

Proceedings of the 8th Workshop on Greenhouse Gas Inventories in Asia (WGIA8)

- Capacity building for measurability, reportability and verifiability -

13-16 July 2010, Vientiane, Lao People's Democratic Republic



Greenhouse Gas Inventory Office of Japan (GIO), CGER, NIES

Center for Global Environmental Research



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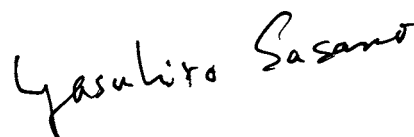
Foreword

The 4th Assessment Report published by the IPCC in 2007 stated that the human-induced climate change is taking place in reality and the increase in anthropogenic greenhouse gas (GHG) concentrations in the atmosphere is “very likely” the cause. Since then, all of us on the globe have been making more efforts than ever to address this issue in both scientific and political fields. The importance of reducing global GHG emissions significantly to achieve a global temperature rise below 2 °C from the pre-industrial level was also recognized at the latest Conference of the Parties (COP15). This effort has to be made not only by developed countries, but also by developing countries, as their current economic and population growth is remarkable and this is associated with an increase in GHG emissions. Therefore, in order to assess the current status of GHG emissions in a reliable manner within each country and to let policymakers select appropriate mitigation measures, setting up and running reliable national GHG inventories is of critical importance for all countries.

The National Institute for Environmental Studies (NIES) has been organizing the “Workshop on GHG Inventories in Asia” (WGIA) annually since November 2003 with the support of the Ministry of the Environment of Japan. The Greenhouse Gas Inventory Office of Japan (GIO), affiliated with the Center for Global Environmental Research (CGER), NIES, has functioned as the Secretariat for this workshop since its first session. This workshop supports government officials and researchers to develop and improve their GHG inventories through enhancing regional information exchange.

The CGER has been engaged in global environmental issues including climate change since its foundation in 1990. CGER conducts environmental monitoring, maintains a global environment database, and acts as a focal point for a number of international and domestic innovative environmental research projects. Moreover, CGER publishes reports on its research findings and activities regularly.

This CGER report serves as the proceedings of the 8th WGIA, which was held on July 13-16, 2010, in Vientiane, Lao P.D.R. We hope that this report will be useful for all those who work in the field of GHG inventory as well as climate change and will contribute to further progress of inventory development in Asia.



Yasuhiro Sasano

Director
Center for Global Environmental Research
National Institute for Environmental Studies

Preface

As awareness in regards to Global Warming is increasing, the inventories are being more and more accepted as being worthwhile, since they provide the basis for evaluating the effectiveness of nationally appropriate mitigation actions taken within a country. Persistent efforts need, therefore, to be made in order to improve their quality and make them more reliable, since it is expected that such mitigation actions are implemented in a measurable, reportable and verifiable manner according to the Bali Action Plan and the subsequent Copenhagen Accord.

Since its first session in 2003, the Workshop on GHG Inventories in Asia (WGIA) has been held seven times so far in order to support the WGIA-member countries in developing and improving their national GHG inventories through enhancing the regional information exchange by strengthening the experts' network in Asia.

This time, the 8th WGIA (WGIA8) was held from 13 to 16 July, 2010 in Vientiane, Lao P.D.R. as a capacity building workshop for measurability, reportability and verifiability. The items set out for this workshop by taking into consideration the current situations of member countries were all essential for the improvement of their inventories.

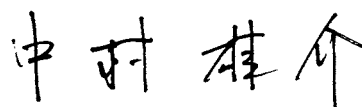
The outcomes of the WGIA8 are summarized in this Proceedings. We would be grateful, if this report was found to be useful and could contribute to further improvement of the GHG inventories in the WGIA-member countries.

In conclusion, we would like to express our sincere appreciation to the members of the local host organization, the Water Resources and Environmental Administration of Lao P.D.R. (WREA), for their excellent support and kind hospitality in hosting the WGIA8. We would also like to thank all the attendees for their participation and active contribution to the success of the workshop.



Yukihiro Nojiri

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List of Acronyms and Abbreviations

AD	Activity Data
AIM	Asia-Pacific Integrated Model
ALU	Agricultural Land Use
CDM	Clean Development Mechanism
CGE	Consultative Group of Experts
CGER	Center for Global Environmental Research
CH ₄	Methane
CO ₂	Carbon dioxide
COP	Conference of the Parties
CS-EF	Country-Specific Emission Factor
DNDC Model	DeNitrification-DeComposition Model
EF	Emission Factor
EFDB	Emission Factor Database
FOD	First Order Decay
GEF	Global Environmental Facility
GHG	Greenhouse Gas
GIO	Greenhouse Gas Inventory Office of Japan
GIS	Geographic Information System
GPG	Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories
GPG-LULUCF	Good Practice Guidance for Land Use, Land-Use Change and Forestry
HFCs	Hydrofluorocarbons
IPCC	Intergovernmental Panel on Climate Change
IPCC-EFDB	IPCC Emission Factor Database
IPPU	Industrial Process and Product Use
LUCF	Land Use Change and Forestry
LULUCF	Land Use, Land Use Change and Forestry
MOEJ	Ministry of the Environment of Japan
MRV	Measurability, Reportability, and Verifiability
MSW	Municipal Solid Waste
NAI	Non Annex I
NAMA	Nationally Appropriate Mitigation Action
NC	National Communication
N ₂ O	Nitrous oxide
NIES	National Institute for Environmental Studies
MCF	Methane Correction Factor
PFCs	Perfluorocarbons
QA	Quality Assurance
QC	Quality Control
REDD	Reducing Emissions from Deforestation and forest Degradation in developing countries

Revised 1996 IPCC Guidelines	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories
RoK	Republic of Korea
RS	Remote Sensing
SBI	Subsidiary Body for Implementation
SBS	Source-by-source
SEA GHG Project	Regional Capacity Building Project for Sustainable National Greenhouse Gas Inventory Management Systems in Southeast Asia
SF ₆	Sulphur hexafluoride
SPM	Summary for Policymakers
SWDS	Solid Waste Disposal Site
SWGA	Workshop on Improvement of Solid Waste Management and Reduction of GHG Emissions in Asia
UA	Uncertainty Assessment
UNFCCC	United Nations Framework Convention on Climate Change
WGIA	Workshop on Greenhouse Gas Inventories in Asia
WREA	Water Resources & Environment Administration, Lao P.D.R.
2006 IPCC Guidelines	2006 IPCC Guidelines for National Greenhouse Gas Inventories

Photos of the Workshop

Welcome Address



Mr. Yusuke Nakamura

Welcome Address



Mr. Syamphone Sengchandala

Overall Chairperson



Mr. Kiyoto Tanabe

Plenary Session



Hands-on Training Session



Working Groups



Inventory

Agriculture



LULUCF



Waste



Tea Break



Colleagues from the host country (Lao P.D.R.)

