



The Japan Committee for International Institute for Applied Systems Analysis (IIASA)
International Workshop

Toward an Integrated Approach to Co-benefits in Asia: Building Bridges and Making Connections

March 6-7, 2014, Pacifico Yokohama, Kanagawa, Japan

Proceedings



**The Japan Committee for International Institute for Applied Systems Analysis (IIASA)
Proceedings of International Workshop – Toward an Integrated Approach to Co-benefits in Asia: Building
Bridges and Making Connections –**

Editors:

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Toward an Integrated Approach to Co-benefits in Asia: Building Bridges and Making Connections

Institute for Global Environmental Strategies (IGES)
as the Japan Committee for IIASA Secretariat

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:

- Rather than starting with a climate change perspective on co - benefits, air pollution control may be a good point of departure for Asia's approach to co - benefits.
- The air pollution perspective on co-benefits is particularly important in the case of tropospheric ozone (O₃). In contrast to concentrating on methane (CH₄) to mitigate O₃, non - methane precursors (namely NO_x and VOCs) play a greater role in ozone formation in Asia.
- While other socioeconomic benefits are the main driver of climate actions, in some countries in Asia climate change is becoming an important motivation for action.

As these messages imply, there is a growing awareness of an integrated approach to air pollution and climate change policy in Asia. However, there is still considerable debate over how such an approach would be designed and implemented in the region. The purpose of this workshop is to begin to build bridges and make connections between researchers and policymakers to better define and operationalize an integrated approach in Asia.

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 discuss an integrated approach to co-benefits in Asia
- 2) To determine how gap between and among policymakers and researchers can be reconciled by an integrated approach in Asia
- 3) To identify pragmatic alternatives for overcoming these difficulties

3. Schedule

| | |
|--------------|---|
| Date & Time | March 6, 2014: 9:30 - 16:30 March 7, 2014: 9:15 - 11:50 |
| Venue | Pacifico Yokohama (1-1-1 Minato Mirai, Nishi-ku, Yokohama, 220-0012, Japan) http://www.pacifico.co.jp/english/facility/accessmap.html |
| Organisers | Ministry of the Environment Japan Institute for Global Environmental Strategies (IGES) |
| Collaborator | The Japan Committee for the International Institute for Applied Systems Analysis (IIASA) |

Toward an Integrated Approach to Co-benefits in Asia: Building Bridges and Making Connections

6-7 March 2014 at Pacifico Yokohama, Yokohama, 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: 6 March 2014 (Thursday) | |
|---|---|
| 9:30 - 9:45 | Registration |
| 9:45 - 10:00 | Welcome Remarks <ul style="list-style-type: none"> - Ms. Masako Ogawa, Ministry of the Environment, Japan Introduction of Participants |
| Session 1: Progress in Atmospheric Science and Modelling Chair: Prof. Katsunori Suzuki | |
| 10:00 - 12:00 | Outcome of IIASA-S-7-3 collaboration <ul style="list-style-type: none"> - Dr. Hajime Akimoto, ACAP, Japan Introduction of IPCC WG1 AR5 and S-12 project <ul style="list-style-type: none"> - Dr. Toshihiko Takemura, Kyushu University, Japan Progress of S-7-2: Improvement of Emission Inventories and Development of Emission Scenarios for Air Pollutants in East Asia <ul style="list-style-type: none"> - Dr. Junichi Kurokawa, ACAP, Japan |
| 11:00 - 11:15 Coffee Break | |
| | Progress of S-7-1: Quantification of Ozone and Aerosol Pollution in East Asia and the Hemisphere Synthesizing Numerical Modeling and Observation <ul style="list-style-type: none"> - Dr. Tatsuya Nagashima, NIES, Japan Asia MERGE model <ul style="list-style-type: none"> - Prof. Junsen Asuka, Tohoku University, Japan Discussions |
| 12:00 - 13:00 Lunch | |
| Session 2: Promotion on Co-benefits (1) Chair: Dr. Eric Zusman | |
| 13:00 - 14:45 | Japanese strategy to promote co-benefits in Asia <ul style="list-style-type: none"> - Ms. Masako Ogawa, Ministry of the Environment, Japan Addressing Air Pollution in Asia-Pacific: Cohesion between existing initiatives <ul style="list-style-type: none"> - Mr. Iyngararasan Mylvakanam, UNEP ROAP CAA strategy <ul style="list-style-type: none"> - Ms. Maria Katherina Cortez Patdu, CAA European perspectives on Co-benefits and SLCPs <ul style="list-style-type: none"> - Dr. William Kevin Hicks, GAPF Discussions |
| 14:45 - 15:00 Coffee Break | |
| Session 3: Promotion on Co-benefits (2) Chair: Dr. Markus Amann | |
| 15:00 - 16:30 | Progress in Asian Co-benefits Partnership (ACP) <ul style="list-style-type: none"> - Dr. Eric Zusman, ACP Secretariat/IGES, Japan China's co-benefits approach <ul style="list-style-type: none"> - Dr. Kebin He, Tsinghua University, China Indonesia's co-benefits approach <ul style="list-style-type: none"> - Ms. Noor Rachmaniah, Ministry of Natural Resources and Environment, Indonesia Discussions |

