CONVENTION ON LONG-RANGE TRANSBOUNDARY AIR POLLUTION (LRTAP)

WORKING GROUP ON EFFECTS (WGE)

INTERNATIONAL COOPERATIVE PROGRAMME ON EFFECTS OF AIR POLLUTION ON NATURAL VEGETATION AND CROPS (ICP VEGETATION)

Minutes of the 29th Task Force Meeting

The twenty-ninth meeting of the Programme Task Force was held from 29 February – 3 March, 2016 in Dubna, Russian Federation. The meeting was hosted by the Joint Institute for Nuclear Research (JINR).

1. The meeting was attended by 90 experts from 33 countries, including Albania, Azerbaijan, Belarus, Bulgaria, Cuba, Czech Republic, Egypt, France, Georgia, Germany, Greece, Guatamala, Hungary, India, Italy, Japan, Kazakhstan, Macedonia, Mongolia, Norway, Poland, Romania, Russian Federation, Serbia, Slovakia, Slovenia, Spain, Switzerland, Turkey, Ukraine, United Kingdom, USA and Vietnam. Participation included a representative of the Secretariat of the UNECE LRTAP Convention, a representative of EMEP/MSC-East and the Head of the Programme Centre for ICP Forests.

2. The Programme Task Force adopted the agenda of the meeting.

3. The welcome address was given by Mr. Victor A. Matveev, Director of JINR. He reported on the 60-year history of JINR, its scientific achievements and its international collaboration; JINR has currently 18 member states and bilateral agreements with six other countries.

4. In the first plenary session, Mr Krzysztof Olendrzynski, on behalf of the Secretariat of the LRTAP Convention, provided an update of the UNECE LRTAP Convention, reporting on:
   - Convention and its Protocols, policy – science links;
   - Update on science (EMEP, WGE);
   - Draft 2016 Assessment Report – a major science report of the Convention;
   - Update on policy (53rd session of the Working Group on Strategies and Reviews (WGSR), 15-17 December 2015 and 34th session of Executive Body, 18 Dec 2015);
   - Update on capacity building activities;
   - Update on outreach activities within and outside UNECE region and communications.

5. Mr Harry Harmens (Chair of ICP Vegetation, UK) gave an overview of the activities and achievements of the ICP Vegetation in 2015. Important deliverables were:
   - Brochure on 'Changing ozone profiles in Europe: implications for vegetation';
   - Brochure on 'Climate change and reactive nitrogen as modifiers of vegetation responses to ozone pollution';
   - Contributions to the Working Group on Effects (WGE) report on 'Trends in ecosystem and health responses to long-range transported atmospheric pollutants';

- Epidemiology and Critical Levels Methodology Workshops, 23 – 25 November 2015, Hindås (nr. Gothenburg), Sweden.

He also described progress with the 2015/16 Moss Survey, with participation extended in South-eastern Europe (SEE), Eastern Europe, Caucasus and Central Asia (EECCA), and other parts of Asia, and progress with other deliverables for 2016, including:

- Brochure on 'Field evidence of ozone impacts on vegetation in ambient air (2007 – 2015)';
- Brochure on 'Impacts of ozone pollution on biodiversity';
- Contributions to the LRTAP Convention Scientific Assessment Report 2016 'Towards Cleaner Air'.

Mr Harmens stressed the importance of the contributions of Parties and their experts to the work of the ICP Vegetation and thanked them for those contributions.

6. Mr. Walter Seidling (Germany), Head of the Programme Coordination Centre of the ICP Forests, reported on the ICP Forests network as a monitoring and research platform. He described the need for long-term planning for forest monitoring, reported on the lack of a relationship between sulphur deposition or sulphur dioxide concentration in air and forest crown condition in the last 20 years, highlighted the co-benefits that can be achieved by combining data analysis from ICP Forests and other ICPs were monitoring sites are co-located, and provided examples of additional assessments at level II sites.

7. Mr. Ilia Ilyin (Russian Federation), representative of EMEP/MSC-East, reported on new analyses of long-term trends of atmospheric heavy metal pollution in EMEP countries based on moss survey data and EMEP modelling results. He showed that long-term trends (1990 – 2010) of modeled total deposition and concentrations of heavy metals in mosses agree well. Both deposition and concentrations in mosses showed similar relative reductions for Europe as a whole and in most individual countries. Modelled deposition in the whole EMEP domain for lead, cadmium and mercury had declined by 78%, 53% and 23% respectively between 1990 and 2012.