Closing Remarks



Dr. Yukihiro Nojiri

1. Executive Summary of WGIA8

The Ministry of the Environment of Japan (MOEJ) and the National Institute for Environmental Studies (NIES), jointly with the Water Resources and Environment Administration (WREA), convened the 8th Workshop on Greenhouse Gas Inventories in Asia (WGIA8) on 13-16 July 2010 in Vientiane, Lao P.D.R., as a Capacity building workshop for Measurability, Reportability and Verifiability (MRV). The workshop was attended by 93 experts from thirteen WGIA-member countries (Cambodia, China, India, Indonesia, Japan, the Republic of Korea (RoK), Lao P.D.R., Malaysia, Mongolia, Myanmar, Philippines, Thailand, and Viet Nam), as well as the United Nations Framework Convention on Climate Change (UNFCCC), the Intergovernmental Panel on Climate Change (IPCC), the United Nations Development Programme (UNDP), the United States Agency for International Development (USAID) and the Regional Capacity Building Project for Sustainable National Greenhouse Gas Inventory Management Systems in Southeast Asia (SEA GHG Project). The Greenhouse Gas Inventory Office of Japan (GIO) under the Center for Global Environmental Studies (CGER), NIES functioned as WGIA Secretariat.

The objectives of the workshop were:

- to report progress made by member countries since the WGIA7,
- to report their latest GHG inventories (hereinafter “inventories”),
- to discuss future activities beyond the latest inventories,
- to exchange MRV-related information, and
- to discuss sector-specific issues.

The welcome address was delivered by Mr. Yusuke Nakamura, Deputy Director of Climate Change Policy Division, MOEJ, followed by the welcome address delivered by Mr. Syamphone Sengchandala, Director of Climate Change Office, Department of Environment, WREA. The workshop was chaired by Mr. Kiyoto Tanabe, NIES Researcher of the GIO.

The experts discussed various subjects of interest to Asian countries, including the recent progress made by member countries, possible future activities in each member country and the WGIA itself, and sector-specific issues. The outcomes of the discussions about each subject are summarized below.

Through the discussions of these subjects, the experts reaffirmed the importance of the inventory as a key tool for promoting mitigation actions in a MRV manner. They also recognized the usefulness of mutual learning that can be conducted among member countries in order to improve their inventories in a more efficient manner, and the importance of making continuous efforts in improving inventories even after the completion of their latest national communications (NCs)¹. They stressed the necessity of WGIA’s continuation, as it provides a good opportunity for government officials and researchers who are in charge of national inventory development in the member countries, and experts from international organizations to get together and exchange updated information with each other. Through this workshop, the network of WGIA-member countries was further strengthened, and it was strongly felt that the continuation of WGIA would further enhance the collaboration among regional inventory experts.

¹ When this workshop was held, Republic of Korea was preparing its third NC, Myanmar was preparing its initial NC, and the other member countries were preparing their second NCs.

The workshop was closed with closing remarks by Mr. Syamphone Sengchandala, WREA, and by Dr. Yukihiro Nojiri, Manager of GIO.

Recent Progress in the WGIA-member Countries

Recent progress in inventory development was shared by Cambodia, China, India and Republic of Korea. Cambodia and China reported that they would be able to complete their second NCs within this year. They introduced their current institutional arrangements, results of their latest inventories, and the issues still to be addressed and their possible solutions. India is the first country to have prepared and published a detailed national inventory report among the member countries. They stated that they were aiming at voluntary compilation of the inventory report every two years. They presented the results of the 2007 inventory published this year and raised some issues to be addressed for its further improvement. Republic of Korea reported that their institutional arrangement had been put into place under the “Green Growth Vision” and the Greenhouse Gas Inventory & Research Center of Korea, which conducts sustainable national inventory compilation and relevant research activities, was established. Since all of these countries’ inventory development and their institutional arrangements were largely enhanced, their information was found to contain information that would be extremely valuable for the other member countries.

Future Activities within and among WGIA-member Countries

Many of the NCs under preparation in the member countries are to be submitted to the UNFCCC Secretariat within this year and some of the countries have already completed the inventory chapter to be included in their NCs. The experts agreed on the necessity of making continuous efforts for inventory improvement in an efficient manner, and future activities that could be conducted in each country, among the member countries and by the regional supporting programs including the WGIA, were discussed.

Mutual Learning among the WGIA-member Countries

The mutual learning, in which inventories of two or more countries are perused and suggestions are made to each other for further improvements, has been voluntarily conducted by Japanese and Korean inventory experts twice so far, and its usefulness for the inventory improvement for both countries was pointed out. Therefore, the implementation of this activity among other member countries was proposed and its possibility was discussed. The WGIA Secretariat suggested that this activity could be implemented back-to-back with the next WGIA and the Secretariat could invite relevant inventory experts from the countries that expressed their interests in this activity. The matching of countries and the selection of subject categories were discussed and some concrete suggestions were made. These matters will be further discussed by the Secretariat and the member countries by taking into account additional suggestions that could be obtained even after the workshop.

Hands-on Training: Mutual Learning for NCs (The Inventory Chapter)

A simulative mutual learning exercise was conducted by looking at inventories from three countries that the Secretariat had selected. It was noted by the experts that perusing other countries’ inventories was useful in order to discover points of improvement for their own inventories.