Day 2: 7 March 2014 (Friday)

Session 4: Future Strategy on Better Air Quality in Asia

Chair: Mr. Hideyuki Mori

| | |
|---------------------|--|
| 9:15 - 10:45 | Japanese proposal for better air quality in Asia, include ASPAC and Ad Hoc High-level Scientists Meeting on Air Pollution and Climate in Asia <ul style="list-style-type: none">- <i>Dr. Hajime Akimoto, ACAP, Japan</i> Progress of GAINS application to China, Korea and other parts of Asia <ul style="list-style-type: none">- <i>Dr. Zbigniew Klimont, IIASA</i> Discussions on future collaboration between Japan and IIASA |
|---------------------|--|

10:45- 11:00 Coffee Break

| | |
|----------------------|---|
| 11:00 - 11:50 | Wrap-up of the discussions and development of conclusions <ul style="list-style-type: none">- <i>All chairs: Prof. Katsunori Suzuki, Dr. Markus Amann, Mr. Hideyuki Mori, and Dr. Eric Zusman</i> Closing Remarks from Representative of IGES-IIASA Committee <ul style="list-style-type: none">- <i>Dr. Kazuhiko Takemoto, Council Member, IIASA /Senior Advisor to Minister of the Environment</i> Closing Remarks <ul style="list-style-type: none">- <i>Prof. Hironori Hamanaka, Chair of the Board of Directors, IGES</i> |
|----------------------|---|

11:50 – 12:50 Lunch

*** Reception from 18:30 at Restaurante ATTIMO**

Pacifico Yokohama, Exhibition Hall 2F

http://www.pacifico.co.jp/english/services/shops_attimo.html



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- Summary -

Day 1: 6 March 2014 (Thursday)

■ **Welcome Remarks: Ms. Masako Ogawa, Ministry of the Environment, Japan**

After welcoming all participants, Ms. Ogawa outlined her expectations for the workshop, namely: to share the progress made for an integrated approach to co-benefits in Asia since last year, especially in the area of air pollution control. She also stated that she hopes to hear frank and active discussion in each session with participation from many different institutions. She felt that this diversity will help pave the way for clearer strategies and strong cooperation on co-benefits.

Session 1: Progress in Atmospheric Science and Modelling

■ **Outcome of IIASA-S-7-3 collaboration: Dr. Hajime Akimoto, ACAP, Japan**

Dr. Akimoto made a presentation on the outcome of IIASA-S-7-3 collaboration titled an SLCP Co-benefit Approach in East Asia. The project was based on a series of scenario analyses for East Asia (Northeast and Southeast Asia) from the base year 2005 to the target year 2030 on various air pollution species, including black carbon (BC), organic carbon(OC), nitrous oxides (NO_x), volatile organic compounds (VOC), sulphur dioxide (SO₂), carbon dioxide (CO₂), methane (CH₄), carbon monoxide (CO), ammonia (NH₃) and particulate matter (PM_{2.5}) using the GAINS model, CHASER/MIROC, and WRF/CMAQ. The examined scenarios were: a current legislation scenario, climate scenario, maximum feasible reduction scenario, and air pollution mitigation strengthened scenario. Dr. Akimoto concluded with the implications from the analyses as follows: (1) strengthening NO_x/VOC reduction in East Asia reduces summer time surface O₃ in the region; (2) strengthening NO_x/VOC and BC reduction in East Asia reduces autumn/winter time PM_{2.5} in the region; (3) strengthening NO_x/VOC and BC reduction also reduces radiative forcing; (4) although SO₂ reduction increases radiative forcing, it is necessary to avoid pollution, and should not be accounted for in the effect of SLCP control.

