1. Introduction

The Japan Committee for International Institute for Applied Systems Analysis (IIASA) was established in 1972 to facilitate collaboration between researchers in IIASA and Japan. Since 2012, part of this collaboration has been in the form of a workshop aimed at strengthening the links between scientific and policy research on co-benefits, especially in Asia. For instance, last year’s workshop concluded with the following key messages:

- Establishing Asian Science Panel on Air Quality (ASPAQ) (tentative title) has a considerable promise to achieve scientific consensus on benefits of air pollution control in Asia.
- The Greenhouse Gas and Air Pollution Interactions and Synergies (GAINS) model might help advance the work of ASPAQ because it is already being used in many countries in Asia but it was developed outside of Asia.
- Japan-IIASA collaboration could be further facilitated by strengthening connection with new initiatives on air pollution co-benefits such as ASPAQ. There may be more opportunities to use the IIASA-JAPAN committee and this workshop to engage with other research institutes in Japan and Asia on co-benefits.

As these messages imply, there is a growing need to strengthen the science-policy interface on atmospheric pollution. There is also an important opportunity for researchers from different institutes to share their findings on atmospheric pollution.

This workshop will therefore consist of a series of panels that aim to make these connections. The workshop will begin with an opening session that highlights what we have learned about co-benefits and where we need to go. It will then follow with three panels on possible ways linking science and policy on co-benefits. It will conclude with panel discussion involving the four chairs from the three sessions that aim to synthesize the recommendations in the session into an integrated approach to co-benefits in Asia.

2. Objectives

1) To strengthen the interface between atmospheric science and policy in Asia.
2) To identify areas for collaboration between researchers based in Japan and other parts of the world.

3. Schedule

<table>
<thead>
<tr>
<th>Date &amp; Time</th>
<th>March 10, 2015 13:15 - 17:30</th>
<th>March 11, 2015 9:30 - 12:30</th>
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<tbody>
<tr>
<td>Organisers</td>
<td>Ministry of the Environment, Japan Institute for Global Environmental Strategies (IGES)</td>
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<td>Collaborator</td>
<td>The Japan Committee for the International Institute for Applied Systems Analysis (IIASA)</td>
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# Bridging Atmospheric Science and Policy in Asia:
Identifying Areas for Collaborative Research

10-11 March 2015 at Shinagawa Prince Hotel, Tokyo, Japan

Organised by
Ministry of the Environment, Japan and Institute for Global Environmental Strategies (IGES), Japan
Collaborated with
The Japan Committee for International Institute for Applied Systems Analysis (IIASA)

## - Agenda -

### Day 1: 10 March 2015 (Tuesday)

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>13:15 – 13:30</td>
<td>Registration</td>
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<tr>
<td>13:30 – 13:40</td>
<td>Opening Session Chair: Dr. Naoko Matsumoto, IGES</td>
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<tr>
<td>13:40-13:50</td>
<td>Photo session</td>
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#### Opening Session

**Welcome Remarks from Representative of JAPAN-IIASA Committee**
- Dr. Kazuhiko Takemoto, Director, United Nations University-Institute for the Advanced Study of Sustainability (UNU-IAS)
- Mr. Seiji Tsutsui, Ministry of the Environment, Japan (MOEJ)

#### Session 1: Updates on Atmospheric Science

**Chair: Prof. Katsunori Suzuki, Kanazawa University**

<table>
<thead>
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<th>Time</th>
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<tr>
<td>13:50- 16:00</td>
<td>Outcome of IIASA - S-7-3 collaboration</td>
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<tr>
<td></td>
<td>- Dr. Hajime Akimoto, Asia Center for Air Pollution Research (ACAP), Japan</td>
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<td></td>
<td>Progress of IIASA-IGES collaboration</td>
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<td></td>
<td>- Dr. Eric Zusman, Institute for Global Environmental Strategies (IGES)</td>
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<td></td>
<td>Progress on S-12 project related to short-lived climate pollutants</td>
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<td></td>
<td>- Dr. Toshihiko Masui, National Institute for Environmental Studies (NIES), Japan</td>
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<td>Progress on co-benefits research</td>
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<td>- Dr. Kenichi Wada, The Research Institute of Innovative Technology for the Earth (RITE), Japan</td>
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<tr>
<td>13:50-16:00</td>
<td>Outcome of research on co-benefit</td>
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<td>- Prof. Jusen Asuka, Tohoku University, Japan</td>
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<tr>
<td>14:40 - 14:55</td>
<td>Break</td>
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**Chair: Dr. Markus Amann, IIASA**

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<tr>
<td>14:55-16:00</td>
<td>Progress of ABC</td>
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<td>- Prof. Veerabhadran Ramanathan, University of California, San Diego (UCSD)</td>
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<tr>
<td>16:00-16:15</td>
<td>Coffee Break</td>
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</table>
Session 2: Scientific Assessments

Chair: Mr. Iyngararan Mylvaivanam, UNEP-ROAP

16:15 - 17:30
(10 min/each + 35 min discus.)