JICA's Regional Supporting Projects

JICA reported that they would implement capacity building projects related to climate change in three member countries (Indonesia, Thailand and Viet Nam). This time, the project being conducted in Indonesia was introduced. This project is aiming at contributing to inventory improvement by enhancing data collection through developing appropriate institutional arrangements in Indonesia.

Continuation of Inventory Development

As was also the case in the previous workshop, some experts pointed out that it was crucial for each country to secure funds to ensure the continuity of inventory-related work. In this context, the experts were strongly encouraged to take advantage of one of the conclusions made by the Subsidiary Body for Implementation under the UNFCCC at its 30th session (June, 2009)² which allows non-Annex I Parties to submit project proposals to the Global Environmental Facility (GEF) for the funding of their subsequent NCs before the completion of their current NCs.

Usefulness of Inventory

Many experts stressed the importance of expanding the WGIA activities to enhance the usefulness of the inventory, e.g., activities to link inventories to mitigation planning and policy making support.

Development of Inventory Manual in each Country

The usefulness and importance of inventory manual which summarizes the inventory compilation flow of a country were pointed out. Sharing such manual among colleagues will be useful. The countries which did not have such a manual were encouraged to make one in order to ensure the compilation of inventories in a continuous manner.

Sector-specific Issues (Inventory, Agriculture, LULUCF, and Waste Sectors)

Inventory (Cross-cutting Issues)

The legal basis for and appearance of institutional arrangements of each country were reported, and the institutional arrangements for the inventory and the problems for the continuity of the inventory compilation process were discussed. The importance of the continuity of inventory compiling systems and different institutional arrangements according to national circumstances was confirmed. Discussions were made not only for the national inventory but also for the utility of local inventories.

Agriculture Sector

The experts shared their experiences with measurements and the development of emission factors (EFs) for various categories. They further discussed the applicability of one country's EFs to the neighboring countries, the possibility of collaborative research, and the possibility of mutual learning for this sector. It was pointed out that exchanging detailed information on the development of country-specific EFs (CS-EFs) and the activity data (AD) collection flow could contribute to each country's inventory improvement and that the development of CS-EFs by taking into account their application to the mitigation actions was desired.

² FCCC/SBI/2009/8, paragraph 21

Land Use, Land-use Change and Forestry (LULUCF) Sector

The usefulness of remote sensing (RS) and geographic information systems (GIS) was reaffirmed to overcome the common issues for member countries, namely, lack of AD and emission/removal factors. Information on new developments of these technologies and on available data was shared, and experiences and lessons learnt from applying these technologies to LULUCF inventory were also shared by Thailand and Indonesia. Myanmar introduced their first inventory results. RS and GIS data which are available free of charge were introduced and their applications were encouraged. The importance of cooperation of experts in LULUCF and Agriculture inventories, RS, GIS, and REDD (Reduced Emissions from Deforestation and forest Degradation) was pointed out for an efficient inventory improvement.

Waste Sector

Results of the analysis grasping each country's inventory development status were reported by the Secretariat. Experts confirmed the necessity of the elimination of "NE" (not estimated) categories and of the application of estimation methodologies with higher tiers according to each country's inventory development status. Information exchange and cooperation among countries, which have similar industrial structure and are in a similar climate zone, was proposed. Furthermore, as a future activity of this working group, the enhancement of discussions for inventory improvement for mitigation actions in a MRV manner was suggested.

2. Introductory Notes¹

2.1. Background

Non-Annex I (NAI) Parties under the United Nations Framework Convention on Climate Change (UNFCCC) are required to prepare GHG inventories as part of National Communications (NCs) to be periodically submitted to the Conference of the Parties (COP) under the UNFCCC (Article 4 and 12). The inventories are important as they provide information on trends in GHG emissions and removals within those Parties. This in turn allows policy makers to adopt measures to reduce emissions and increase removals in a more effective and reliable manner.

In order to support the NAI Parties in Asia², making it possible for them to fulfill this requirement, and also to enhance continuous improvement in their national inventories, the workshop on GHG inventories in Asia (WGIA) has been convened by the Ministry of the Environment of Japan (MOEJ) and by the National Institute for Environmental Studies (NIES) together with host country organizations (in the case of the WGIA8, the Water Resource and Environment Administration (WREA), Lao P.D.R.). These workshops have been held on an annual basis since 2003 and each time some specific issues to be addressed by the WGIA member countries were discussed among the appropriate government officials and researchers in cooperation with the experts from international organizations. So far, seven WGIA8s have been held and have contributed to the enhancement of national GHG inventory development of all WGIA member countries.

<WGIA8s in the past>

- WGIA1 – Phuket, Thailand on 13-14 November 2003
- WGIA2 – Shanghai, China on 7-8 February 2005
- WGIA3 – Manila, Philippines on 23-24 February 2006
- WGIA4 – Jakarta, Indonesia on 14-15 February 2007
- WGIA5 – Kuala Lumpur, Malaysia on 6-8 September 2007
- WGIA6 – Tsukuba, Japan on 16-18 July 2008
- WGIA7 – Seoul, Republic of Korea on 7-10 July 2009

In the meantime, the importance of national GHG inventory of the NAI Parties has also been given more and more attention in the international negotiation processes. At the COP13 (Bali) held in December 2007, the importance of measurable, reportable and verifiable (MRV) nationally appropriate mitigation actions (NAMAs) taken by the developing country Parties has been recognized in the implementation of the Convention (Decision 1/CP.13, 1 (b) (ii)). Subsequently, the G8 Environmental Ministers Meeting held in Kobe in May 2008 stated in its Chair's Summary that setting up and running GHG inventories in developing countries is of fundamental importance in order to enhance the NAMAs of NAI Parties in Asia. This Ministers Meeting launched the "Kobe Initiative" which aims at holding meetings, together with the outreach countries, for capacity building support for inventories and data collection within developing countries. In response to this, the WGIA6 in July 2008 was held as part of this "Kobe Initiative". Since then, the WGIA8s have been convened as a capacity building

¹ The introductory notes were shared with participants prior to the workshop.