8. In the second plenary session, Ms. Marina Frontayeva (Russian Federation), Head of the Moss Survey Coordination Centre, provided an update of participation in the 2015/16 moss survey, highlighting the increased participation of countries in Easter Europe, Caucasus and Central Asia. Ms. Gina Mills (United Kingdom), Head of the ICP Vegetation Programme Coordination Centre, reported on preparations for the ozone critical level workshop, to be held early November 2016 in Madrid, Spain. One preparatory workshop on methodology was held back to back with an epidemiology workshop late November 2015 in Hindås, Sweden. Another preparatory workshop will be held early June in Deganwy, UK, focusing on ozone dose-response relationships. Mr. Ignacio González Fernández described progress made with establishing critical levels for effects of ozone on biodiversity. He emphasized the lack of information for ozone impacts on plant diversity and concluded that ozone critical levels set for effects on aboveground biomass may not protect from long term effect on plant diversity (mediated by effects on seed and flower biomass) in Mediterranean annual pastures. Finally, Mr. Robert Šajn (Slovenia) described the applicability and advantages of artificial neural networks for predicting concentrations of chemical elements in various environments using various case studies.

9. The next six sessions consisted of two parallel sessions considering the ozone and moss survey sub-programmes. The topics of oral presentations and discussions in these parallel sessions are provided in Annex III. For further details on the content of the oral presentations we refer to the book of abstracts available on the ICP Vegetation web site

(http://icpvegetation.ceh.ac.uk). In addition, over 30 posters were presented during the meeting, covering similar topics as the oral presentations. Further details of the content of the poster can be found in the book of abstracts.

10. In the ozone sub-programme, the sessions had the following themes:

    - Ozone concentrations, fluxes and effects on vegetation;
    - Global outreach: (1) Ozone effects on food security; (2) Ozone effects on carbon sequestration and biodiversity;
    - Ozone critical levels methodology;
    - Mapping ozone risks.

11. In the moss survey sub-programme, the following issues were discussed:

    - Case studies of monitoring trace elements in Southern-Eastern Europe and the EECCA region;
    - Improvements of the moss survey and further exploitation of data;
    - Mosses as biomonitors of radionuclides;
    - Outreach beyond the UNECE region;
    - Future activities and opportunities.

12. In the final plenary session, a summary of the parallel sessions was provided, and conclusions and recommendations were presented, discussed and adopted by the Task Force as described in Annex I. An updated medium-term workplan (2016-19) was agreed and adopted by the Task Force (see Annex II). Mr. Harmens (UK) drew attention to various workshops and conferences in 2015, particularly the ozone critical level workshop in November 2016 in Spain and a preparatory meeting in June 2016 in the UK. The Task Force accepted the offer from Poland to host the 30th Task Force Meeting of the ICP Vegetation in Poznan, scheduled for 14 - 17 February 2017. The Task Force took note of an offer from Romania and India to host a future Task Force meeting.

13. On behalf of the Task Force, Mr. Harmens (UK) closed the meeting by thanking the Joint Institute for Nuclear Research (JINR) for hosting and funding the meeting. Mr. Harmens acknowledged the UK Department for Environment, Food and Rural Affairs (Defra), the United Nations Economic Commission for Europe (UNECE) and the Natural Environment Research Council (NERC) for their continuous financial support of the ICP Vegetation Programme Coordination Centre. Last but not least Mr. Harmens thanked the participants of the ICP Vegetation for their valuable contributions to the programme.

Annex I.
Decisions and recommendations by the Task Force of the ICP Vegetation as agreed at its 29th meeting, 29 February – 3 March 2016, Dubna, Russian Federation. Recommendations for workplan items for 2018 -2019 are included in Annex II.

OZONE RELATED ACTIVITIES:

- New datasets were identified for the derivation of critical levels for crops (wheat and salad crops).

