups; therefore it is not sensible to invest in this work presently.

11. Financing of the programme.

- Czech funding to be confirmed but test sites are open for commercial operations.
- Italian funding (in kind) currently in place.
- German funding confirmed for 3 year period.
- Norwegian funding reviewed annually.
- Polish funding in place for next 2 years.
- Russian funding to be confirmed.
- Swedish funding reviewed annually.
- Swiss funding confirmed for 3 year period.

12. Any other business

- Calls for proposals within Horizon 2020: When a call for data is released delegates should communicate with each other. Work has been carried out on effects in tunnels by several delegates, and the effect of chlorides. A lack of standardised testing can be a problem when comparing data from different studies.

- JPI Call for proposal: No co-ordinated effort is done within the group.

Information on Eurocorr 2014 and the International Corrosion conference (ICC) was briefly discussed. *Katerina Kreislova* will be involved in organising Eurocorr 2017 as this will take place in Prague.

Attendees at meeting 23-25th April 2014

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<p>Mrs Vladlena Nikolaeva International cooperation section JSC "SRI Atmosphere" 7, Karbyshev st. St. Petersburg, 194021 Russian Federation vladenaboeva@gmail.com</p>	<p>Test site 55</p>

Also in attendance:

Eva Lindh Umgren, Swerea KIMAB

Andrew Gordon, Swerea KIMAB

Anna Forsgren, Swedish Environmental Protection Agency

Martin Ferm, IVL

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