² Cambodia, China, India, Indonesia, Republic of Korea, Lao P.D.R., Malaysia, Mongolia, Myanmar, Philippines, Singapore, Thailand, and Viet Nam.

workshops for MRV. Moreover, at 15th Session held in Copenhagen in December 2009, the COP took note of the Copenhagen Accord, which states that the MRV NAMAs taken and envisaged by the NAI Parties shall be communicated through NCs including national inventory reports (Decision 2/CP.15).

The WGIA supports the NAI Parties in Asia in improving their national GHG inventories in a consistent manner by providing opportunities, which promote information exchange in regards to the latest news from international negotiations and by supporting discussions regarding inventory-related technical matters.

These introductory notes for the WGIA8 are intended to inform the prospective participants of the objectives and expected outcomes of the workshop as well as the details of each session. It is hoped that this will help participants prepare for the workshop. We would also like to encourage the participants to provide the Secretariat with suggestions and comments during the on-going preparation process.

2.2. Major Themes of the WGIA8

Currently, most of NAI Parties in Asia are preparing the inventories to be included in the second NC³. However, based on the questionnaire survey conducted prior to the WGIA8 and the UNFCCC document (FCCC/SBI/2010/INF.3), some of them have already completed the inventory part and have even started considering the next inventory to be included in the third NC. By taking into account the current status and also issues which still need to be addressed, the discussion items were chosen as follows:

- Report on progress made by member countries since the WGIA7,
- Report of their latest inventories (to the extent possible),
- Discussions on future activities beyond the latest inventories,
- Exchange of MRV-related information, and
- Discussions on sector-specific issues.

2.2.1. Opening Session (July 13)

Objectives: To get to know participants and the outline of the WGIA8

Session Style: Plenary

Overview: The agenda items of this workshop will be presented by the WGIA Secretariat. Subsequently, participants will be given updated information, which is considered to be specifically important for the NAI Parties in preparing their NCs. In addition, the organizer (MOE, Japan) and the host of the WGIA8 (WREA, Lao P.D.R.) will present their policy schemes to combat climate change.

2.2.2. Session I: Progress since WGIA7 and Summary of the Latest Inventories (July 13)

Objectives: To share experiences gained through the activities based on the conclusions of the WGIA7

Session Style: Plenary

Overview: Member countries have continuously been working to make their inventories better. In this plenary session, some countries will report their progress with

³ The first NC for Myanmar; while the third NC for Republic of Korea.

regard to any of the following topics: uncertainty assessment, development of time-series estimates, awareness-raising in regards to GHG inventories as well as to the mitigation of emissions and/or enhancement of removals. See also Annex, as it summarizes the responses obtained from each member country to the questionnaire survey, which was conducted prior to the WIGA8.

2.2.3. Session II: Future Activities beyond the Latest National Communications (July 13)

Objectives: To discuss possible future activities by each WGIA member country as well as by the WGIA itself

Session Style: Plenary

Overview: By taking into consideration the fact that quite a few of member countries have completed their national inventories and are ready for preparing the next one, we will discuss how we can further improve our inventories in a more efficient manner. As the mutual learning, which had been conducted twice between Republic of Korea and Japan specifically on the waste sector, was found to be a good way of accomplishing it, participants will be invited to discuss the possibility of implementing such mutual learning among WGIA member countries. The items to be considered will be presented prior to the discussion. Furthermore, participants will be informed about the on-going and/or expected MRV projects being implemented in WGIA member countries by the Japan International Cooperation Agency (JICA). In addition, expected roles of the regional programs such as the WGIA will be discussed.

2.2.4. Hands-on Training: Mutual Learning for National Communications (July 13)

Objectives: To find ways to improve our own inventories by perusing inventories from other regions

Session Style: Group discussion

Overview: The purpose of this training is to provide an opportunity to peruse inventories from other regions in an objective manner, with a view to helping us consider how inventories could be improved from the reader's viewpoint, and thus helping us find ways to improve our own inventories. In this session, participants will split into small groups and exchange opinions on points that should be applauded, points that could be of good reference for our own inventory improvement, and raise questions in regards to any unclarities within the perused inventories. The materials to be studied will be distributed to each participant by the WGIA Secretariat prior to the WIGA8. Therefore, it is hoped that the participants will have the opportunity to study them in advance of this session. The findings of each group will be summarized by the attending GIO member and then shared in the wrap-up session.

2.2.5. Session III: Working Group (WG) Discussions (14 July)

Objectives: To discuss sector-specific issues and possible ways to solve them

Session Style: Group discussion

Overview: Participants will split into 2 groups (Inventory and Agriculture) in the morning and 2 groups (LULUCF and Waste) in the afternoon to discuss sector-specific issues. In this way, participants can attend more than one WG discussion. A GIO member in each group will provide a brief guidance prior to the discussion. See detail discussion topics below.

1) Inventory

Discussion topic: Cross-cutting Issues (e.g., Institutional Arrangement)

Participants will exchange information and opinions as to inventory cross-cutting issues such as each country's institutional arrangement for the inventory preparation (e.g., legal basis for inventory preparation, quality assurance / quality control (QA/QC) plans). Some member countries will present their examples. Their good practices and any challenges made by them for further improvement are also to be shared and discussed among the participants. Active contributions from each participant to this discussion are highly appreciated.

2) Agriculture

Discussion topic: Estimation Methods and Development of Parameters

The scope of this WG discussion has a wide range, as it will treat the issues which participants in the past WGIA were interested in: e.g., information on methodologies, emission factors and activity data, as well as related research activities for the estimation of emissions from rice paddies, agricultural soils and livestock including manure management. Mitigation options are also within the scope of this WG. This WG discussion is hoped to provide clues which help improve each country's agriculture inventory.

