

## CONVENTION ON LONG-RANGE TRANSBOUNDARY AIR POLLUTION

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

Minutes of Meeting for  
31<sup>st</sup> Meeting of the Programme Task Force

The meeting was held on April 22-24th, 2015, starting on Wednesday April 22nd at 09:00 and ending on Friday April 24th. The meeting took place at NILU, Kjeller.

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

1. Opening of the meeting  
Johan Tidblad opened the meeting.
2. Information from the local organisers  
Dr Kari Nygaard, CEO of NILU welcomed the participants of the meeting and gave an overview of NILU activities.
3. Approval of Draft Agenda  
The draft agenda was approved without any changes.
4. Introduction  
The delegates introduced themselves:  
Johan Tidblad, Andrew Gordon, Krzysztof Olendrzynski, Terje Grøntoft, Martina Ivaskova, Katerina Kreislova, Gunnar Skotte, Stefan Brüggerhoff, John Christodoulakis, Nadia Gladkaia, Tiina Vuorio, Aurélie Verney-Carron, Stefan Simon, Markus Faller, Ulrik Hans, Thor Ofstad, Pasquale Spezzano. Tim Yates and Daniel de la Fuente attended the meeting by video-call in the afternoon of the first day.
5. Discussion of 2014 Work plan:  
*The following reports were finalised in 2014 and the meeting was expected to approve the reports, with comments if necessary.*  
(a) ICP Materials Report No 75: Environmental data report. October 2011 to December 2012 (*Terje Grøntoft*);

No comments have been given since the report was presented at the last ICP Materials meeting in Sweden 2014. No other comments were given at this time.

It was commented that in general reporting of data has been good, pH and ion reporting however has not been so consistent. An indication of what type of sample is being reported i.e. passive, could be done in the future.

It was noted that if the data is put into open database in the future then they will be updated regularly.

- (b) ICP Materials Report No 76: Trends in pollution, corrosion and soiling 1987-2012 (*Johan Tidblad*);

Johan described how all data are presented in annexes of report.

The use of PM in DRF's and its inherent differences due to its constituent parts was discussed by the group. The difference between PM 2.5 and PM10 with regards to corrosion has not been investigated as yet, however, PM2.5 is part of PM10 so in effect is the most important. PM2.5 is seen as being the most important with regards to health issues, so it would be interesting to know which PM is the most important to corrosion.

Regarding limestone degradation more data is required in order to explain how much freeze thaw is now affecting degradation rates on this material. New types of samples would perhaps be required to investigate this. Variation in samples (quality) becomes more important as "natural" degradation becomes more important and anthropological effects less so.

According to the data presented in the report weathering steel corrodes faster than carbon steel after 1 year of exposure. After a longer period however, carbon steel corrodes at a faster rate. Therefore result interpretation is critical; an explanation of the data should be given in the report so that the reader understands the trends.

It was discussed if the format of all UNESCO reports should be similar. It was agreed that the relevant policy questions should be contained within the reports, however care should be taken so that all experimental conditions are also detailed in the reports. It was also noted that due to the reduction of SO<sub>2</sub> it is important where SO<sub>2</sub> is reported that its sources also be detailed so that new policy can be made accordingly. The same can also be said PM sources, as well as its constituents.

As of 2017 EMEP data will be reported on a higher grid resolution. ICP materials should request to EMEP if it requires historical data to be recalculated on the new grid.

- (c) New version of Mapping Manual (*Johan Tidblad*)

The translation to Russian was discussed. Nadia Gladkaia offered to check the final version of chapter 4. Krzysztof Olendrzynski shall contact Anna-Christina Nadal regarding who and when will it be translated, and if ICP materials will be involved.

