Background Paper[1]

North-East Asia Clean Air Partnership: Strengthening Science-based, Policy-oriented Cooperation

NEASPEC Secretariat

I. BACKGROUND

1. During 2014-2016, NEASPEC implemented the project "Development of the Technical and Policy Frameworks for Transboundary Air Pollution Assessment and Abatement in North-East Asia" to develop a new subregional framework by conducting joint scientific assessments and consultations.

2. The Project mainly involved technical assessments and consultations on the overall direction and thematic areas of a new subregional framework as summarized below. The outcomes and processes of activities have been reported to Senior Officials Meetings (SOM-19, 20 and 21) for review and further guidance.

(a) **Expert Group Meeting on the Project** in May 2014: identified target pollutants and priorities of a potential framework, and prepared the implementation plan of the Project, in particular, modeling of transboundary air pollution.

(b) **Consultation Workshop on Modeling of Source-Receptor Relationship (SRR) of Transboundary Air Pollution** in March 2015, which developed a detailed modeling plan taking account of the methodology and emission inventory of Long-range Transboundary Air Pollutants in Northeast Asia (LTP).

(c) **Modeling of source-receptor relationship of transboundary air pollution** by the Scientific Research Institute for Atmospheric Air Protection (SRI Atmosphere) with technical support from experts working on LTP for the installation of modeling programmes and the preparation of an input data set.

(d) **Consultations with LTP experts** on the preliminary modeling results of SRI Atmosphere by presenting at the 18th and 19th Expert Meeting of LTP (Nov 2015 and Nov 2016, respectively).

[1] This paper was initially presented to the 21st Senior Officials Meeting as an official document, and further revised for the consultation meeting.

(e) **Preparation of technical papers to identify potential roles of NEASPEC and a new subregional framework** on selected areas including emission inventory, monitoring, modeling, integrated assessment, and science-policy linkages.

(f) **Expert Consultation on integrated assessment modeling and a Roundtable on Transboundary Air Pollution in Northeast Asia** in December 2016, which discussed specific approaches and work on a new framework.

(g) 21st Senior Officials Meeting in March 2017 discussed the proposal for launching the North-East Asia Clean Air Partnership (NEACAP) and suggested the Secretariat to conduct further consultation with member Governments and relevant mechanisms for its future development.

II. APPROACHES, THEMATIC AREAS AND COOPERATION MODALITIES

3. Outcomes from the series of assessments and consultations under NEASPEC spanning from 2012 reiterate the need for strengthening science-based, policy-oriented cooperation. Such cooperation would promote a holistic approach covering all components of transboundary air pollution management, build connections between science and policy, and provide channels for open and effective exchange of knowledge and information, etc.

4. In this connection, the first expert group meeting in May 2014 and SOM-19 came to a general conclusion that the works of a new subregional framework could include source-receptor relationship of transboundary air pollution, policy scenarios, impact assessment, emission inventory, and abatement technology assessment. In terms of target pollutants, the framework could focus on key pollutants of national and subregional concerns, Particulate Matter ($PM_{2.5}$ and PM_{10}) and Ozone, while it would need to address their linkages with other pollutants including Sulfur Oxide (SO_x), Nitrogen Oxide (NO_x), Black Carbon, Ammonia (NH_3) and Volatile Organic Compounds (VOCs).

5. Subsequent assessments and consultations on **potential approaches, thematic areas and cooperation modalities** of a new subregional framework have suggested the following options.

6. **Potential Approaches**: Throughout the assessments and consultations, strengthening science-based, policy-oriented cooperation has been highlighted as a key approach for a new subregional framework.

(a) **Strengthening information sharing** through exchanging available and relevant information on air pollution control technologies and national policies. NEASPEC Secretariat could compile the information and prepare annual/ biennial report to facilitate the information sharing and assess progress in policies and practices. Countries could voluntarily initiate a peer review of national policies.