Progress with NEASPEC
- Dr. Sangmin NAM, UNESCAP East and North-East Asia Office (ENEA)

Summary of Discussion on Science Panel
- Dr. Hajime Akimoto, ACAP, Japan

LTP
- Prof. Young Joon Kim, Gwangju Institute of Science and Technology (GIST)

EANET
- Dr. Supat Wangwongwatana, Regional Resource Centre for Asia and the Pacific (RRC.AP)

Discussions

Day 2: 11 March 2015 (Wednesday)

Session 3: Reflecting Science into Policy

Chair: Mr. Hideyuki Mori, IGES

9:30 - 11:00
(15 min/each + 45 min discus.)

Guidance Framework for Urban Air Quality
- Ms. Kaye Patdu, Clean Air Asia (CAA)

Regional Assessment
- Dr. Eric Zusman, IGES

Science and Policy experience in Europe including suggestion to Asia
- Dr. Markus Amann, IIASA

Discussions on future collaboration between Japan and IIASA
- Discussion

11:00 - 11:15 Coffee Break

11:15 – 12:30
(75 min)

Wrap-up of the discussions and development of conclusions
- All chairs: Prof. Katsunori Suzuki, Dr. Markus Amann, Mr. Hideyuki Mori, and Dr. Eric Zusman

Closing Remarks
- Mr. Hideyuki Mori, IGES
## Participants List

**Bridging Atmospheric Science and Policy in Asia (IIASA)**

Shinagawa Price Hotel Main Tower 32F Aquamarine32

10-11 March 2015

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<tr>
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Bridging Atmospheric Science and Policy in Asia: Identifying Areas for Collaborative Research

10-11 March 2015 at Shinagawa Prince Hotel, Tokyo, Japan

Organised by
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Collaborated with
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- Summary -

1. Introduction
The Japan Committee for International Institute for Applied Systems Analysis (IIASA) was established in 1972 to facilitate collaboration between researchers in IIASA and Japan. Since 2012, part of this collaboration has been in the form of a workshop aimed at strengthening the links between scientific and policy research on co-benefits, especially in Asia. The 2015 workshop had two main objectives:

- To strengthen the interface between atmospheric science and policy in Asia.
- To identify areas for collaboration between researchers based in Japan and other parts of the world.

2. Key Messages
The meeting helped generate many important messages, including:

- In Asia, it may be preferable to take a different approach to co-benefits than in North America and Europe. This approach could focus first on air pollution abatement and then with CO₂ mitigation.
- It will be increasingly important to factor the effects of governance failures into co-benefits modelling scenarios. The effects of these failures in China and India’s transport sector may have resulted in between 8,000 and 24,000 premature deaths in China; and 5,000 and 14,000 premature deaths in India in 2010.
- There is a need to fully account for multiple co-benefits in future modelling of climate policies. This will be particularly challenging for non-Krypto gases but will also help to systematically account for synergies and trade-offs between a range of climate and non-climate objectives.
- In the future, it will be increasingly important to look at the social benefits from mitigating CO₂. There is already a significant amount of literature quantifying and monetizing these benefits.
- Several projects have helped or are helping to advance knowledge or spur action on air quality and climate protection co-benefits in Asia. These include the following:
  - The Atmospheric Brown Cloud(ABC) project that paved the way for both further science on clouds of dimming pollutants and possible solutions (Project Surya).
  - The Airpet project that helped uncover new mitigation opportunities and implementation challenges in key sectors (open burning).
  - Acid Deposition Monitoring Network in East Asia’s (EANET) scientific assessment that has identified potentially important implications for acid rain and may include a broader range of pollutants in the future.
The Long Range Transport of Air Pollution (LTP) project has a long track record of generating regionally important science, and plans are in the works to continue those contributions with two additional monitoring sites in China and Korea.

The (NEASPEC) project has also helped promote greater interaction in developing emission inventories between China, Japan and Korea.

Clean Air Asia’s Guidance Framework that is being developed to provide an authoritative reference on air quality management in Asia.

The Climate Change and Clean Air Coalition’s (CCAC) Regional Assessment which recently received funding for a two year assessment and engagement process.