■ **Introduction of IPCC WG1 AR5 and S-12 project: Dr. Toshihiro Takemura, Kyushu University, Japan**

Dr. Takemura made a presentation on two themes. First, he provided an introduction of radiative forcing and future projections of short-lived climate pollutants (SLCPs) from the Intergovernmental Panel on Climate Change Working Group 1 Assessment Report 5. This presentation included the following findings: (1) the confidence level of assessment of radiative forcing is high for tropospheric ozone and the aerosol-radiation interaction, while it is still low for the aerosol-cloud interaction; (2) radiative forcing of BC should continue to be assessed with changes in other aerosol species; (3) future regional atmospheric loading and radiative forcing of aerosols and ozone depend on mitigation scenarios; and (4) a new definition of “effective radiative forcing” has been adopted. Second, he shared the research plan of the S-12 project which is supported by the Environment Research and Technology Development Fund S-12. This project will quantitatively assesses climate change and environmental impacts from SLCPs and develop an integrated approach for identifying suitable paths for reducing well mixed greenhouse gases and short-lived climate pollutants from a scientific perspective.

■ **Progress of S-7-2: Improvement of Emission Inventories and Development of Emission Scenarios for Air Pollutants in East Asia: Dr. Junichi Kurokawa, ACAP, Japan**

Dr. Kurokawa presented the progress of S-7-2—the subgroup of an atmospheric pollution research project that focuses on emission inventories and emission scenarios. He introduced the REAS 2.1, a regional emission inventory in Asia, and reported the results of analysis on emissions in Asia, including trends and geographical differences. He also reported the preliminary results of the projection of future emissions based on several scenarios. He concluded the presentation by identifying the following key messages: (1) both spatial and temporal variation of emissions of air pollutants and GHGs in Asia are expected to be complicated and thus continuous efforts for developing and improving emission inventories in Asia is much needed; (2) detailed information from each country is required to develop emission inventories that can be used for considering effective measures to mitigate emissions and therefore collaboration with researchers in different countries is essential; and (3) for understanding the status of air quality and climate and creating effective scenarios to mitigate air pollution and climate change, a combination of wide range of research fields such as observation, bottom-up emission inventories, regional and global modelling for the atmosphere, inverse modelling, social modelling, policy science studies are critically important.

■ **Progress of S-7-1: Quantification of Ozone and Aerosol Pollution in East Asia and the Hemisphere Synthesizing Numerical Modeling and Observation: Dr. Tatsuya Nagashima, NIES, Japan**

Dr. Nagashima made a presentation on two of the study results of S-7-1. The first was the analyses of the source-receptor (S-R) relationship of O₃ in Asia based on the CHASER model. The result showed that: (1) the surface O₃ in Japan has diverse origins; (2) the recent increase in O₃ in Japan can be partially (at least 36%) attributed to the increase in O₃ created in China; and (3) Northeast and Southeast Asia both suffer from O₃ pollution. The second study estimated the effect of emission reductions and future emission scenarios in East Asia. The analyses were based on WRF for weather and CMAQ for chemical transport, drawing emission data from REAS. The impact of 50% reduction in emissions from each region (North China, South China, Korea, and Japan) and sector (power generation, industry, transport, and domestic sectors) on high O₃ and high PM_{2.5} events was assessed and the following conclusions were drawn: (1) emission control of air pollutants in China has a large impact on Japanese air quality, but the impact is different for different pollutants (O₃ < PM_{2.5}); and (2) the 450ppm scenario can improve air quality in East Asia to a certain degree, but it is not sufficient, especially for China and Korea.

■ **Asia MERGE model: Prof. Junsen Asuka, Tohoku University, Japan**

Professor Asuka first pointed out that, while bottom-up studies have been developed in the area of co-benefits, applications of Integrated Assessment Model (IAM) / top-down macro-economic model is limited. Second, he introduced the Asia MERGE model developed by Tohoku University. He then reviewed the major conclusions from the model, including: (1) without co-benefits from local air pollution (LAP), the costs of global climate change (GCC) cannot be covered by the benefit of GCC alone; (2) integrated policy have a bigger benefit compared to modest increase in the cost; and (3) internalizing the LAP and GCC reduces the emission price (efficiency gain). Third, he presented a proposal for Sino-Japan cooperation using CDM and co-benefits; the proposal would involve Japan paying a premium for projects that clearly demonstrated co-benefits.