(b) **Building scientific foundation and a stronger epistemic community**[2] through engaging in multidisciplinary research and policy-oriented assessment, covering subregional emission inventory development and maintenance, air pollution transport modeling including SRR modeling, integrated assessment modeling, etc.

(c) **Developing potential measures** to enhance cooperation and tackle transboundary air pollution through science-based, policy-oriented consultations, development of a common methodology for policy scenarios and integrated assessment modeling, cooperation on technologies and good practices, etc.

(d) **Promoting voluntary participation and contribution** through building a new subregional framework which is comprehensive but flexible. In terms of programme areas, the framework could be comprehensive in order to incorporate priority cooperation areas and bring all key stakeholders to enhance subregional cooperation. Meanwhile, it could also be flexible in terms of its legal and political nature, and in terms of member States' participation in specific activities.

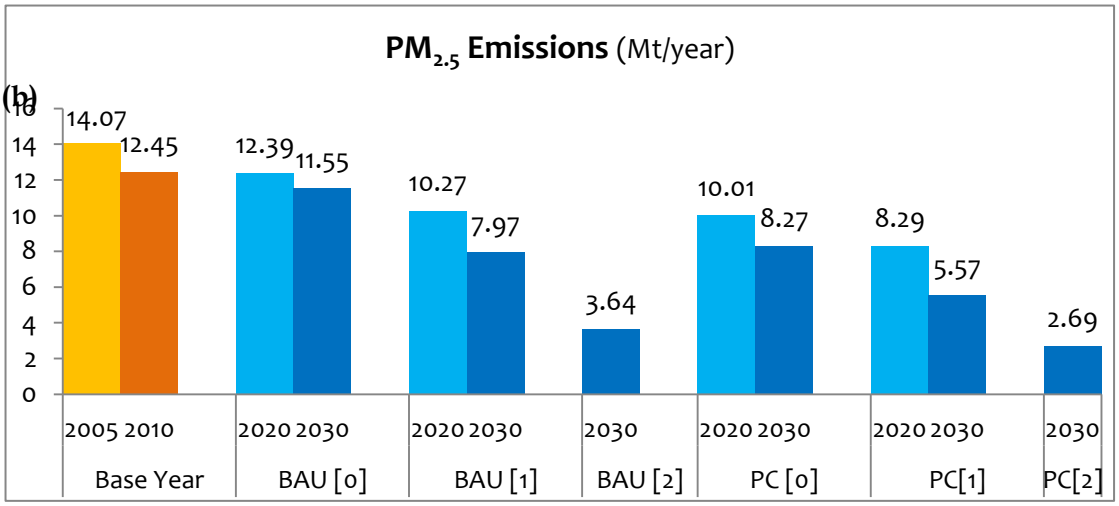
7. **Thematic areas:** Based on priority areas identified by the first expert group meeting and supported by SOM-19 in 2014, the assessments and consultations further reviewed existing and potential activities and came to the following conclusion.

(a) **Integrated Assessment Modeling (IAM):** Priority areas identified by the first expert group meeting include policy scenarios, impact assessment, and abatement technology assessment. IAM integrates these multiple dimensions and serves as a cornerstone of interactive processes between science and policy. In particular, IAM incorporates the assessment of emission trends, health and environmental impacts, mitigation options, and costs and benefits of policy and technical measures. It could therefore support policy-makers to develop a more comprehensive view on mitigation policy as well as optimized technical solutions. The scientific community in North-East Asia has recently

[2] Epistemic community is defined as a "transnational network of knowledge-based experts who help decision-makers to define the problems, identify various policy solutions and assess the policy outcomes".

started IAM at a subregional scale.[3] For example, one study[4] has looked into the recent emission trends of SO_2, NO_x, PM, and non-methane volatile organic compounds (NMVOC) in North-East Asia, and projected their future emissions up to 2030 with six emission scenarios based on end-of-pipe control strategies and energy saving policies.