- The above projects could offer potentially important contributions to the work of an Asia Pacific Clean Air Partnership (ASPAQ) Science Panel and Assessment Report.
- IIASA is working with several research institutes in Asia, including new partners in Thailand to Korea. IIASA collaborative research in Asia has shed light on the importance of new pollutants (such as ammonia); offered insights into a the impacts of different startegies on multiple pollutants in China, India and Japan; supported the creation of new emissions inventories in India
- It will be important to look at the costs of inaction and ineffective enforcement of regulations in Asia. This could be a potentially important area for future research between researchers in Japan and IIASA.
- There will be important opportunities to collaborate between Asia Pacific Integrated Model (AIM) and IIASA Greenhouse Gas and Air Pollution Interactions and Synergies (GAINS). This collaboration will be particularly important since GAINs can identify SLCP mitigation technologies.

**Day 1: 10 March 2015 (Tuesday)**

**Opening Session**

Chair: Dr. Naoko Matsumoto, IGES

**Welcome Remarks from Representative of JAPAN-IIASA Committee**

Dr. Kazuhiko Takemoto, Director, United Nations University Institute for the Advanced Study of Sustainability (UNU-IAS)

- Dr. Takemoto welcomed participants and expressed a special thanks to the Ministry of the Environment, Japan (MOEJ) for its continued support of this international workshop since 2012. He underlined that the main purpose of this meeting was to identify areas for future collaboration and to strengthen the science-policy interface on atmospheric pollution. He also touched upon recent international progress on SDGs to underscore an area where this workshop results could make an important contribution to a major policymaking process.

**Opening Remarks**

Mr. Seiji Tsutsui, Director, International Cooperation Office, Environmental Management Bureau Ministry of the Environment, Japan

- Mr. Tsutsui opened the workshop by stating his gratitude for this international workshop. He reminded participants that last year’s workshop concluded with the establishment of the ASPAQ (tentative title) as well as recent various efforts to promote co-benefits for air pollution and climate change mitigation. After reviewing the session outline, he closed his remark by encouraging participants to engage actively in discussions.

**Session 1: Updates on Atmospheric Science**

Chair: Prof. Katsunori Suzuki, Kanazawa University

**Outcome of IIASA - S-7-3 collaboration**

Dr. Hajime Akimoto, Asia Center for Air Pollution Research(ACAP), Japan

- Professor Akimoto presented on collaboration with IIASA under the Suishinhi 7 project. He noted that the starting point for this collaborative work was the assumption that the air pollution situation in East Asia is markedly different than the European Union and North America. Whereas Europe and North American scientists concentrated on SLCP reduction in terms of climate change mitigation (e.g. UNEP Report & CCAC), countries in East Asia continue to confront severely degraded air quality. Therefore, it
may be more appropriate to focus on air pollution abatement in parallel with CO₂ mitigation in Asia.

* In taking this air pollution first approach, he also argued the following. Strengthening NOx/VOC reduction in East Asia reduces summer time surface O3 in the region. Strengthening NOx/VOC and BC reduction in East Asia reduces autumn/winter time PM2.5. Strengthening NOx/VOC and BC reduction together with CH₄ reduction reduces radiative forcing. But once the direct and indirect effect of the change of aerosol is accounted for, the overall climate effect is uncertain. Although reducing SO₂ increases radiative forcing, this should not be avoided. Rather there is a need to compensate for exposed warming when the cooling of SO₂ is removed.

**Progress of IIASA-IGES collaboration**

- Dr. Eric Zusman, Institute for Global Environmental Strategies
  - Dr. Zusman presented on the collaboration between IIASA and IGES. That collaboration has focused on integrating governance into modelling scenarios for transport emissions in Thailand, India, Indonesia, and China.
  - He began by noting that diesel emissions both warm the climate and pose a grave threat to public health. Mitigating these impacts requires a well-designed diesel control strategy. Such a strategy involves steadily strengthening emissions standards and fuel quality standards along with an effective inspection and maintenance program (I/M program). But especially in a developing country context, there have been lags in the implementation of stronger standards and difficulties in the enforcement of I/M programs.
  - The presentation then concentrated on three scenarios: 1) an “original policy plans” scenario based on the letter of emission control legislation; 2) a “current practices” scenario based on actual implementation schedules and enforcement practices; and 3) a “leapfrog” scenario based on the potential benefits of a direct transition from the current emission standards to Euro-6/VI equivalent standards. The results suggested that PM2.5 emissions were 50% higher than would have resulted from effective policy implementation in 2010, while BC emissions and NOx emissions were 40% and 30% higher relative to more effective enforcement regimes. The costs of delayed and ineffective enforcement in 2010 resulted in between 8,000 and 24,000 premature deaths in China; and 5,000 and 14,000 premature deaths in India in 2010. Continuation of current practices would lead to 30,000 and 55,000 premature deaths in both countries annually by 2030.