3) Land Use, Land-Use Change and Forestry (LULUCF)

Discussion topic: Follow up of the WGIA7 (Remote-sensing and GIS data)

Through the negotiations on the future framework of the Convention including the issues of reducing emissions from deforestation and forest degradation in developing countries (REDD), the need for development of estimation methodology for the forestry GHG inventory with a reasonable accuracy is widely recognized. This WG will firstly try to reveal the issues to be addressed by the south-east Asian countries, as they can also be common issues for other WGIA member countries. Subsequently, participants will be informed in regards to the latest trends on the GIS/RS data and its applicability to the inventory as a challenging technology to combat the lack of data.

4) Waste

Discussion topic: Information exchange on the current status of the inventory preparation for waste sector in each Asian country

Considering that many of the WGIA member countries are almost completing their inventories, information on their latest waste inventory will be shared among participants. The improvement and/or achievement made since the last NC submissions and the future tasks or issues remained to be solved are to be discussed. Furthermore, sector-specific issues, such as the methodologies to estimate emissions from wastewater handling as well as possible mitigation options for this sector, will be presented and discussed by participants.

2.3. Wrap-up Session (July 15)

Objectives: To wrap up the discussions of the previous days and discuss future activities

Session Style: Plenary

Overview: The outcomes of each plenary session and working group will be presented by the appointed rapporteurs. These will be the basis for discussions on the future perspective of the WGIA member countries as well as the WGIA activity. Also, we will discuss how to disseminate our knowledge and recommendations to other NAI Parties.

Annex: Answers to the Questionnaire

Q1: Any Progress in Your Country?

(1) Uncertainty Assessment (UA)

Country	Yes / No	Answer
Cambodia	No	It will be considered in the second NC report.
China	Yes	After WGIA7, China began to prepare its second NC. The UA is a main task for each sector.
India	Yes	Level 1
Indonesia		
Rep. of Korea	Yes	ROK has been managing GHGs inventory by professional organizations each sector after the first NC. We don't know whether all sectors perform the UA or not. But, we can confidently reply "YES" only in case of waste sector.
Lao P.D.R.	Not yet	It is being planned for the assessment and expected to be completed in late July or early August.
Malaysia	Yes	UA were done for LULUCF and Energy sectors in the second NC.
Mongolia	No	
Myanmar		
Philippines	No	UA has not been possible due to unavailability of the associated uncertainty values for activity data and emission factors. Future inventory compilers could attempt to undertake UA of GHG estimates by generating uncertainty values for activity data and emission factors in consultation with local experts and through expert knowledge.
Singapore		
Thailand	Yes	All sector (AD and EF uncertainty) and national total uncertainty are estimated.
Viet Nam	Yes	To share information for UA activities in Vietnam under the second NC. The GHG projection to 2020, 2030 (Energy, Agriculture, LULUCF)

(2) Development of Time-series Estimates and Projections

Country	Yes / No	Answer
Cambodia	Yes	Some time series data have been available by relevant agencies. The projection was not done in GHG Inventory section, but it has been developed in sector-base mitigation study, i.e. Livestock, Forestry, and Energy sectors.
China	No	In some sector, China has got its time-series active data, but we didn't estimate its emissions for time-series estimates. There are some researches on time-series estimates based on special sub-sector and do some projections.
India	Yes	1994 and 2007 available now
Indonesia		
Rep. of Korea	Yes	ROK estimates and announces national inventory on all sectors from 1990 to recent year every year but officially submits it through only NC to UNFCCC. Also ROK announced total/sectoral BAU & reduction target of 2020 year in 2009 year and suggested sectoral projections through 1 st NC and second NC.
Lao P.D.R.	Not yet	This scheduled to be conducted after UA completion
Malaysia	Yes	Time-series estimates were available for all sectors for 2000-2007 and TS projections up to 2020.
Mongolia	No	
Myanmar		
Philippines	No	There was an attempt to do for the Energy sector as part of developing mitigation measures. Time series estimates and projections could be done but this will entail more resources for data collection and organization.
Singapore		
Thailand	Yes	2000-2004 for National total. In some sectors and categories from 1990 to 2005 or 2007
Viet Nam	No	See "(1) Uncertainty Assessment"

(3) Awareness-raising

Country	Yes / No	Answer
Cambodia	Yes	Awareness rising for GHG Inventory was implemented through workshops.
China	Yes	With the development of public media program about climate change, Chinese people pay more attention to climate change issues and greenhouse gases mitigation. More and more people practice low carbon activities in their daily life.
India	Yes	Through workshops
Indonesia		
Rep. of Korea	Yes	The low carbon, green growth has emerged as the main issue of policies on climate change in ROK. Therefore, the enforcement ordinance for low carbon, green growth act came into effect on April 14, 2010. In this enforcement ordinance, the most important issue for low carbon is to enforce mandatory GHG emissions and energy uses reporting by each facility or company.
Lao P.D.R.	Not yet	Likely it would be carried out after submission of second NC
Malaysia	Yes	Workshops and consultations involving partners within each sector were organized.
Mongolia	No	
Myanmar		
Philippines	Yes	Consultations with relevant stakeholders were undertaken by each sectoral group to increase awareness about the GHG inventory activity. To some sectors, in particular the IPPU sector, awareness campaign has been inadequate since there was resistance from the industry sector to share data and information.
Singapore		
Thailand	Yes	On demand trainings have been requested from several government institutes that work on activity data collection.
Viet Nam	No	

(4) Compilation of Summary for Policymaker (SPM)

Country	Yes / No	Answer
Cambodia	Yes	It has been prepared in part of second NC.
China	No	
India	Yes	2007 inventory
Indonesia		
Rep. of Korea	Yes/No	Many branches of our government and agencies, related organizations have announced the policies on climate change. But we don't explain each SPM for this item because we don't have enough information on this.
Lao P.D.R.	Not yet	Planned for the end of 2010
Malaysia	Yes	It formed part of second NC.
Mongolia	No	
Myanmar		
Philippines	No	
Singapore		
Thailand		
Viet Nam	No	