Session 2: Promotion on Co-benefits (1)

■ **Japanese strategy to promote co-benefits in Asia: Ms. Masako Ogawa, Ministry of the Environment, Japan**

Ms. Ogawa began by outlining how her division in the MOEJ defines co-benefits. In particular, she noted that co-benefits approach is the measures that aim to reduce GHG emissions while meeting other development needs. The MOEJ has engaged in several projects and programs to promote co-benefits in Asia. These include a series of feasibility studies and demonstration projects with counterparts in Indonesia's Ministry of Natural Resources and Environment (MOE) and the Ministry of Environmental Protection of China (MEP). The MOEJ has also supported multilateral stakeholder collaboration under the Asian Co-benefits Partnership (ACP), tools development and research with the United Nations University (UNU), and collaborative research with International Institute for Applied Systems Analysis (IIASA). In the

future, the MOEJ will work on a series of projects that aim to achieve co-benefits from better air quality management in cities and regions in Asia with Clean Air Asia (CAA) and the United Nations Environment Programme (UNEP). Also moving forward, the MOEJ intends to solicit feedback from current projects, and capacity building; review achievement and to identify issues; establish a committee to discuss co-benefits strategies; enhance cooperation with industries and academics; and expand bilateral cooperation on co-benefits.

■ **Progress on ABC Asia and UNEP strategy: Mr. Mylvakanam Iyngararasan, UNEP ROAP**

Mr. Mylvakanam Iyngararasan presented on several important air pollution science and policy initiatives in Asia. He began by noting that much of the recent interest on SLCPs originated with the Atmospheric Brown Cloud (ABC) project that presented the most recent science on regional air pollution's impacts. He then underlined that there have several air pollution agreements in Asia paralleling the accumulation of knowledge from atmospheric science. These include the ASEAN Haze Agreement, the Acid Deposition Monitoring Network in East Asia, and the Male' Declaration on Control and Prevention of Air Pollution and its Likely Transboundary Effects for South Asia. He nonetheless noted that the need to capitalize on possible synergies between these agreements and develop a "one policy forum" for the region. The Joint Forum on Atmospheric Environment in Asia and the Pacific offers platform for such unified forum.

■ **CAA strategy: Ms. Kaye Patdu, CAA**

Kaye Patdu introduced participants to Clean Air Asia and highlighted work that CAA is doing on co-benefits. She noted that CAA was created to promote better air quality and liveable cities by translating knowledge to policies and actions that reduce air pollution and greenhouse gas (GHG) emissions from transport, energy and other sectors. Since its 2002 establishment, CAA has become the leading advocacy organization on air quality in Asia. CAA is currently looking to strengthen that reputation by helping to develop a Guidance Framework for Better Air Quality in Asian Cities. The Guidance Framework is scheduled to be endorsed at the 2014 Intergovernmental Meeting on Air Quality—one of several events where CAA aims to bridge knowledge and action on air pollution. Ms. Patdu then highlighted some institutional, resource, and communication gaps and opportunities for integrating co-benefits into policy in Asia. She closed by encouraging participants to join the Better Air Quality (BAQ) workshop on 19-21 November in Colombo, Sri Lanka.

■ **European perspectives on Co-benefits and SLCPs: Dr. Kevin Hicks, GAPP**

Dr. Hicks began by summarizing the reasons for the recent interest in short-lived climate pollutants (SLCPs). He stressed that mitigating SLCPs is a complement not a substitute for mitigating GHGs. He then highlighted other pollutants where there are possible climate and development synergies and trade-offs. These include nitrogen deposits which can serve as a fertilizer but may also harm biodiversity. More generally, he noted that there is still much to learn about the interactions of the various pollutants, such as ozone and nitrogen, in a changing climate and across spatial and temporal scales. He then reflected on the European experience with a more integrated approach to atmospheric pollution. In this connection, he observed that there has been considerable progress but still notable impacts from air pollution on human health, crops, environment and biodiversity. In Europe, further abatement measures will be required for reactive nitrogen, ozone precursors and particulate matter, especially black carbon. Europe and other regions will need to cooperate to tackle tropospheric ozone issues with CH₄ affecting global background and NMVOC and NO_x reductions contributing to peak ozone. The latter NO_x concern will be challenging because NO_x reduction strategies for diesel vehicles in Europe have failed in on road conditions over the last 20 years. Ozone has also an equally important indirect effect on climate through reducing carbon sequestration in vegetation. He nonetheless concluded on an optimistic note by suggesting that articles are being considered in the revision of the Gothenburg Protocol and EU thematic strategy (will probably highlight both the climate (and possibly CH₄) and health effect). Other encouraging signs are that EU is a partner of the Climate and Clean Air Coalition (CCAC); the EU is planning to impose a 79 % reduction in emitted HFCs by 2030; and European policy is recognizing that it is necessary to integrate both the climate and health/environment aspects, including ecosystem services, in the future to get the full benefits and avoid trade-offs.