**Progress on S-12 project related to short-lived climate pollutants**

- Dr. Toshihiro Masui, National Institute for Environmental Studies (NIES), Japan
  - Dr. Masui provided an overview of the Suishinhi-12 project. He noted that the project is divided into three main themes. The first theme is focusing on an analysis on regional atmospheric quality change; an emission inventory (REAS); and an inverse model to estimate emissions. The second theme is focusing on socio-economic and global emission scenarios; national and local emission scenarios; and urban and household emissions and air quality assessment. The third theme is focusing on an impact assessment of aerosol and GHGs; and an assessment of health, agriculture water and sea level rise.
  - Dr. Masui closed by presenting some preliminary findings from modeling work on co-benefits of implementing CO₂ control strategies. He further noted the interest in collaborating more with IIASA on modelling reductions in SLCPS.

**Progress on co-benefits research**

- Dr. Kenichi Wada, The Research Institute of Innovative Technology for the Earth(RITE), Japan
  - Dr. Wada framed his presentation around the idea that there is need to expand the scope of co-benefits to look at a broader range of ecological impacts from climate policies. In particular, he underlined the
importance of looking at non-Kyoto forcing agents and their interactions with land use change, tropospheric ozone, and other factors. He further contended that in expanding the scope to include other factors is likely to come with greater uncertainties.

- Dr. Wada concluded by noting that the need to fully account for co-benefits in future modelling. This will be challenging but will also help to systematically account for synergies and trade-offs he argued.

**Outcome of research on co-benefit**

- **Prof. Jusen Asuka, Tohoku University, Japan**
  - Dr. Asuka presented research on co-benefits from climate policies. He began by noting that recent evidence suggests the use of coal has already peaked in China—approximately 15 years before models assumed there would be such a peak. He attributed this peak to growing concerns over air pollution that have, in turn, brought down emissions of CO$_2$. Hence China has mitigated climate change for reasons relating first and foremost to co-benefits.

  - He went further to present results of co-benefits scenarios using the Merge model in Asia. Those results clearly demonstrated that the climate benefits were not great enough to encourage adoption of climate policies alone. The implication was that there needs to be other side benefits.

  - He concluded by reflecting on research that has monetized some of these side benefits—suggesting that there is a social benefit to cutting carbon. The peer reviewed literature on these co-benefits highlight they fall somewhere in the range of $2.00/ton of CO$_2$ to $192.00/ ton of CO$_2$.

**Progress on Atmospheric Brown Cloud (ABC) project**

- **Prof. Veerabhadran Ramanathan, University of California, San Diego (presented by Soon Chang Yoon)**
  - The presentation began by noting that the ABC program published its first major output in 2008—a regional assessment report for Asia. That report warned of the adverse effects of ABCs on climate change, water security, and food security in Asia. One of the major highlights of the ABC was the establishment of The EV-K2-CNR Pyramid Observatory by the Italian Government. This observatory has helped to gauge the seriousness of climate change in one of the main areas that can anticipate future climate changes.

  - In the years since the publication of the ABC report, subsequent efforts have been made to publish research that led to the formation of the CCAC. Other important findings include research on the contribution of biomass burning to ABCs and action oriented research on cookstoves under the auspices of project Survya. The project concluded with a vision for carrying forward the work of ABC with improved science, technology, policy and governance.

**Progress of GAINS application to China, Korea and other parts of Asia**

- **Dr. Zbigniew Klimont, International Institute for Applied Systems Analysis (IIASA)**
  - Dr. Klimont presented on the progress in development and application of the GAINS model in Asia. He focused on six areas of collaboration.

  - The first area is collaboration across China, Japan, India, Thailand, Indonesia, as well as the with researchers from the Hemispheric Transport of Air Pollution (HTAP) and The Model InterComparison Study for Asia (MICS-Asia) projects. This work looked at how emissions of CO$_2$, SO$_2$, NOx, BC, and PM$_{2.5}$ changed in China, Japan, and India over four scenarios: 1) current legislation; 2) no further control; 3) SLCP mitigation; and 4) maximum reduction. The second area involves collaboration with Beijing University, Tsinghua University and the World Bank and looks at whether ammonia emissions in Asia should receive more attention. The third area is the aforementioned collaboration with IGES and examines potential opportunities in transport sector (see IGES-IIASA collaboration). The fourth area involves the development and application of GAINS Korea and is supported by collaboration with the
National Institute for Environmental Research (NIER) and Konkuk University. The fifth area involves collaboration with King Mongkut’s University (Bangkok), University of Indonesia, Research/Centre for Climate Change (Jakarta), TCRDL (Toyota, Japan), IGES (Japan) on the impacts of policy on co-benefits. The sixth is bawed on collaboration with The Energy Resources Institute (India), TCRDL (Japan, Toyota) and consists of the development of a new non-methane volatile organic compounds inventory for India.