(5) Data Collection

Country	Yes / No	Answer
Cambodia	Yes	Data collection has been conducted through inline ministries and research institutions.
China	Yes	In china, there is more and more reliable approach to get active data for GHG emission estimating.
India	Yes	of activity for various sectors
Indonesia		
Rep. of Korea	Yes	National Statistical Office provides the activity data as good as standing comparison with those of developed countries. But because the part of data is not enough to estimate national inventory, we continue to collect the appropriate data sets for estimating national inventory.
Lao P.D.R.	Not yet	Likely it would be carried out after submission of second NC (if this means data collection to develop country specific emission factors)
Malaysia	Yes	Data collection for second NC has been completed, compiled and analyzed. Involvement of the Statistics Department is expected in future inventory.
Mongolia	No	
Myanmar		
Philippines	Yes	For the Energy sector, there is a need to improve data collection and reporting by the fuel end-users and the organization that manages the flow of data to final data user. This is to minimize disparity between top-down and bottom-up results.
Singapore		
Thailand	Yes	Under preparation and should finish by end of April
Viet Nam	No	

(6) Development of Country-specific Emission Factors

Country	Yes / No	Answer
Cambodia	No	There is very little scientific research and development related to establishing country emission factors.
China	Yes	In China, there are lots of researches and projects focus on the development of country specific emission factors, it will be useful for National GHGs inventory.
India	Yes	CH ₄ from Flooded rice fields, CH ₄ emission from enteric fermentation though feed intake, N ₂ O from soils, new NCVs of coal for different years, CO ₂ from ammonia production
Indonesia		
Rep. of Korea	Yes	Professional organizations have been developing country-specific emission factors on each sector but ROK has not used the EFs yet. We think that most EFs will be substituted for country-specific emission factors in a few years.
Lao P.D.R.	Not yet	Likely it would be carried out after submission of second NC
Malaysia	Yes	Combination of IPCC default values and country specific emission factors.
Mongolia	No	
Myanmar		
Philippines	Yes	Most of the emission factors used in second NC are taken from the IPCC default values except for the estimate of methane emission from rice where country-specific emission factors for rice cultivation in the Philippines were developed from research findings of the International Rice Research Institute (IRRI).
Singapore		
Thailand	Yes	Database developments are in place
Viet Nam	No	

(7) Source-by-source (SBS) Documentation

Country	Yes / No	Answer
Cambodia	No	We consider creating database for climate change.
China	Yes	There are many researches on source-by-source active data and emission factor in China.
India	Yes	all source categories
Indonesia		
Rep. of Korea	NO	We don't have yet source by source documentation. But because the enforcement ordinance for low carbon, green growth act already came into effect, we expect this documentation to play an important role in climate change
Lao P.D.R.	Not yet	Likely this might be conducted after submission of second NC
Malaysia	Yes	All sectors have produced SBS adopting USEPA template.
Mongolia	No	
Myanmar		
Philippines	Yes	The Agriculture Team benefited from the USEPA Template Workbook for Developing a National Greenhouse Gas Inventory System (Documentation and Source-by-source description or SBS documentation) in keeping record of the choice of methods, activity data and emission factors. The template is available at http://www.epa.gov/climatechange/emissions/ghginventorycapacitybuilding/index.html
Singapore		
Thailand	Yes	Database developments are in place
Viet Nam	No	

(8) Other, if any

Country	Yes / No	Answer
Cambodia		
China		
India		
Indonesia		
Rep. of Korea	Yes	MOEK has estimated local government's GHGs inventories from 2009 based on all categories in 2006 IPCC Guidelines. We expect these to have the higher accuracy compared to national inventory if we can substitute the default emission factors to country-specific or plant-specific emission factors.
Lao P.D.R.		
Malaysia		The second NC is in the final stage of editing before printing.
Mongolia	Yes	We would share information on mitigation issues
Myanmar		
Philippines		
Singapore		
Thailand	Yes	As part of the database development
Viet Nam	No	

Q2: Any Changes in Your Country?

–e.g., institutional arrangement, inventory compiling agency and staff members, data collection system

Country	Yes / No	Answer
Cambodia	Yes	National Climate Change Committee (NCCC) is responsible for climate change issues. Climate Change Office (CCO) was upgrade to be Climate Change Department (CCD) within the Ministry of Environment, and therefore, Office of GHG Inventory and Mitigation section was also created. Involved agencies and staffs are considered the same.
China	No	National Development and Reform Commission (NDRC) is in charge of climate change issues in China. Main improvements are setting up of clear mandates and responsibilities of relevant institutions. Such as, <i>Energy Research Institute and Tsinghua University are in charge of Energy and IP sectors separately.</i> In Agriculture sector, It is divided as Livestock and Cropland sub-sector, and <i>Academy of Agricultural Sciences and Institute of Physics, Academy of Sciences are in charge of them separately.</i>
India	Yes	Ministry of Environment and Forests (MoEF) is responsible for CC issues in India and also prepares the national communication. The GHG inventory is prepared with the help of a network of institutions that are under the Indian Council of Agriculture Research, Council of Industrial and Scientific Research, Forest Survey of India, Indian Institute of Science, National Remote Sensing Centre, Industry associations and some NGOs working in the area of energy and environment. Recently India has established the Indian Network for Climate Change Assessment (127 institutions and 228 scientists) the aim to assess the drivers and implications of climate change through scientific research, prepare climate change assessments, develop decision support systems, and build capacity to manage risks associated with climate change.
Indonesia		
Rep. of Korea	Yes	1. Institutional arrangement: MOEK performs the role of focal point on national inventory after April 14, 2010. Related branches of the government (or professional organizations, e.g. KECO, KEEI, KEMCO, etc.) prepare sectoral GHGs inventories, like the institutional arrangement as ever. 2. Inventory compiling agency: "Climate change information center" affiliated to MOEK compiles GHGs inventory. 3. Staff members: Center members aren't decided yet. 4. Data collection system: Activity data for national inventory is based on National Statistical Office. 5. New Act on Low Carbon Green Growth is effective since April 14, 2010
Lao P.D.R.	Yes	More and wider participation of relevant organization and working group has more ownership on GHGs inventory. Better team work, the working group and consultant works as a team rather than individual.
Malaysia	Yes	Division of Environment and Climate Change at the Ministry of Natural Resources and Environment is the focal point for GHG inventory and climate change.
Mongolia	No	
Myanmar		
Philippines	Yes	The Philippines has created the Commission on Climate Change (CCC), by Republic Act 9729 or the Philippine Climate Change Act of 2009. The CCC, through the Climate Change Office (CCO) coordinates the collection of climate change reports submitted by the different sectors. The CCO prepares the National Greenhouse Gas Inventory of the Philippines.
Singapore		
Thailand	No	
Viet Nam	No	