- There is a need to improve communication with crop breeders regarding impacts of ozone on crops globally;

- Expand the network for ozone gardens (containing ozone-sensitive species) across Europe as a main biomonitoring activity to collate further evidence of impacts of ambient ozone;

- Further collaboration with the ICP Forests on the possible development of a critical level for visible ozone injury on tree species;

- Further development of a database for setting critical levels for biodiversity;

- Review the option of having a call for data after the ozone critical level workshop (November 2016, Spain) and in time for the next revision of the Gothenburg Protocol;

- There is a need for new experimental data to support future development of ozone critical levels. Much of the current data is from the period 1980 – 2000, when ozone profiles in Europe where different (higher peaks, lower background);

- Encourage further collaboration with EMEP (particularly MSC-West), including:
  - Participation in ozone critical levels workshops;
  - Provision of information on the parameterisations used with mapped flux data;
  - Discuss how to include regional parameterisations in full flux model runs, and how that data should best be used by ICP Vegetation participants Consideration of how regional POD_YIAM parameterisations could be included in future runs of source-receptor matrices.

MOSS SURVEY RELATED ACTIVITIES:

- The previously agreed time-schedule was confirmed for the report of the 2015/16 survey:
  - If mosses are collected in 2015: data submission by 1 October 2016;
  - If mosses are collected in 2016: data submission by 1 April 2017;
  - Draft maps: 1 October 2017;
  - Final report: 1 April 2018.

- Participants are encouraged to submit improvements to the moss monitoring protocol by the end of May 2016, taking into consideration recommendations included in the paper Fernández et al., 2015. Science of the Total Environment 517: 132-150. The Moss Survey Coordination Centre will circulate the current version of the manual as a reminder. Provisional recommendations for improvements discussed were: sampling in

one year (i.e. 2020 for the next survey) and within the shortest time period possible; establish common moss species for sampling in Eastern Europe and Asia (representative of France to circulate species list); consistency in sampling sites important for assessing temporal trends and changes in spatial patterns; for new participating countries, apply a regular grid, taking national expert opinion into consideration.

- The Moss Survey Coordination Centre will circulate the MossMet template by 1 April 2016. Participants are encouraged to report MossMet data using the template.

- ICP Vegetation will develop a data access and usage policy, using the policy developed by ICP Forests as an example (note: the ICP Forests policy is still being updated).

- Participants of the moss survey are advised to inform the Moss Survey Coordination Centre by 1 April 2016 if they want to set up a formal agreement regarding data usage before submission of the 2015/2016 data.

- The ICP Vegetation Programme Coordination Centre will amend the current data submission template to include additional information about sites, i.e. whether a site is an ICP Forests site, an EMEP site, at Natura 2000 site and/or mainly affected by local pollution sources (request from EMEP/MSC-East).

- For future joint publications, the lead author should circulate the aims and an outline at the start, so co-authors have the opportunity to comment, and should allow co-authors sufficient time (at least two weeks) to comment on draft versions. Co-authors should actively agree to be included, even if they do not have any comments on the paper.

- Explore opportunities for an European funded project on heavy metal pollution in urban and industrial areas using active moss biomonitoring to identify risk to human health. Mira Anicic Urolevic (Serbia) voluntered to lead with support from Pranvera Lazo (Albania), Monaci Fabrizio (Italy), Agnes Balint (Hungary) and Dinesh Saxena (India).

Annex II. Medium-term workplan (2016 – 2019) ICP Vegetation
(updated on 3 March 2016)

Workplan items for 2016 and 2017 were adopted at the 33nd session of the Executive Body of the LRTAP Convention in December 2015. Workplan items for 2018 and 2019 have been proposed by the Task Force, to be included in the biannual workplan of the LRTAP Convention for 2018-2019.

Ongoing annual activities:

- Report on supporting evidence for ozone impacts on vegetation, including establishing ozone gardens;
- Report on progress with the moss survey 2015/2016;
- Contributions to common workplan items of the WGE.

New activities:

2016:

- Updated report on field-based evidence of ozone impacts on vegetation (brochure);
- Report on ozone impacts on biodiversity (brochure);
- Hold an ozone critical levels workshop.

2017:

- Report on revised ozone risk assessments methods based on outcomes of ozone critical levels workshop;
- Revision of Chapter 3 of the Modelling and Mapping Manual.

