

Workshop on regional impact assessment of
atmospheric deposition and air pollution on forest ecosystems
21-22 November 2019, Niigata, Japan

Summary of the workshop

I. Introduction

1. “Promotion of information exchange - Information exchange on clean air technologies and regional impact assessment through workshops, seminars, etc.” is one of the activities described in the *Medium Term Plan for the Acid Deposition Monitoring Network in East Asia (EANET) (2016-2020)*. Additionally, “promotion of research activities on regional impact assessment to plants and ecosystems” is also described in the medium term plan.
2. The EANET has been accumulating monitoring data since 2001. However, the number of monitoring sites is still limited and impacts of air pollution/total atmospheric (wet + dry) deposition have not been enough assessed on the East Asian scale. It was expected that the information exchange on regional impact assessment would be promoted referring to the long-term experience of the European networks in this field.
3. Taking account of the situation above, the “*Workshop on the regional impact assessment of atmospheric deposition and air pollution on forest ecosystems*” was held on 21 – 22 November 2019 in Niigata, Japan, in cooperation with the International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests) under the Convention on Long-range Transboundary Air Pollution (CLRTAP), United Nations Economic Commission for Europe (UNECE).
4. The workshop was held for the following objectives:
 - To exchange information on the current condition of atmospheric deposition/ air pollution;
 - To exchange information on the regional impact assessment of atmospheric deposition/ air pollution on forest ecosystems
 - To discuss possibility of scientific cooperation between ICP Forests and EANET
5. In addition to the objectives above, the oral presenters took the following subjects into consideration for preparation of their presentations.
 - How the monitoring data/their studies have contributed to regional impact assessment.

- How the monitoring data and the assessment have contributed to policy making in the region.
 - What kind of collaborations can be considered between the regions in the near future.
6. The workshop was participated by scientists/experts from EANET community and European networks including ICP Forests and International Cooperation Programme Modelling and Mapping (ICP M&M) under CLRTAP, UNECE. Scientists from China and Japan also participated as resource persons. The list of the workshop participants is attached as annex (EANET/ WRIA/ Info. 1).

II. Opening of the workshop

7. Prof. Wilfredo M Carandang, Chair of Task Force on Soil and Vegetation Monitoring of EANET, opened the workshop.
8. Dr. Shiro Hatakeyama, Director General of Asia Center for Air Pollution Research (ACAP), made welcome remarks from the Network Center for EANET (NC). He emphasized necessity of knowing the impact of acid deposition and related air pollutants in East Asian region. One of objectives of EANET is to provide useful inputs for decision-making at local, national and regional levels aimed at preventing or reducing adverse impacts on the environment caused by acid deposition. Thus, in the Medium Term Plan for EANET (2016-2020), information exchange and promotion of research activities on regional impact assessment are included as the activities. He expected the participants to exchange the relevant information through the workshop and attain scientific cooperation between ICP Forests and EANET in the near future.
9. Dr. Marco Ferretti, Chairman of ICP Forests, made the introductory remarks. He introduced that the year 2019 was the 40th anniversary of the Convention on Long-Range Transboundary Air Pollution (CLRTAP, today termed Air Convention). As one of the monitoring programs under Working Group on Effects (WGE) of the Convention, ICP Forests has been carrying out monitoring and assessment of air pollution effects on forest ecosystems in Europe since 1980s: ICP Forests was officially launched in 1985. He pointed out that regional assessment of air pollution impacts has certainly contributed to policy decision-making in Europe. Moreover, he explained that monitoring is necessary even after emissions of air pollutants are reduced, because:
- Effects may last decades after the reduction of pollutants.
 - It is important to keep a monitoring system operational to have an early warning

system for emerging issues.

- As a matter of fact, the European program is now important also for climate change, biodiversity, and sustainable forest management.

Finally, he emphasized that the workshop would be an excellent opportunity to share and compare the European knowledge and experience with colleagues from EANET, and to promote further co-operation in the future.

III. Scientific Sessions

Session 1: Current status of air pollution in Asia

10. Scientists from the EANET community made presentations to introduce the current status of air pollution in Asia. Prof. WM Carandang chaired the session.
11. The scientific presentations in this session included:
 - *Long-term trends of anthropogenic emissions of air pollutants in Asia* (presented by Jun'ichi Kurokawa)
 - *Calculation of emission from transport in major cities in Vietnam and estimation of emission in 2020* (presented by Tuong Nguyen Thanh)
 - *Improving monthly NH₃ emissions in China based on inverse model and observed data* (presented by Miaomiao Cheng)
 - *Major outcomes from the EANET deposition monitoring* (presented by Tsuyoshi Ohizumi)
 - *EANET ecological monitoring in a changing atmospheric environment in Asia* (presented by Hiroyuki Sase)

Session 2: European history on the regional impact assessment

12. Representatives from the Coordination Centre for Effects (CCE) of ICP M&M and Programme Coordinating Centre (PCC) of ICP Forests made presentations to introduce European history on the regional impact assessment. Dr. M. Ferretti chaired the session.
13. The scientific presentations in this session included:
 - *European history on regional impact assessment* (presented by Thomas Scheuschner)
 - *ICP Forests: Long-term, large-scale and policy-relevant forest monitoring in Europe* (presented by Kai Schwärzel)

Session 3: Poster session

14. Scientists/experts from the EANET community made short-oral presentations (1 minutes each) to introduce their posters. Totally, 14 posters were introduced.
15. Individual discussions were made for the respective posters among the participants.