Figure 1 Emission scenarios of air pollutants in North-East Asia (excl. Russia)



(c) Emission Inventory: As shown in Figure 2, there are various global and regional inventories available for modeling. In particular, inventory experts from China (Tsinghua University and Peking University), Japan (Asia Center for Air Pollution Research) and the Republic of Korea (ROK) (Konkuk University) as well as experts outside North-East Asia have jointly developed a regional emission inventory, MIX. It is a mosaic of regional and national emission inventories including Regional Emission Inventory in Asia (REAS), the Multi-resolution Emission Inventory for China (MEIC), a NH_3 emission inventory, the Clean Air Policy Support System for the ROK (CAPSS), and an Indian emission inventory (ANL-India). The inventory has been developed to support the Model Inter-Comparison Study for Asia (MICS-Asia III) and the Task Force on Hemispheric Transport of Air Pollution (TF HTAP) projects.[5]

[3] EANET, 2015, Review on the State of Air Pollution in East Asia: please refer to chapter 7 Mitigation technologies of air pollutant emissions in East Asia

[4] Wang S. X. Wang, B. Zhao , S. Y. Cai , Z. Klimont , C. P. Nielsen , T. Morikawa , J. H. Woo, Y. Kim , X. Fu , J. Y. Xu , J. M. Hao, and K. B. He, 2014. Emission trends and mitigation options for air pollutants in East Asia, Atmos. Chem. Phys., 14, 6571–6603

[5] For further information, please refer to MIX Asian Emission Inventory (http://www.meicmodel.org/dataset-mix)

Figure 2 Overview of emission inventories

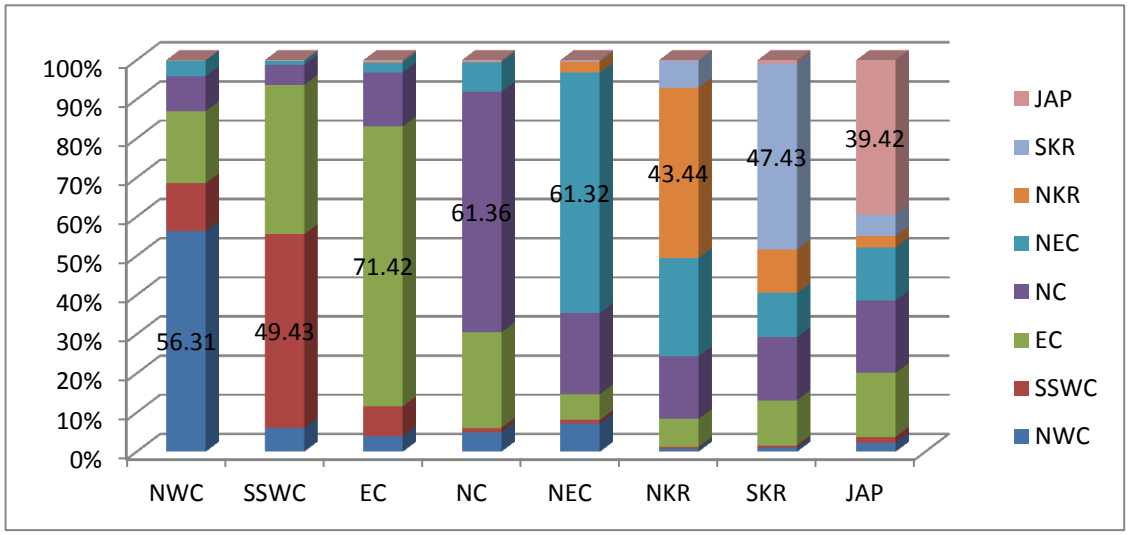
However, modeling work under this NEASPEC project faced difficulty in preparing input data as it was not possible to ensure full comparability among national data. There are also large discrepancies among inventories both in magnitude and spatial distributions.[6] Furthermore, conducting a policy-oriented model requires a more comprehensive set of data that includes not only the emission data of each pollutant, but also data of socio-economic activities including economic indicators, energy consumption sectors, etc. In this regard, the assessments and consultations indicated the need for developing and improving a subregional inventory that provides accurate, complete and up-to-date data with a common methodology for comparability between national data. Developing a subregional inventory would involve close consultations among experts working on national and regional inventories, and intergovernmental supports including through NEASPEC.