Progress of Airpet
- Prof. Nguyen Thi Kim Oanh, Asian Institute of Technology (AIT), Thailand
  - Dr. Oanh presented on the Asian AIR Pollution research NETwork (Airpet) project. She noted that this was a 10-year project (2001-2010) that focused on the following themes: 1) PM monitoring with QA/QC; 2) PM database for 6 cities (2002-2008) and remote sites source apportionment; 3) Southeast Asia regional photochemical smog models; 4) new control devices for VOCs and NOx; and 5) demonstration projects (brick kilns, rice straw field burning, etc.). The project concluded with a multi-autored edited book that highlighted key findings in each of the above areas. The main policy recommendations centred on targeting different sources in different regions (including for instance, diesel generators); improving regional air quality management strategy; several country specific recommendations (i.e. stringent control for industrial VOC in China); and overall tighter integration between air pollution and climate change policy.

Discussion
- Following the presentation, the discussion concentrated on greater collaboration between researchers working on the Asia-Pacific Integrated (AIM) Model and GAINs model, especially since the latter model is better designed to model SLCP mitigation.
- The discussion also turned to whether and when would a conventional climate change strategy would eventually mitigate sources of SLCPs—that is, was there a point where climate change policy obviated the need for a SLCP strategy.
- A third area of discussion centred on how regional cooperation could affect optimal abatement costs.

Session 2: Scientific Assessments

Progress with NEASPEC
- Dr. Sangmin NAM, UNESCAP East and North-East Asia Office (ENEA)
  - Dr. Nam concentrated on progress with the NEASPEC project. NEAPSEC was established by six counties in 1993 to combat air pollution. The project was motivated by the realization that Northeast Asia had made limited progress developing mechanisms to regulate transboundary air pollution. A related motivation was modeling conducted in China, Korea and Japan further highlighted the need for data sharing to improve data accuracy.
  - In 2012, Russia proposed a Technical and Policy Framework for Transboundary Air Pollution Assessment and Abatement, which was endorsed at SOM-18 in 2013. The targeted pollutants were PM2.5, PM10 and Ozone as well as linkages with other pollutants (including SOx, NOx, Black Carbon, NH3 and VOCs). The framework aimed to include 1) health impact of air pollution, 2) policy scenarios, 3) emission inventory, 4) abatement technology assessment, and 4) modeling of source-receptor relationship of transboundary air pollution, policy scenarios, impact assessment, etc. The concept of a sub-regional framework will be presented at the intergovernmental consultations meeting for further decisions in October 2015.
  - NEASPEC has also helped promote greater interaction in developing emission inventories between China, Japan and Korea, and other regional and global inventories developers. Mongolia and Russia have less engagement but they are trying to expand their activities.
Summary of Discussion on APCAP Science Panel
- Dr. Hajime Akimoto, ACAP, Japan
  - Dr. Hajime Akimoto presented on an APCAP Science Panel. He started by suggesting APCAP is a Strategic Framework for Asian Air Pollution by UNEP-ROAP with initial funding from the MOEJ (for the first five years). The long-term framework is intended to include atmospheric scientist and engineers, scientists working on impact studies, and social scientists recommended by consultation members in Northeast, Southeast and South Asia region. The activities will include the Joint Forum, Science Panel, and the regional assessment. There is still ongoing discussion on the name of science panel: APCAP science panel / ASPAC (Asia Science Panel for Clean Air). He concluded by noting that following the discussion in this meeting, a TOR for the Science Panel will be revised by UNEP in March/April. The first session of the Science panel will be held and the preparation of regional synthesis report will start in summer/fall.

Summary of Long Range Transport of Air Pollution (LTP)
- Prof. Young Joon Kim, Gwangju Institute of Science and Technology
  - Professor Kim presented on the LTP project. The LTP was started in 2000 as a government-based air pollution in Northeast Asia among Korea, Japan, China, and research framework. He noted that aerosol loading is increasing in Asia with high levels of PM 2.5 being observed in Beijing and Seoul.

  - For the first two phases of the project, SO2, NO2, O3, PM10, PM2.5 and ionic components were monitored at six monitoring sites in three countries. In Phase 3, source-receptor relationships for total nitrate and sulphur were studied. The project is now entering Phase 4; although the monitoring activity is currently stopped, plans are to resume the project with two additional monitoring sites in China and Korea.

Summary of EANET Scientific Assessment
- Dr. Supat Wangwongwatana, Regional Resource Centre for Asia and the Pacific (RRC.AP)
  - Dr.Supat focused on on scientific assessments to the Acid Deposition Monitoring Network in East Asia (EANET) is a network of 13 participating countries in East Asia regularly monitoring acid deposition, including wet, dry, soil, vegetation, inland aquatic and catchment monitoring. EANET only conducts monitoring; hence research activities are not routine activities of the network. EANET has Scientific Advisory Committee (SAC) in its institutional body. The SAC, composed of scientific and technical experts from the participating countries, advises and assists the Intergovernmental Meeting with various scientific and technical matters related to the EANET activities as mandate to it by the Intergovernmental Meeting.