6. Information from WGE/CLRTAP and common work plan items 2015, specifically:  
 (a) Information from the secretariat including information of WGE trend report and LRTAP assessment report (*Krzysztof Olendrzynski*)

Mr. Krzysztof Olendrzynski from the LRTAP Convention (CLRTAP) Secretariat gave an update on the activities under the Convention. He presented the highlights of the 33<sup>rd</sup>

session of the Executive Body (December 2014) and the recent meetings of the Bureau of the Executive Body, the Extended Bureau of the Working Group on Effects (WGE) and of the EMEP Steering Body (March 2015). The EMEP and WGE communities are preparing a report on long-term trends of air pollutant emissions, depositions and their adverse effects. The main results from this trend report will be fed into the “2016 Assessment Report” a comprehensive report (to be completed in 2016) on the Conventions’ achievements and the remaining challenges.

The UN ECE secretariat is carrying out a comprehensive capacity building program to help countries in Eastern Europe, the Caucasus and Central Asia to ratify and implement the Convention and its latest three protocols. The “Environment for Europe” – ECE’s ministerial conference (Batumi, Georgia, June 2016) will focus on efforts to improve air quality. Air quality will be one of the two key themes for the Conference. He also informed about some recent air pollution related decisions and activities by WHO and UNEP.

With regards to the trend report it was noted that information on the effects of nitrogen and PM pollution from ICP materials perspective would be useful as this is being discussed now.

The contribution from ICP Material to the EMEP/WGE trend report was discussed and a number of detailed recommendations were made:

Add uncertainties/error bars to carbon steel diagrams in trend report.

Clarification of why the dates “1718 to 1987...” are used in limestone section (1.1.1). Add explanation on differences between metallic and stone materials – porous structure, how this relates to the time lag in response.

In table X, “HN<sub>4</sub>” should be NH<sub>4</sub>.

In table X, “X” and “(X)” could be changed to “M” and “O”.

In climate change section, more explanation could be given to allow easier understanding of the reasoning behind the conclusions.

In Figure X the term “(m)” used with some of the materials should be defined.

The wording of the report should be made simpler with all definitions, as audience will be very wide. All data should be described so that it is clear if it is annual or whatever.

In “Conclusions”:

1<sup>st</sup> para: Define which materials the conclusions relate to. “...in recent years” be more specific. “stone materials” also too general, define which materials have been studied.

“...values measured in 1987” change to “late 1980’s”, and reference that these measurements are those taken by ICP materials.

2<sup>nd</sup> para: “non-polluted” should be “less polluted”. “targets are exceeded” by how much? Enter some figures here, and define by how much and where exactly (in Europe?).

3<sup>rd</sup> para: Rephrase last sentence to avoid it sounding like a criticism “climatic change might influence the conclusions of this work...etc”.

- (b) Enhance the involvement of countries in the Eastern Europe, the Caucasus and Central Asia (*Nadia Gladkaia*);

Nadia Gladkaia of JSC SRI atmosphere (St Petersburg) presented information regarding a planned congress meeting (EECCA countries) that will be held in September 2015. It may

be possible to present ICP materials at this meeting to generate interest. It was suggested that Johan Tidblad could represent ICP Materials at this congress. St Petersburg is seen as a good target audience for cultural heritage conservation; however local support for such a group as ICP materials is unclear. There exists a cultural heritage group who carry out measurements but data is not shared. Support could be difficult as financial benefit must be demonstrated.

Suggested dates for the 2016 ICP meeting in St Petersburg were given as April to June, and in June there is a congress at same time and so this could prove beneficial as a place to present ICP Materials to EECCA representatives. However, due to the WGE meeting in September, the deadline for ICP documents is June. Therefore it was decided that the meeting should take place in approx. April/May. It was suggested that a representative of ICP Materials could be sent to the congress in June instead.

(c) Information of activities of ICP Waters (*Gunnar Skotte*)

Gunnar Skotte of ICP Waters presented an overview of activities completed within this ICP.

7. Discussion of 2015 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. Collection of environmental data 2014-2015 (*Terje Grøntoft*);

Terje Grøntoft requested that members use only the new spreadsheet to report data, due to changes from previous versions.