(d) Modeling of Source-Receptor Relationship (SRR) of transboundary air pollution: LTP has been conducting the SRR modeling, which initially started with SO_2 and NO_x, and recently expanded to PM, based on eight source and receptor subregions, i.e. North-East China (NEC), North-West China (NWC), North China (NC), Southern South-West China

[6] Eri Saikawa, 2015. Comparison of Asian Emission Inventories, https://www.epa.gov/sites/production/files/2015-09/documents/saikawa_pres.pdf

(SSWC), East China (EC), North Korea (NKR), South Korea (SKR) and Japan (JAP). Figure 3 below shows the SRR result conducted by the RO Korean team, which presents the level of $PM_{2.5}$ contributions from its own and other subregions. The numbers on the column indicate the rate of self-contribution of $PM_{2.5}$.

Figure 3 SRR Modeling of $PM_{2.5}$ by RO Korean experts under the LTP



(*Note: The figures on the columns indicate the share of $PM_{2.5}$ originated from its own sources in 2013.)*

This LTP process has supported the national experts to build a common modeling methodology, to have a shared view on transboundary air pollution as well as to gain substantial experience in carrying out joint research. Thus, subregional collaboration on SRR modeling needs be closely connected with LTP in such a way to further scale up the existing geographical scope of LTP, and utilize findings from LTP for IAM and policy dialogues.

8. To sum up the assessment and consultations, the Integrated Assessment Modeling is proposed as the centerpiece of a new subregional framework to incorporate identified priority areas, i.e. policy scenarios, impact assessment, and abatement technology assessment and SRR, and enhance science-based, policy-oriented cooperation. This would require creating a multidisciplinary group of experts and designating academic institution(s) with solid experiences as technical centers.

9. **Cooperation modalities:** In support of science-based, policy-oriented cooperation, the assessments and consultations have put forwarded the following ideas.

(a) **Operating standing bodies for strengthening scientific cooperation and building science-policy linkage:** A Science and Policy Committee and its Science Working Group and Policy Working Group has been proposed for planning and coordinating the overall work, carrying out scientific studies, holding policy dialogues, liaising with other relevant mechanisms, etc..

(b) **Operating technical centers for carrying out tangible cooperation and enhancing roles of academic and research institutions in member States:** In particular, carrying out IAM and operating an emission inventory would require dedicated support from academic and research institutions. Thus, a new subregional framework could invite member Governments to designate their institutions, each as a technical center for a specific programme.

(c) **Operating an open platform for policy-makers and stakeholders:** An open forum, e.g., *North-East Asia Clean Air Forum*, could be held annually/ biennially to widely share the latest findings from scientific assessments, discuss policy and technical measures, and build multidisciplinary expert network.

(d) **Coordinating with other relevant mechanisms for technical inputs:** The works of the new framework would require close coordination with relevant mechanisms such as LTP, Acid Deposition Monitoring Network in East Asia (EANET), Model Inter-Comparison Study for Asia (MICS Asia) and its MIX Asian Emission Inventory, and the Asia Pacific Clean Air Partnership (APCAP).

III. NORTH-EAST ASIA CLEAN AIR PARTNERSHIP

10. Based on the various ideas and recommendations as summarized above, the "*North-East Asia Clean Air Partnership (NEACAP)*" is proposed as a voluntary programme under NEASPEC.