  - The network has developed high quality monitoring datasets and produced Periodic Report on the State of Acid Deposition in East Asia (PRSAD) and Report for Policy Makers (RPM). The PRSAD is published every 5 years and the 3rd PRSAD will be published next month.

Discussion
- Following the presentation, the discussion concentrated on the incentive for the government to conduct modeling work and continuing collaboration in Northeast Asia, including partnership with Russia.

Day 2: 11 March 2015 (Wednesday)

Session 3: Reflecting Science into Policy  
Chair: Mr. Hideyuki Mori, IGES

Guidance Framework for Urban Air Quality
- Ms. Kaye Patdu, Clean Air Asia(CAA)
  - Ms. Patdu focused on how CAA works to translate science into policy. She noted that it is important to have a science-based and participatory approach to air quality management, especially in identifying effective policy interventions. As CAA’s main policy engagement platform is at the regional level, CAA
and UNEP holds Governmental Meetings on Urban Air Quality in Asia. The second meeting in 2008 endorsed the “Long-term Vision on Urban Air Quality in Asia” to help Asian cities to better understand requirements for future urban air quality management strategies. The fourth meeting in 2012 agreed upon developing a “Guidance Framework for Better Air Quality in Asian Cities” (Guidance Framework) to provide an authoritative document to support the implementation of the long-term vision and strengthening government’s capacity to manage air pollution. The Guidance Framework is now being developed with expert groups. Each chapter includes 1) a roadmap which serves as a recommended guide to show progress in implementation of measures for each guidance area; 2) concrete indicators to gauge level of improvement; and 3) recommendations on implementing the roadmap.

- Ms. Patdu also remarked that communicating the science into language which is understood by and applicable to policymakers/decision makers is critical. CAA is also working to strengthen the links between the Guidance Framework and other areas such as the Framework for Action to Protect Human Health from Air Pollution in the Western Pacific Region 2016-2020 with the WHO-WPRO.

Regional Assessment
- Dr. Eric Zusman, Institute for Global Environmental Strategies
  - Dr. Zusman spoke about the CCAC regional assessment. He began by noting that the regional assessment has been approved and the basic outline mirrors the outline for the APCAP assessment report. The next step will be to harmonize the two assessments. In so doing, he pointed to the four guideposts outlined at the end of APCAP meeting that can shape the process—namely, 1) what is happening and where when it comes to air pollution?; 2) why should we care?; 3) what are the measures? and 4) what could we do to close the gap? He closed by discussing the process for bringing the two assessments together.

Science and Policy experience in Europe including suggestion to Asia
- Dr. Markus Amann, International Institute for Applied Systems Analysis (IIASA)
  - Dr. Amann presented on some of the experiences translating science into policy in Europe and offered some recommendations for advancing Japan IIASA collaboration. He began by highlighting some of the keys to making science policy relevant noted in the literature on epistemci communities (legitimacy, salience, and credibility). He then noted that many of the struggles that Asia is going through to generate science based policy are not unique to Asia. For instance, France has recently encountered very serious air pollution. In trying to bridge science and policy, he underlined the need to look for major contributors to the problem; appreciate major implementation barriers; quantify the costs of these barriers; analyze arguments against policy change from different stakeholders; and generate a repository of successful cases. He further remarked that IGES and IIASA could serve as a repository of successful examples for case studies on how barriers can be overcome.

Discussions
Much of the discussion focused on the direction for APCAP. Below are some of the more salient points:
  - **Prakash:**
    - Guidance frameworks give comfort to policymakers, especially if others are following the same guidance. However, one common thread is that policymakers are afraid of making a mistake or an ineffective regulation. Therefore, it is good to compile a list of ineffective measures, and why policymakers decided on ineffective ones in the past.
    - Policymakers and scientists both are suffering from meeting fatigue. APCAP-Joint forum, CAA intergovernmental meeting – could these all be grouped together, or are they already the same?

  - **Kalpana**
    - It is important not to get overwhelmed with the details of India and China, although they are very important. Consider country specific profiles as a supplement. IGES and IIASA could conduct these
• **Rehman**
  - Need to highlight China and India in the report. Many best and worst practices come from both countries. These practices should feature prominently as case studies. They are also useful for Southeast Asia.
  - These reports need to have an emotional connection. Otherwise, it will not reach policymakers. Needs to be linked to that which interests politicians and citizens. Of course, having a scientific basis is important, but if it is not packaged in terms of what politicians and citizens are interested in, then it will not be persuasive.