It was reported that the optional data is generally not being used in analyses, however it could be useful in future work.

Any changes to stations or reporting should be sent to Terje and Johan for future updates to the Technical manual.

In comparison to 2011-2012, it has taken up to 2 years to gather all data.

2. Discussion of evaluation of samples after the trend exposure 2014-2015 (*Johan Tidblad*):

i. Carbon steel and stainless steel (*Katerina Kreislova*)

Sulphur trends have increased at Kopisty during recent years.

Aluminium corrosion has initiated after 2 years.

There is a need to monitor Cl<sup>-</sup> deposition due to its effect on stainless steels. Some stainless steel samples will be taken down after 1 year for evaluation. Next exposure more samples will be prepared for longer

exposures. These will be evaluated for deposits, pitting and mass loss.

ii. Zinc (*Markus Faller*)

Sites with low SO<sub>2</sub> could be interesting to investigate further. Both zinc material types used (Swiss and Czech) will be evaluated. More comparisons between zinc data will be difficult due to lack of pure zinc samples. Titanium zinc has similar corrosion resistance to pure zinc, so it is possible to use this material instead.

iii. Copper and aluminium (*Johan Tidblad*)

Al samples to be withdrawn fall 2015 after 4 years of exposure (3 samples per site).  
Cu samples to be withdrawn 2015 after 1 year of exposure (3 samples per site).  
No other comments.

iv. Weathering steel (*Daniel De la Fuente/Skype*)

Daniel De la Fuente presented results of the 2011-2012 trend exposure of weathering steel samples. Comparison was made to the results from 1987-1988 where corrosion rates were generally higher. The samples have been evaluated for adhesion and appearance of corrosion products. It was suggested that there is a presence of biological material on the samples surfaces.

v. Limestone (*Tim Yates/Skype*)

Tim Yates presented an overview of the recession rates of limestone samples from 1987 to 2012, which have generally reduced with time. Differences in sample materials were discussed and it was concluded there is little evidence to suggest that sample materials from different quarries have affected the quality of the results.

Current methodology of building surface recession rates have been developed from measurement of natural rock surfaces (placement of holes into surface). An alternative could be to cover a surface so that weathering does not occur and then compare this to an exposed surface. It was suggested that it could be worthwhile gathering info on other methods used elsewhere.

It was discussed that due to the small size of ICP Materials' limestone samples it is probable that free-thaw effects are not as accurate as on larger samples. Frost damage tends to be small areas detaching on horizontal surfaces first, and then progressing from there. Increased rate of dissolution tends to be coupled to salt. It could be investigated how frost affects this. The samples currently used have quite good frost

resistance. In general more information required for cost assessments.

vi. Modern glass (*Aurélie Verney-Carron*)

Aurélie Verney-Carron presented her work. Carbon analysis has not been possible, so the planned scientific paper is on hold. However mass increase and haze of samples has been measured. DRF's have been tested with new data. Climatic parameters could be added to DRF. Interactions of SO<sub>2</sub> and NO<sub>2</sub> and PM, and size distribution of PM and BC could be added.

A climate chamber will be used to test effects of climate (RH) and pollution (SO<sub>2</sub> and NO<sub>2</sub> concentrations). PM size injected to chamber is measured. Differentiation between PM<sub>2.5</sub> and PM<sub>10</sub> is important for correlation to field data. Characterisation of sites has been done by micro-analysis of particles collected on samples. However, the function cannot but adjusted as yet. Tests have duration of approx. 1 or 2 weeks. Interaction of different pollutants will be analysed by haze. XRD has been tested but it has proved difficult due to the glass, as was the case with Raman spectroscopy.