11. The attached Terms of Reference (TOR) consists of (1) Introduction, (2) Aims and Objectives, (3) Geographic scope and target pollutants, (4) Core Activities, (5) Organizational structures, (6) Budget, (7) Role of member States. With the aim to ensure protection of the environment and human health from air pollution in North-East Asia, the proposed TOR includes the following objectives of NEACAP:

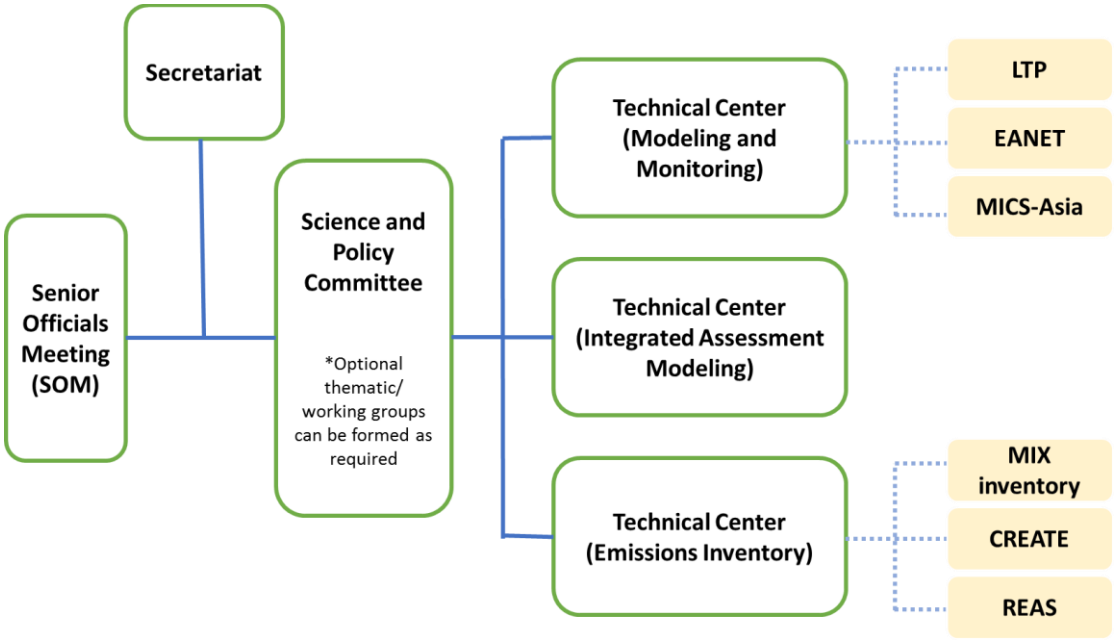
- promotes environmental cooperation, including its science, policy and technical aspects;
- enhances and further develop information and experience exchange;
- acts as the key voluntary framework addressing transboundary air pollution issues in North-East Asia;

- contributes to the development of relevant national and subregional policies; and
- promotes knowledge on environmental and human health aspects of air pollution

12. In terms of target pollutants, as identified during expert consultations, the TOR proposes that NEACAP could focus on pollutants of national and subregional concern, namely Particulate Matter ($PM_{2.5}$ and PM_{10}) and Ozone, and other relevant pollutants, including Sulfur Oxides (SO_x), Nitrogen Oxides (NO_x), Black Carbon, Ammonia (NH_3) and Volatile Organic Compounds (VOCs). Core programmes on addressing the pollutants could include exchanging available and relevant information to extent possible; engaging in common research activity development; and proposing potential technical and policy measures through regular meetings, regular review reports, technical projects, open forums and outreach.

13. In support of these activities, the TOR proposes setting up the Science and Policy Committee and Technical Centers, and indicates the option of forming thematic/working groups such as science working group and policy working group which will be operated under the broad guidance of the Senior Officials Meetings of NEASPEC. NEACAP could begin with a pilot stage of 2-3 years, review its outcomes and develop its full structure and programmes at a later stage.

Figure 4 Structure of NEACAP



14. Developing and implementing collaborative activities with technical support from the proposed bodies will require substantial increases in financial and in-kind contributions of member States to NEASPEC Core Fund as well as Project-based Fund.