• **Kaye**
  - Agree with the importance of discussing both failures and successes. There are challenges in getting information about failures and communicating lessons in a positive manner.
  - Consider asking regulators to express challenges (rather than failure cases). Develop case studies based on challenges. Then build a database of information. Ask regulators to reflect how they should have handled challenges in the past.
  - Southeast Asia is also important, not just China and India.

• **Eric**
  - Maybe good to have separate chapters on China and India, either as part of the report or separate addendums.
  - In terms of communicating with policymakers, IGES is a boundary organization trying to do both. Need to partner with existing organizations with good communication capacity such as CAA.
  - Case study repository of good and bad practices is a good idea; may be similar to an earlier APFED project which tried to do this.

• **Shaw Liu**
  - Presentations at this workshop were very clear and of high quality. But PM2.5 and Ozone in China and India are relatively well understood. China is making significant efforts. But it may take some time. These problems will be solved. But PM2.5 and ozone control will not solve the GHG problem. If we really want to control climate pollutants, a sharper focus is needed. We cannot propose how to control CO2 in this meeting. Are we just focusing on air pollutants, or we are also trying to do something more important, which is climate?

• **Carmichael**
  - We made good progress in developing ideas for the assessment report chapters. However, we haven’t decided how much to stress the climate element. But I don’t see a process behind all of the ideas. A single assessment cannot accomplish all of the goals that have been discussed at this meeting. Who is going to do what? How will the communications be implemented? Need to make the process more concrete if we want to do something useful. How can the drivers be developed into scenarios that can be used in models? Amann’s chart on SO2 was nice, but not clear how all of the parts relate to each other? How can we develop an integrated approach?

• **Zhang**
  - To link science to decision making at the regional level, there are already a lot of assessments and research reports. So what is the key focus of our report?
  - There is a lot of information available, but what are the barriers and gaps? Why is enforcement not in place? That would be important value added for this report.
  - One of the possible unique feature of this report could be whether or not to link climate change to regional or local air pollution. What would be the implications for different stakeholders?
  - As Marcus mentioned, postponement of action will also result in costs. This is a key message.
  - Asian countries have both success and failure stories. For example, whether public transportation
should be developed first to avoid locking in particular development patterns

- **Pedersen**
  - The problem is that many policymakers are not always rational. So just rational research based recommendations often does not work. Regional assessments are useful for providing data, science, and policy recommendations. But how to get the recommendations may be the work of local organizations. Recommendations cannot be one-size-fits-all. The usefulness of the regional assessment is part of a continuum. There are many organizations which are good at arguing for implementation, which is very different from research. They can mobilize public opinion to influence policymakers.
  - We have a unique opportunity to achieve real change in air quality; this is different from climate change. In climate change it is difficult to generate public pressure because the effects will be felt in the future. However, air pollution consequences are more immediate. Public pressure in China is a good example, as public awareness was created by the publication of the US embassy monitoring data.
  - Advocacy to implement this group’s recommendations it may be beyond the ability of this group.

- **Amann**
  - Need to distinguish between the regional assessment, and understanding why recommendations are not implemented.
  - We already know what should be done, but it isn’t being done. We need to understand why actions are not being taken. This should be the future research priority.

- **Eric**
  - There is a challenge in combining meetings, because then the meetings become too long.
  - Regarding collaboration, for some social aspects that are barriers to implementation, social scientists do have data and they can be integrated into the models. You can use basic econometrics to more systematically assess the impacts of these barriers. Case studies are crucial, but also more systematic analysis of the barriers is needed. How to systematize these barriers to clearly demonstrate their impacts.

- **Kaye**
  - Agree with points raised. Systematizing analysis of barriers is important.

- **Kim**
  - In Asia most population is urban areas. Amman showed high PM2.5 in Paris last year. There are two driving factors, emissions and meteorology. Meteorology is changing, so this kind of expertise is needed. Last year the Korean government funded a big project on this.

- **Oanh**
  - Assessment report should be easy to communicate to policymakers. Success cases will be in Ch. five. There is a challenge to limit the volume of the report. Better not be too long. Maximum 100-150 pages.
  - The greater the involvement of diverse stakeholders the more visible the report.

- **Rehman**
  - In terms of the process, consider two aspects 1) the assessment report, 2) policy brochure or booklet or policy brief which simplifies and carries messages. Not sure how much addendum reports will be read.

- **Asuka**
  - Highlighting the cost of inaction is a good idea.
  - How to communicate short and long term impacts, especially reduction of cooling air pollutants, is difficult.
- Benefits should include job creation.
- Need to link air pollution to tobacco and health issues. This will be easier for policymakers and lay people to understand.