Q3: Any News in Your Country? – Any Topics Regarding Inventory Development

Country	Yes / No	Answer
Cambodia	No	The second National GHG Inventory is expected to be released at the same time with the second NC, the end of 2010. For that, the UNFCCC Software has been used. In addition, the ALU Software is being trial with Agriculture and LUCF sectors, and intends to use it for the next NC.
China	No	China set up two research groups to research the GHG emissions forecasting methodologies and national database. China improved UA and conducted QA/QC for some activities in verification. In China's second NC, the following improvement are included: Gas: include F-gases Sector: to add some products in IP sector: such as Aluminum and Magnesium Production, in Waste sector: Incineration is included.
India	Yes	The Minister for Environment & Forests (MoEF) has released the 2007 GHG inventory. For the second NC, the GPG (2000) are being used, CS-EFs were applied to 35% source categories, and tier 3 methods were applied to the categories which cover 21% emission estimates.
Indonesia		
Rep. of Korea	Yes	MOEK will play the role in focal point on national inventory and mandatory GHGs & energy reporting after April 14, 2010. And through low carbon, green growth act, national inventory of ROK thinks to become grew up more and more.
Lao P.D.R.	Yes	The inventory for the year 2000 has included industrial processes for GHGs calculation while it was skipped for GHGs inventory for 1990.
Malaysia	Yes	A standardized national data collection for GHG inventory is being proposed.
Mongolia	No	
Myanmar		
Philippines	Yes	Guidelines and tools in preparing GHG projections for developing mitigation options.
Singapore		
Thailand		
Viet Nam	No	

Q4: Can You Share with Us Your Country's Inventory Data Included in the Latest NCs?

Country	Yes / No	Answer
Cambodia	No	It is still the draft report.
China	No	The second NC is still in progress. Information on the initial NC can be shared.
India	No	It is still under compilation. But will be able to share the GHG inventory released by the MoEF recently for 2007 and which is likely to be included in the second NC.
Indonesia		
Rep. of Korea	Yes/No	Our company doesn't have related inventory data, and so we can't decide whether we share this data with other countries or not.
Lao P.D.R.	Yes	It is sharable but the issue is about time since the second NC hasn't finished yet. National circumstance, GHGs inventory, V &A is be drafting.
Malaysia	Yes	Upon the approval of second NC, it will be published and disseminated.
Mongolia	Yes	
Myanmar		
Philippines		I suggest two approaches to access the second NC data: 1) through the country's second NC Project Manager; and 2) through the UNFCCC secretariat.
Singapore		
Thailand	?	The NGHGI data has to be approved by our government. Data can be shared in term of academic sharing purposed without further quoting and they are still not the official data.
Viet Nam	No	Please contact directly to Department of Meteorology Hydrology and Climate change of MONRE who response to GHG inventory databases.

Provision of New Country-specific EFs and the Roster of Regional Experts in 2010

Country	EFDB Updated?	Sector (how many?)	Roster Updated?	Sector (how many?)
Cambodia	No	2009: Agriculture (2); LULUCF (12); Waste (1) 2010: -	Yes	2009: Energy (3); Agriculture (2); LULUCF (3); Waste (2); Other (4) 2010: -
China	Yes	Energy (9)	Yes	IP (1); Waste (2)
India	No	2009: Energy (11); IP (7); Agriculture (20) 2010: -	No	2009: Other (1) 2010: -
Indonesia				
Rep. of Korea	No	Energy (46); Waste (21)	Yes	Energy (3); IP (5); Agriculture (1); LULUCF (1); AFOLU (2); Waste (16); Other (5)
Lao P.D.R.	No		Yes	2009: Agriculture (1); LULUCF (1); Other (3) 2010: Energy (3), IP (1), Agriculture (2); LULUCF (2), Waste (2)
Malaysia	No		Yes	2010: Agric (2), LULUCF (3), Waste (1), Energy (1)
Mongolia	No	2009: Agriculture (2) 2010: -	No	2009: Energy (2); IP (1); Waste (1); Other (1) 2010: -
Myanmar			Yes	2009: Energy (1); IP (1); Agriculture (2); LULUCF (3); Waste (1); Other (1) 2010: -
Philippines		2009-10: Agriculture (2 EFs for rice cultivation; one for dry season and one for wet season)		
Singapore				
Thailand	No	2009: Energy (12); Agriculture (10); LULUCF (12); Waste (60) 2010: -	Yes (updated)	2009: Energy (2); IP (1); Agriculture (3); LULUCF (1); Waste (2); Other (3) 2010: Inventory (2); Energy (2); IP (1); Agriculture (3); LULUCF (1); Waste (2)
Viet Nam	No	2009: Agriculture (9); LULUCF (4); Waste (2)	Yes	2009: Energy (5); IP (1); Agriculture (3); LULUCF (2); Waste (1); Other (1) 2010: Other (2)

Note: Some experts are in charge of two or more sectors. Therefore, double counting may be present for the Roster of regional experts.

3. Workshop Report

3.1. Opening Session

The opening session was chaired by the overall workshop chair, Mr. Kiyoto Tanabe (NIES, Japan) and the rapporteur was Dr. Damasa Magcale Macandog (UPLB, Philippines).

The welcome address was delivered by Mr. Yusuke Nakamura, Deputy Director of Climate Change Policy Division, MOE, Japan. He thanked the WREA for their support in hosting the WGIA8 and everyone for their participation in this workshop. He pointed out the urgent need of mitigation actions to reduce GHG emissions, and emphasized that MRV of inventories was essential in the implementation and enhancement of such actions. He noted that the WGIA was one of the key elements of Japan's capacity building support for that.