2018 - 2019:

- Final report and brochure of the European moss survey 2015/2016;
- Update of moss monitoring manual for 2020;
- Report on ozone risk assessment based on new flux models and critical levels (in collaboration with EMEP);
- Protocol for data access and usage;
- Report on ozone impacts on food production (brochure);
- Report on ozone impacts on forests (in collaboration with ICP Forests; brochure);
- Report on ozone impacts of ozone on Natura 2000 areas – case studies (brochures);
- Report on outreach activities (e.g. Latin America, India, China; brochure).

Annex III. Programme of presentations 29th Task Force Meeting of the ICP Vegetation

Tuesday 1st March, 2016

Session 1: 9:15 – 10:50 Plenary session Chair: Marina Frontasyeva

09:15 Welcome address – JINR Director. Academician *Victor A. Matveev.*

09:30 *Krzysztof Olendrzynski* – Update from the Secretariat of the Long-range Transboundary Air Pollution Convention.

09:45 *Harry Harmens et al.* – Overview of the achievements of the ICP Vegetation in 2015 and future workplan (2016-2018).

10:10 *Walter Seidling* – ICP Forests - platform for monitoring and research.

10:30 *Ilia Ilyin* – Analysis of long-term trends of atmospheric heavy metal pollution in the EMEP countries based on moss survey data and modelling results.

Session 2: 11:50 – 13:00 Plenary session Chair: Harry Harmens

11:50 *Marina Frontasyeva et al.* – Information on the moss survey in 2015: some preliminary results.

12:10 *Gina Mills et al.* – Preparations for ozone critical level workshop, autumn 2016, Spain and report from the epidemiology workshop.

12:25 *Ignacio González Fernández* – Establishing critical levels for effects of ozone on biodiversity.

12:40 *Robert Šajn et al.* – Applicability of artificial neural networks for predicting concentrations of chemical elements in various environments.

Session 3a: Ozone effects on crops Chair: Gina Mills

14:00 Introduction to ozone sessions (Gina Mills) and introductions by participants.

14:20 *Kent Burkey et al.* – Updates on studies of ozone-temperature interactions in the field.

14:40 *Vicky Bermejo et al.* – O_3-sensitivity of the Mediterranean Spanish bread wheat: from the old cultivars to the current market-dominant. Preliminary results.

15:00 *Ignacio González Fernández* – Ozone effects on the marketable biomass of leafy crops under Mediterranean conditions.

15:20 General discussion.

Session 3b: Moss survey in the EECCA region Chair: Eiliv Steinnes

14:00 *Inga Zinicovscaia et al.* – Multi-element atmospheric deposition study in the Republic of Moldova.

14:20 *Yulia Koroleva et al.* – Trace elements accumulation by mosses, lichens and mushrooms in South-Eastern Baltic.

14:40 *Pavel Nekhoroshkov et al.* – Atmospheric deposition of major and trace elements in the mountain Crimea studied by the moss biomonitoring technique.

15:00 General discussion.

Session 4a: Ozone: Global outreach activities - (1) Effects on food security
Chair: Vicky Bermejo

16:00 *Gina Mills et al.* – Impacts of peak versus background ozone on wheat.

16:15 *Gina Mills et al.* – Modelling the global impacts of ozone on wheat.

16:35 *Kent Burkey* – Developing a coordinated global process to assess and improve the ozone tolerance of crops

16:55 Discussion including:

- Report from HTAP (Gina); What do we know? What do we need to know? Future ICP Vegetation activities.

Session 4b: Moss survey: improvements and making more use of the data
Chair: Harry Harmens

16:00 *Lotti Thöni* – Reduction of the number of sampling sites in Switzerland for the survey 2015.

16:20 *Emeline Lequy et al.* – Assessment of the uncertainty associated with heavy metal concentrations in mosses measured in France (1996 to 2011).

16:40 *Mitja Skudnik et al.* – Spatial interpolation of N concentrations and $\delta^{15}N$ values in mosses collected within or outside the area of the canopy drip line.

17:00 General discussion:

- Improving moss monitoring manual (see Spanish paper);
- Publications of German colleagues and MossMet data;
- How can we make more use of ICP Vegetation moss data.