3. Update of technical manual, contents and format (*Johan Tidblad*)

The layout and content of the technical manual was discussed within the group. It was agreed that the technical manual should include all historical information (disused test sites, marking of samples, etc.) in case of future statistical analysis of data. Also, all statistical analysis tools that have been used should be described, so that it covers all methodologies.

The document could be sectioned so that it starts as a guide of how to expose samples, then all detailed information of test sites etc. could be in an annexe. A diagram showing when test site has been active: histogram for example could be used to show which sites have been active when. Such a diagram is in the environmental report.

Johan will request data and descriptions from each new test sites, and where help is required for historical sites.

i. Presentation of new test site in Finland (*Tiina Vuorio*)

Tiina Vuorio of the HAMK sheet metal centre, presented information about the new test site at Hämeenlinna. Corrosion rates have been estimated from environmental data, excluding chlorides. Rates have been calculated for each available environmental test site in Finland, all of which are C2 according to ISO 9223. The site number is 57.

ii. Presentation of new test site in Slovakia (*Martina Ivašková*)

Martina Ivašková of the University of Žilina presented information about the university and the new test site. The test site number is 59.

iii. Presentation of new test site in USA (*Stefan Simon*)

Stefan Simon of Yale University presented information about the proposed new test site. There were several choices of test site location. It was concluded that it would be more convenient to have the site near the laboratory (in the courtyard at Stefan's dept.).

An exposure start date of Autumn 2015 was agreed.

Johan to notify all subcentres of Yale site start, possibility for extra samples etc. and supply of materials from each sub-centre.

Numbering of test site: Keep 56 open for Moscow (or other), use 58 for Yale. Rename site to New Haven – Stefan Simon to send proposal to Johan.

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

1. Report from UNESCO sites, Part IV;

Pasquale Spezzano presented the report on UNESCO sites part IV. It was suggested that local models for pollutants could also have been used in the report. Prague was given as an example which has some recent models that could be used in this report.

It was also suggested that it could be good to compare observed corrosion rates with modelled corrosion rates. Soiling was discussed but it did not feature in this work so far.

Johan to ask Tim Yates for info on limestone soiling.

Pasquale shall contact sites for information on soiling. Soiling to be mentioned in the report.

Regarding the calculation of degradation rate of limestone: it was generally agreed that relative change of degradation rates is more representative.

Report timing: it is planned to present the report to Geneva in September 2015. Report to be reviewed by all (now on website). Feedback to be given by end of May/start June.

2. Plan for issuing a call for data on inventory and condition of stock materials at UNESCO cultural heritage sites;

It was agreed that UNESCO would be a good place to start for sending out the call for data.

The spreadsheet should include “on voluntary basis” for additional information section.

Approval by Executive Body is not required for this work, only by the WGE.

It was discussed that some questions, such as “State of conservation” – are difficult to answer/describe. Perhaps it would be good to give suggested answers in the spreadsheet. An example spreadsheet could also be included so that users have an idea of how to fill in the form. The form will be sent out with some marketing material showing how the users will benefit from this exercise.

It is possible that the required data would maybe have to be sourced from a secondary place outside the item of interest (cultural heritage authority) such as ministry of environment. Therefore a two step approach could be used: gain interest from cultural heritage site, then from the contact point for data.

Regarding the number of sites from which data is being sought, if small (5-10) then a more targeted approach can be used. If more, then the suggested 2 step approach could be used. Perhaps a 3 step process could be used: an extra step involving a screening process whereby only sites with air pollution problems are included. Alternatively preliminary work could identify sites with air pollution problems by using existing available data on air pollution.

A targeted approach to members of UNESCO which have traditional interest in cultural heritage, i.e. Italy, Germany, Spain could be applied. This can then be taken further to UNESCO.

3. Brochure of UNESCO sites accompanying the call.

The brochure was presented by Pasquale, and generally it was deemed to be too technically detailed – perhaps it is necessary to simplify the content for a broader audience?

All were requested to send feedback on brochure etc. to Pasquale. Research interesting sites – vs air pollution effects. Pasquale to contact UNESCO in Italy.