- **Supat**
  - What will happen after the regional assessment is completed? The report might be presented at the Joint Forum. What is the next step after that? Do you expect the representatives from the government to come to the meeting, receive the report and implement it? This will not happen. The assessment report is just a starting point. Action will have to be taken at the national level.
  - Tailored national level policy recommendations are needed. How could these be developed?

- **Hao**
  - What is science? Some science is paper science insofar as it intended to make money from publishing, not really answering questions for policymakers. So we need to focus on solutions. Assessment is good to see the global perspective, but for countries, more focused questions are necessary. Science needs to provide the tools to solve problems. In 1997, the World Bank made an assessment, *Blue Sky and Clean Water*, and it was translated into Chinese. This report really helped to move forward policy.
  - In China, now, there are many ways for science to go to the decision makers. The Chinese government is now open to receiving scientific information.
  - Many people want to advise China, but they do not know the current conditions of China or what China is doing. It is important to have a clear picture of both before providing guidance.

- **Iynagarasan**
  - We are focusing on translating science into to policy, and science is focusing on monitoring and impacts. But we have not put much emphasis on the mitigation side. In Europe the countries could invest in control methods, but this is not true in Asia.
  - Ministries of environment say we know what the problem is, but wonder what they can do in a cost effective way.
  - Regarding the scope, it will be a regional report but also focus on subregional issues. We need to leave space for the smaller countries, not just focus on China and India.

- **Klimont**
  - There has been a lot of discussion about elements of what makes an assessment successful.
  - Looking at the ozone assessment, which was successful, it had a lot of these components. It was lucky because it received a lot of media attention. The science panel should consider how to raise the profile of its work.

- **Kaye**
  - Importance of creating ownership in the process.
  - Importance of job creation, identifying sectors that would benefit from reduced air pollution, for example, awhile ago CAA conducted a study of the savings of air pollution reduction for health insurance.

- **Eric**
  - Report could be 150-200 pages. But could publish a summary for policymakers first (about 30 pages).
  - Regarding packaging, to get media attention, for SLCP, it was the 16 measures. Earlier work on “mitigation wedges” by Pacala and Socolow could also be a good example of easily digestible research.

- **Amann**
  - Need to focus on answering questions from policymakers, and emphasizing the benefits. Air quality benefits can be quantified in the short term; this is a major advantage compared to climate
Wrap-up of the discussions and conclusions

- **Wrap-up by Prof. Suzuki:**
  - Asia needs integrated policies for mitigating various air pollutants. While a co-benefits strategy is recommended to be reflected in policies, the presentations pointed out that experiences show that its difficult to implement. However, the costs of delayed and ineffective enforcement will result in many casualties. Thus Importance of lost benefits of inaction for air pollution mitigation should be explained with easy languages so that policymakers in Asia can understand.
  - There will be opportunity for further collaboration between researchers in Japan and the IIASA on GAINS in Asia through S-12 research project which is funded by the Environment Research and Technology Development Fund of the MOEJ for promotion of climate policies by assessing impacts of SLCP and LLGHG emission pathways (FY2014-18))
  - In sum, an integrated approach is very important in Asia. Regarding the lost benefits of inaction, impacts on social aspects may be further discussed in future collaboration.

- **Wrap-up by Dr. Amman:**
  - A common message from three presentations was that Asia has the biggest population in the world and the policies significantly influence regional issues. Three presentations explained that we had to address both urban and rural air pollution sources in the region, covering clean cookstoves by the ABC project, agricultural emissions by GAINS model project and biomass burning by the Airpet. In contrast to other parts, assessment of rural emissions is extremely important.

- **Wrap-up by Mr. Mylvakanam/Dr. Zusman:**
  - After giving short summaries of each presentation in the session, the meeting minutes and revised TOR of the science panel would be shared shortly along the agreed schedule.
  - The IIASA workshop underlined two areas for key cooperation in the GAINS model and implementation of measures. As the secretariat of this series of workshops, IGES would like to suggest presenting two working papers in the next workshop.

Closing Remarks

- **Mr. Hideyuki Mori, IGES**
  - Air pollution, especially from PM2.5, is common to Europe and Asia. We have common challenges facing many countries, both developed and developing. In order to tackle these comparable issues, we need to learn how they can be addressed. Each country has a significant amount of history in addressing air pollution, so there must be many lessons and it would be very useful to share both more and less effective experiences.
  - Regarding the science policy linkage, we live in an increasingly democratic world. Democracy takes different forms in each country, but a lot of data and information can easily be shared. There is more transparency. Science plays an important role in increasing transparency. The strength lies in monitoring and modelling. But the analysis needs to be linked to policy as much as possible. Since models have been applied in various places, it has become an important part of the decision making process. However, science and modelling cannot address value judgments. Policymakers need to make the final decision and this is also based on values.