Wednesday 2nd March, 2016

Session 5a: Ozone: concentrations and effects **Chair: Klaudia Borowiak**

09:00 *Pierre Sicard et al.* – An epidemiological assessment of stomatal ozone flux-based critical levels for visible ozone injury in Southern European forests.

09:20 *Evgenios Agathokleous et al.* – Growth, physiology and productivity of willow (*Salix sachalinensis* L.), an energy crop, exposed to ethylene di-urea under O_3-enriched free air.

09:40 *Samia Madkour* – Different bean (*Phaseolus vulgaris* L.) genotypes exhibit different modes of tolerance against ozone injury.

10:00 General discussion.

Session 5b: Mosses as biomonitors of radionuclides **Chair: Trajce Stafilov**

09:00 *Eiliv Steinnes et al.* – Use of mosses for monitoring atmospheric deposition of radionuclides – possibilities and limitations.

09:20 *Miodrag Krmar et al.* – Spatial distribution of some radionuclides measured in mosses collected over large area.

09:40 *Zbigniew Ziembik et al.* – Application of gamma spectrometry and compositional data analysis in estimation of atmospheric deposition.

10:00 *Grzegorz Kosior et al. – Pleurozium schreberi* (Brid.) Mitt. as a bioindicator of heavy metal pollution and radionuclides in selected Polish National Parks.

10:20 General discussion.

Session 6a: Ozone: Global outreach activities - (2) Effects on carbon sequestration and biodiversity Chair: Kent Burkey

11:00 *Mary Ramos* – Ozone pollution in Central America.

11:20 *Gina Mills et al.* – Collation of field-based evidence of ozone impacts.

11:40 *Gina Mills, Patrick Büker et al.* – Update on mapping impacts of ozone on C sequestration.

12:00 Discussion including:

- What do we know? What do we need to know? Future activities.

Session 6b: Moss survey: future activities and opportunities Chair: Marina Frontasyeva

11:00 *Luca Paoli et al.* - Do lichen bioaccumulation data tell the truth?

11:20 Discussion on progress 2015/16 moss survey and future activities:

- Preparations for report of 2015/16 moss survey;
- Opportunities for monitoring air pollution in urban areas;
- Opportunities for further enhancement participation EECCA coutries.

Session 7a: Ozone: mapping of ozone risks Chair: Gina Mills

14:00 Harry Harmens – Mapping procedure within the Convention.

14:15 *Gina Mills* – Mapping ecosystems at risk from ozone in the UK.

14:35 *Ignacio González Fernández* – Mapping ecosystems at risk from ozone in Spain.

14:55 Discussion including:

- How do national maps of risks of ozone impacts compare with those produced by EMEP?
- Introducing a call for data within the ICP Vegetation – Opportunities and limitation.

Session 7b: Moss survey in South-Eastern Europe Chair: Sébastien Leblond

14:00 *Trajce Stafilov et al.* – Heavy metals air pollution study in mines environments. Case study Bregalnica river basin, Republic of Macedonia.

14:20 *Pranvera Lazo et al.* – First Albanian moss biomonitoring survey and some future considerations.

14:40 *Agnes Balint et al.* – Atmospheric deposition of heavy metals in „Óbuda" and „Margaret" Islands (Budapest, Hungary) tested by different mosses and ICP-OES.

15:00 *Claudia Stihi et al.* – Moss survey 2010 in Romania. Results and perspectives.

15:20 Discussion.

Session 8a: Ozone: critical levels methodology **Chair: Ignacio González Fernández**

Current developments in methodology (Led by Gina Mills).

Focus on (semi-)natural vegetation (Led by Ignacio González Fernández).

Discussion on field-based evidence of ozone effects:
- What do we know? What do we need to know? Future activities.

Session 8b: Moss survey: outreach **Chair: Mitja Skudnik**

16:00 *Dinesh Saxena* – Assessing airborne pollution by mosses as biomonitors - Long-term integrated monitoring of atmospheric metals (2000-2010).

16:20 Discussion on further outreach opportunities.

Thursday 3rd March, 2016

Session 9: 09:00 – 10:30 Plenary session **Chair: Harry Harmens**

- Reporting back from ozone and moss sessions
- Medium-term work plan ICP Vegetation 2016 – 2018
- Decisions and recommendations of the 29th Task Force Meeting
- 30th ICP Vegetation Task Force Meeting
- Other business