■ **Discussions**

- The discussions for this session focused on the differences between Europe and Asia in the

management of atmospheric pollution. It was noted that Europe has had a longer history of dealing with transboundary air pollution and that initial agreements were modest in scope and impact. They nonetheless set the stage for greater progress down the road.

- The discussions also concentrated on whether it would be prudent to strengthen the linkages between the CCAC and the UNFCCC. The meeting recognized the need to promote coordination among the existing networks and there was a general consensus on establishing a unified forum for air pollution at the regional level building on the Joint Forum.

Session 3: Promotion on Co-benefits (2)

■ **The Asian Co-benefits Partnership: Looking Back and Forward: Dr. Eric Zusman, ACP Secretariat/IGES, Japan**

The Asian Co-benefits Partnership (ACP) was established in 2010 to provide an informal and interactive platform to enrich stakeholder dialogue on co-benefits in Asia. The ACP has disseminated information and supported programming to help mainstream co-benefits into a variety of decision making processes. In the future, the ACP can help identify entree points for co-benefits and support developing user-friendly tools and training for relevant stakeholders. Moving forward, the ACP could also help promote a more integrated approach to climate change and air pollution policy in Asia. That integrated perspective would recognise the multiple impacts across time and space of different forms of pollution. This would, for instance, include the cooling impacts of sulphates. It will also require promoting multi-stakeholder, multi-level governance for co-benefits in Asia. Having focused more on bringing research and policy, its first ACP white paper will be launched at the end of March 2014.

■ **Short-lived Climate Pollutants and Co-benefits Approach in China: Dr. Kebin He, Tsinghua University, China**

In China, haze and air pollution chiefly from PM_{2.5} is becoming increasingly serious. The Chinese government has launched a new air quality standard in March 2013 and 74 cities have begun announcing hourly reports on PM_{2.5} concentration. Notably the average PM_{2.5} concentrations in these 74 cities is twice national standards and Beijing is three times higher, making it difficult to achieve the current national standard. PM_{2.5} is complex issue and much of its complexity is related to its chemical composition. Recent analyses indicate that secondary component of PM_{2.5} has increased steadily. National inventories show that SO₂ has been decreased while NO_x, VOC and BC emissions in the last 20 years increased. BC mitigation can be “no-regret” measures for co-benefits, and the issue is noted for improving the visibility.

While total emission amounts in China has increased along with economic growth, emission intensity per unit GDP has declined. Thus there is significant pressure on each region to sustain the increase of economic growth while decreasing pressure to environmental quality. The central government has introduced a new action plan with 10 major measures to reduce PM_{2.5} concentration in Beijing-Tianjin-Hebei regions by 25% in 2017. Key measures in China’s carbon mitigation strategies include: optimising the industrial structure; energy conservation; developing low-carbon energy; promoting technological innovation; promoting low-carbon development in localities and sectoral carbon mitigation. Coordinating control of multi-pollutants will be equally critical.

■ **Indonesia's co-benefits approach: Ms. Noor Rachmaniah, Ministry of Natural Resources and Environment, Indonesia**

The Ministry of Natural Resources and Environment, Indonesia has carried out utilisation of palm oil mill wastes as a co-benefits promotion project by capturing biomass fuel and methane for electricity from boilers. The palm oil industry can achieve zero waste discharge potential by managing from beginning to the end and considering that waste or the principle of the 3Rs (reduce, reuse, recycle) as well as through the implementation of technology conversion within its industry or other industry. The potential biomass from oil palm industry in Indonesia should be managed in an integrated system using appropriate technologies such as renewable and sustainable energy to obtain economic value. The biogas captured from the tofu industry and cattle manure cannot only mitigate local and global pollution, but could be combusted for cooking, lighting and heating of hot water for small households, thereby reducing the reliance on fossil fuel.