8. Discussion of 2016-2017 work plan:

(a) Trend exposure programme 2017-2018 (*Johan Tidblad*):

Will take place according to plan.

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

Finalise call for data. Work shall begin in 2016, therefore a status report could be

published end 2017.

- (c) Discussion on economic assessment of corrosion and soiling of materials including cultural heritage (*Johan Tidblad*);

The possible update of report 65 (from 2010) was discussed with the information from literature. It was generally considered to be a worthwhile exercise but will depend on the available budget.

Additional info from Tim Yates may be available, Johan to contact.

- (d) 32<sup>nd</sup> meeting of the Programme Task Force (2016).

St Petersburg May 11-13<sup>th</sup> 2016 proposed. (Or possibly week after 18-20<sup>th</sup>)  
Nadia will issue personal invitations in order to allow visas.

## 9. Medium term work plan (2018-2019).

No comments at this stage.

## 10. Dissemination of results:

- (a) Development of a metadata description of ICP Materials data and possible subsequent publication of data (*Johan Tidblad / Katerina Kreislova*).

There are no current entries on Wikipedia about ICP materials. This could be something that the group could change.

The EMEP portal was given as a good example of data dissemination. It was discussed how ICP Materials currently stores its data. NILU stores environmental data as spreadsheets. Yearly trend values are easily available, currently in Report 76. Monthly values are not.

It was agreed that to have all corrosion data centrally would be very valuable. However, care should be taken over how recent the data is that is made available – to avoid unwanted use of the data by only publishing older data (more than 18 months old).

The main benefits of publishing the data would be citation in papers that use ICP data. It was stated that there should be an accompanying paper regarding the publishing of the data.

Regarding funding of this work “Openair” project via horizon 2020 was suggested as a possibility. The level of funding required is unclear at this stage and depends on the level of ambition.

1<sup>st</sup> step: sub-centres send files to JT. JT to write a letter to all sub-centres requesting this.

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

More communication with EMEP & MSC west about their models is required. Specific

data that are needed by ICP materials should be given. Johan to contact Hilde.  
Information on PM from organisations looking at health effects could be collected.  
Johan could contact task force on health.

- (c) Development of web page including statistical information on visits (*Andrew Gordon/Johan Tidblad*).

No changes to website other than scheduled updates of information and reports.  
Statistics on website visits show an unusually high number of visits during March 2015.  
These visits were not traceable by IP address which seems odd.

## 11. Financing of the programme and discussion of relevant H2020 and other European calls.

Information on Horizon 2020 was given: “are there any research gaps?” “Does climate change lead to increased effects of air pollutants?” Most likely the call on disaster resilience requires more than what is currently done within ICP materials since it mentions extreme events.

Sweden: Annual funding decision, financing at same level as previous year.

Norway: Same as 2014, annual funding decision.

Slovakia: 2015 funding in place, 2016’s funding to be decided in Nov 2015.

Czech: Annual financing decision.

Germany: Current budget until April 2016, expected to be extended by 2-3 years.

Greece: Annual funding decision.

Russia: 2016 funding approved.

Finland: No direct funding, expenses covered by other projects.

France: 2 year funding in place.

USA: No funding in place yet.

Switzerland: current 4 year funding due to finish in 2016.

Italy: annual funding decision.

## 12. Any other business.

Passive samplers: Nitric acid samples have arrived at test sites broken (top ring) (Markus, Aurélie, Tiina). IVL to answer as to why this may occur? Johan to contact IVL.

Stefan B: Translation of German ICP brochure to be completed by June 2015 and distributed to all ICP members.

Krzysztof pointed out the possibility for present national work at the WGE/EMEP meeting in September 2015.

Katerina presented recent efforts of mapping in the Czech Republic.

Stefan B will summarise results of national traffic project into English and disseminate to ICP group members.