Session 4: Regional assessment of the monitoring data in Europe

16. Scientists from the Scientific Committee and the Expert Panels (EPs) of ICP Forests made presentations to introduce European history on the regional impact assessment. Dr. M. Ferretti chaired the session.
17. The scientific presentations in this session included:
 - *30 years of deposition monitoring in European forests – are sulphur and nitrogen still an issue?* (presented by Arne Verstraeten)
 - *Impacts of air pollutants on soil and soil solution chemistry as revealed by the UNECE ICP Forests monitoring programme* (presented by Henning Meesenburg)
 - *Large-scale assessments of ozone effects on symptom development and forest growth* (presented by Marcus Schaub)
 - *Monitoring of tree condition as a part of UNECE ICP Forests: pressures, damage and trends* (presented by Nenad Potočić)
 - *Long-term growth monitoring in European forests* (presented by Tomislav Levanic)

Session 5: Trials on national/regional assessments of atmospheric impacts in East Asia

18. Scientists from the East Asian countries made presentations to introduce trials on national/regional assessments of atmospheric impacts in the region. Dr. H. Sase chaired the session.
19. The scientific presentations in this session included:
 - *Transition of atmospheric N deposition in China and its implications* (presented by Xuejun Liu)
 - *Regional impact assessment on acidification/N saturation in the East Asia: a critical loads approach* (presented by Naoyuki Yamashita)
 - *Estimation of atmospheric deposition load and its effects on nutrient dynamics in forest ecosystems using Sr and Pb isotopes in soil* (presented by Rieko Urakawa)
 - *Ozone impacts on Japanese forest tree species* (presented by Makoto Watanabe)
 - *Effects of ozone pollution on Chinese woody plants: an overview* (presented by Zhaozhong Feng)

Major discussions in the Scientific Sessions

20. Highlights of all the presentations above are shown in the abstract book of the workshop (EANET/ WRIA/ 2).
21. Active scientific/technical discussions have been made for the respective topics. Major discussions relevant to the workshop scope included the following:
 - i. It was pointed out that the number of ground observation was still limited in the East Asian region and therefore satellite observations and chemical transport models have been used as effective tools to elaborate emission inventory in the region.
 - ii. It was informed that the EANET has been discussing possibility of sharing the national air pollution data of the respective countries in the network. If these data were available, a state of air pollution would be some more precisely clarified in the region.
 - iii. In a few EANET sites, where acidification of lake/river water was reported, increase of pH and decrease of SO_4^{2-} and NO_3^- concentrations have been recently observed with decrease of atmospheric S and N deposition. It was pointed out that continuous monitoring would be important to identify whether the phenomena were actual “recovery from acidification” or not.
 - iv. The Critical Load concept has been used to evaluate reduction of the emissions as an effect-base evaluation tool. Despite considerable progress, there are still hot spots in the exceedance maps for acidification and eutrophication in Europe. As it is inherent to the Critical Load concept, both deposition level and ecosystem sensitivity contributed to the distribution of the hotspots in these maps.
 - v. National Emission Ceilings (NEC) Directive is set to reduce emissions of atmospheric pollutants in the European Union (EU) Member States. Monitoring programs under the Air Convention, including ICP Forests, will contribute to provide knowledge for the assessment of the effectiveness of the NEC-Directive in protecting the environment.
 - vi. Contribution of science to decision-making in air pollution policy is essential. It was suggested that the work carried out under the WGE contributed to science-based air quality policies at the international level in Europe.
 - vii. The monitoring network of ICP Forests is very large with several thousands plots. It is a big challenge to obtain funding to maintain the large network. It was suggested that coordination with other initiatives, such as NEC-Directive of EU, would be effective to exploit synergies.

IV. Summary discussion/ closing of the workshop

22. Before closing the workshop, Dr. H Sase as the workshop organizer noted the following points:
- Monitoring must go on.
 - Regional impact assessments based on the monitoring data have been certainly contributing for policy making on air pollution abatement in Europe.
 - Quality assurance and quality control (QA/QC) is essential to accumulate high quality data.
 - Even after the emissions are reduced enough, monitoring should be continued:
 - To confirm recovery (or to identify other alterations) with reduction of air pollution
 - To contribute to other environmental issues, such as climate change
23. Dr. M Ferretti summarized the workshop with the following conclusive remarks:
- In Europe, the regional impact assessment has contributed to policy making on air pollution abatement. They contributed evidence and advance knowledge on air pollution effects on forest health, growth, diversity, and biogeochemistry.
 - In East Asia, efforts should also be made to further promote regional impact assessments to provide scientific inputs useful for policy making. Some constraints, such as limited number of the sites, large variation of ecosystem conditions, etc. were also pointed out.
 - Modeling and satellite observation needs to be more integrated to support and extend assessment. High quality of the monitoring data is essential to validate the output of these different approaches.
 - Collaboration between regions could start from: (i) selected topics, e.g. ozone impacts, N deposition, interaction between air pollution and climate change. The latter is becoming a key topic for the Air Convention. (ii) Selected activity: continuing exchange through joint workshops/conferences, training, and publications.
 - Collaboration will broaden our views on forest ecosystems in the northern hemisphere, and deepen our understanding of the ecological dynamics and forest ecosystem functioning in the respective regions.
24. Dr. Erdenebat Eldevochir, Deputy Director General of ACAP, made closing remarks from the NC. He emphasized that all the participants have successfully accomplished the aim of the workshop that was to exchange information on the current condition of atmospheric

deposition/air pollution and the regional impact assessments. Moreover, based on two days' discussion, they could identify a possible future cooperation between EANET and ICP Forest. Finally, on behalf of the Asia Center for Air Pollution Research, he expressed his sincere appreciations to all of the participants for their contributions to the workshop.

25. Prof. WM Carandang officially closed the workshop.

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List of the Participants

From European networks (alphabetical order):

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Nenad Potocic
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Marcus Schaub
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