Day 2: 7 March 2014

Session 4: Future Strategy on Better Air Quality in Asia

■ **Proposal of Asia Science Panel for Air and Climate (ASPAC) - Plan for Ad Hoc High-level Scientists Meeting on Air Pollution and Climate in Asia : Dr. Hajime Akimoto, ACAP, Japan**

Dr. Akimoto presented a proposal for an Asia Science Panel for Air and Climate (ASPAC). He started with an explanation of the necessity for a scientific epistemic community on air pollution by comparing the Asian condition with the European case. He then highlighted the importance of considering the views of Asian scientists to those of European and North American, as their understandings on Asian situation might be different. The aim of ASPAC is therefore to synthesize scientific knowledge on air pollution in the Asian region, to reach a common understanding among scientists and policy makers, and to develop an international initiative for an integrated approach to air pollution and climate change reflecting the views of Asian scientists. In the latter half of his presentation, he discussed the possible design of ASPAC including geographical scope, members, organizational structure, funding source, and Ad Hoc High-Level Scientists Meeting.

■ **Progress of GAINS application to China, Korea and other parts of Asia: Dr. Zbigniew Klimont, IIASA**

Dr. Klimont presented on the development and applications of GAINS in Asia. He began by introducing GAINS China which was developed by IIASA in cooperation with Tsinghua University; as well as GAINS City for China that was also developed as a prototype in collaboration with Tsinghua University, Peking University, and Princeton University by focusing mainly on energy efficiency and transport management in Beijing and Jinan. Then he explained the development of GAINS Korea which started in 2013. The Korean government's intention is to adopt different control strategies for individual provinces with a strong emphasis on co-benefits and green growth. In addition, other activities in Asia such as MICS-III/HTAP (harmonization of GAINS-Asia emission inventories) and Toyota Clean Air Project were briefly introduced. Lastly he underlined that CH₄ is recognized as an air pollutant as it is a precursor of ozone. Proposals for national emission ceilings for CH₄ and the importance of implementing no regret/'negative cost' measures for CH₄ will allow one to compensate air pollution control costs.

■ **Discussions on future collaboration between Japan and IIASA**

Dr. Amann shared two lessons learned from GAINS with participants. One is that it is very important to communicate with decision makers with a precise and common interpretation of scientific knowledge. The other lesson is that considering economics of pollution control is crucial.

Dr. Zusman raised two questions: one related to the usability of modelling. He asked IIASA colleagues about their experience with GAINS—namely can GAINS be used by policymakers themselves or do they need to contact science communities. The other is regarding ASPAC whether or ASPAC will use one common model or different models.

In response to the 1st question, Dr. Klimont answered that it still remains a challenge to make modelling frameworks simple enough for decision makers. He noted that first stage was not successful in this regard and would keep working in the second stage to realize a user friendly and a robust modelling framework.

Dr. Amann also noted that the model was not a reality but always a simplification and it changed modelling frameworks depending on purposes. He mentioned that, in reality, it was hard to achieve a simple modelling framework which in turn enables to accomplish its purposes. He underlined that it is usually best if models are fit for purpose.

Dr. He explained the background needs for GAINS City in China by mentioning that much of the action happens at the city level; as cities lack capacities, providing scientific and technical tools are very important.

Dr. Akimoto responded to Dr. Zusman's second question by noting that an ensemble approach that utilizes various models would be more desirable than using a single model. This would help countries to accept simulated results. In addition, Mr. Mylvakanam noted that as a model is always just a model, we should focus more on observed evidence.

Prof. Suzuki raised a question concerning IIASA-Japan cooperation--namely whether or not there is still a need for Japanese engineers and scientists to develop emission scenarios, latest mitigation measures,

latest technological information, and so forth.

Dr. Klimont highlighted that stronger collaboration with Japan is needed. Especially regarding scenario development, there are strong needs to collaborate and reflect the impacts of new policies. This is particularly important because there is a great deal of dynamism in trends in rapidly growing developing countries such as India, Viet Nam, Thailand, and Malaysia. He noted that collaboration with other groups is hence needed and much we can learn from each other.

From Indonesia's point of view, Ms. Rachmaniah noted that modelling helps understand the benefits of a co-benefit approach. It is indeed very useful to promote and ensure knowledge-based decision making. Similarly, Ms. Patdu noted that modelling tools have always been very important to convince policy makers to apply air pollution policies.

Dr. Akomoto made a practical comment on IIASA-Japan cooperation. He explained that S-7 has identified a concept design and therefore the next steps are to develop concrete co-benefits scenarios. He suggested a cooperation strategy with MOEJ is needed. He also underlined two communication channels: one is the IIASA Japan committee and the other is researchers who worked on S-7.

In conclusion, Dr. Amann underlined the importance of consolidating scientific knowledge and integrating it into the decision making processes. He noted that the model is a tool to help achieve targets but it is just one step. He further highlighted that we should use both top-down and bottom-up approach to discuss bilaterally to achieve meaningful outputs. Lastly, Mr. Mori and Dr. Zusman recommended that GAINS should be utilized under ASPAC as one of Japan-IIASA cooperation in future.

■ **Wrap-up of the discussions and development of conclusions**

The workshop concluded with a wrap-up session that highlighted key findings from the four sessions.

Session 1: Prof. Katsunori Suzuki

- Possible collaboration with IIASA could include developing new scenarios to reflect new policies especially policies for severe air pollution episodes.
- Also possible collaboration with IIASA to account new technologies.
- Scenarios can be built upon 5th assessment report of the IPCC.
- It is important to improve emission inventories to make emission scenarios more robust.
- Area that would be particularly important to scenario development in Asia would be ozone and aerosol.
- Further development and integration between top-down and bottom-up modelling for co-benefits also promises to be important in Asia.

Session 2: Dr. Eric Zusman

- Differences between European and Asian contexts should be taken into account in strengthening science policy interface in Asia. In particular, Asia might not develop LATAP-style convention rather it might see more integrated approaches to take shape at the national level.
- One area where Asia can learn from Europe is the packaging of different policies, packaging can allow different countries or regions to achieve net benefits from a combination of policies while possibly losing on a single policy.
- More research is needed on whether CCAC or SLCPs can be linked to UNFCCC. This would be particularly important as new forms of climate finance become operational.
- In thinking about linkages between SLCPs and International climate, regional air pollution and national sectoral policies, it will be important to draw upon research on multi-stakeholder multi-level governance.

Session 3: Dr. Markus Amann

- Definition of co-benefits will likely vary in different countries. In China much of the interest in air pollution co-benefits comes from recent strengthening of air pollution control policies.
- In Indonesia, work on co-benefits has focused more on waste management in particular 3Rs and an integrated approach to managing palm oil.

- Asian Co-benefit Partnership (ACP) is well positioned to take understanding of co-benefits at the international level and make it context appropriate at the national level.
- When discussing co-benefits at the international level, it will also be important to clarify that mitigating SLCPs is a complement not a substitute for mitigating GHGs.

Session 4: Mr. Hideyuki Mori

- Establishing ASPAC has a considerable promise to achieve scientific consensus on benefits of air pollution control in Asia. The GAINS model might help advance the work of ASPAC because it is already being used in many countries in Asia but it was developed outside of Asia.
- One of critical issues will be determining how policy makers use models like GAINS. In particular there might be trade-off between usability and accuracy. There needs to be more research on how to strike a balance between usability and accuracy.
- Japan-IIASA collaboration could be further facilitated by strengthening connection with new initiatives on air pollution co-benefits such as ASPAC. 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.

■ **Closing Remarks from Representative of IGES-IIASA Committee: Dr. Kazuhiko Takemoto, Council Member, IIASA /Senior Advisor to Minister of the Environment**

Dr. Takemoto provided some remarks on behalf of the Japan Committee for IIASA as well as the MOEJ. He expressed his appreciation to all participants for their active engagement and dynamic discussion in the workshop. Dr. Takemoto also noted that he was impressed by the workshop and encouraged by the progress of research activities. Dr. Takemoto underlined the importance of bridging academic community and policy makers and concluded by noting that he expected further progress and development of cooperation among participants in future.

■ **Closing Remarks: Prof. Hironori Hamanaka, Chair of the Board of Directors, IGES**

Prof. Hamanaka closed the meeting by emphasizing the fact that Asia has much to gain from accelerating the implementation of SLCP mitigation measures. He highlighted that the proposed Asian Science Panel on Air Pollution and Climate Change (ASPAC) is likely to help in bridging between scientists and policy makers to reduce SLCPs in Asia. Lastly, he conclude that the most important link in this interface is people and that to strengthen personal relationships will require building the bridges and making the connections suggested in the title of this workshop. He expressed his hope that the workshop offered an opportunity to build those personal ties.

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