Mr. Syamphone Sengchandala, Director of Climate Change Office, Department of Environment, WREA, Lao P.D.R. (Laos), welcomed everyone to Laos. He pointed out that the WGIA was a good opportunity to share knowledge and experiences in inventories in Asia. He wished all participants to join in sharing their knowledge and experiences in order to effectively achieve the aims of this workshop.

Dr. Junko Akagi (NIES, Japan) gave an overview of WGIA and introduced the objectives, participants and the agenda of WGIA8. The objectives of the workshop were:

- To report progress made by member countries since the WGIA7,
- To report their latest inventories (to the extent possible),
- To discuss future activities beyond the latest inventories,
- To exchange MRV-related information, and
- To discuss sector-specific issues. [Abstract, p. 47]

Mr. Yusuke Nakamura (MOE, Japan) made a presentation on Japan's climate change policies and MRV initiatives. He stressed the need for a significant reduction in GHG emissions throughout the world, and introduced Japan's initiatives in international environmental cooperation, including the WGIA. He introduced Japan's mid- and long-term GHG emissions reduction targets and gave an overview of Japan's domestic initiative "Challenge 25" to achieve the goals. He also introduced the "bill of Basic Law on Climate Change" which included three key policy measures and was to be re-submitted to the next Diet session. [Abstract, p. 48]

Mr. Syamphone Sengchandala (WREA, Laos) talked about the climate change policy of Laos. He introduced Laos's current status and the institutional framework of climate change policies. The Government of Laos concerned about both mitigation and adaptation, and approved the national strategy which prioritizes seven areas for action taking (1. agriculture and food security, 2. forestry and land use change, 3. water resources, 4. energy and transport, 5. industry, 6. urban development and 7. public health). He further introduced Laos's initiative on climate change, i.e., the Government set up the target to increase forest cover to reach 70% of land area by 2020, aimed to get out of the Least Developed Country (LDC) status by 2020, and was embarking on a path of Green Growth. He also said that climate change had been streamlined in the National Development Socio Economic Development Plan (2010-15). He mentioned that these steps were all challenges for Laos to respond to climate issues. [Abstract, not available]

Following his presentation, Mr. Hiraishi (IGES, Japan) asked where the WREA was actually affiliated to and if it had a good connection with the national development authorities, as this connection would be important for future data collection. Mr. Sengchandala explained the change in the government structure after the submission of their first NC, and mentioned that the Department of Environment (DoE) which issued the first NC and the relevant committee were still connected to the Prime Minister's Office. He agreed the importance of the structure for the collection and management of climate change related information and data, by raising an example they faced and the other neighboring countries would also encounter, i.e., the contradiction of data reported by more than two ministries. Dr. Gao (CRAES, China) pointed out that the waste treatment should also be included in the seven priorities, as this matter would also be a concern to Laotians in the near future. Mr. Sengchandala agreed to his comment and explained that the issues not listed in the priorities did not necessarily mean that the Government of Laos considered the matter less important. Although the waste treatment was not specifically listed, it would be addressed under various initiatives such as public health, energy and transport, etc. Dr. Akagi shared the information that Laotian and Thai inventory teams were currently closely working together to develop Laos' inventory, and suggested that everyone who were interested could ask for more detailed information directly from them. Mr. Hiraishi, recalling the fact that Laos would complete their inventory to be included in second NC within this year, strongly encouraged them to request the GEF for funding for the third NC in order to avoid a break in their activities. Mr. Tanabe supported his comment and pointed out that this was applicable to the other countries as well.

Mr. Dominique Revet (UNFCCC) updated the experts on the latest debate at SBI32 (June 2010) on the topic of NCs of the NAI Parties. He introduced the progress of the work of the Consultative Group of Experts (CGE)¹, the agenda sub-item "4 (b) Consideration of information contained in NCs from NAI Parties" which was continued to be held in abeyance, and "4(c) Further implementation of Article 12, paragraph 5, of the Convention" which dealt basically with the frequency of NC submission and was discussed at this session for the first time. In regard to financial and technical support, he pointed out that the GEF would provide detailed information on the funding proved NCs in COP16², and they would be very important and influential to the discussions. He also recalled the conclusions of SBI30, which encouraged NAI Parties to submit project proposals for funding of their subsequent NCs before completion of their current ones, in order to avoid a lack of continuity in project financing. [Abstract, not available]

Following his presentation, Mr. Sulayakham (MPWT, Laos) asked about the timing of proposal for application for funding. Mr. Revet answered that if one country's NC had been completed about 75-80%, they were strongly recommended to apply for funding to the GEF, since the NC should have already been completed by the time the funding was really available. Mr. Buendia (SEA GHG Project) asked if there was a template for funding proposal, as it might facilitate the proposal process, and if one could apply for funding not for NC but for the inventory chapter only. Mr. Revet answered that the funding proposal should be submitted through each country's implementation agency which had such a template, and that the funding for only the inventory chapter was not possible but was aimed for the whole NC. He also introduced that there were two types of funding, the expedited funding and the one for full-cycle projects. The latter one provides more funding but requires detailed information to

¹ FCCC/SBI/2010/L.18 (<http://unfccc.int/resource/docs/2010/sbi/eng/118.pdf>)

² <http://unfccc.int/resource/docs/2010/sbi/eng/117.pdf>

be provided and is associated with longer process till the approval. Mr. Nguyen (RCCSD, Viet Nam) asked about the methodology for future inventories and the availability of materials and capacity building support for mitigation and adaptation options. Mr. Revet explained that the minimum requirement for the methodology was the Revised 1996 IPCC Guidelines, but participants were always encouraged to use better methods such as GPGs and the 2006 IPCC Guidelines. However, he pointed out that the reporting year was still unclear, as the CGE had been working on developing a new set of guidelines for NCs. Nevertheless, he pointed out the importance of reporting a series of data not only for preparing NCs but also for supporting policymakers of each country. Regarding materials and capacity building support for mitigation and adaptation options, he introduced the training materials developed by the previous CGE members a few years ago which covered all parts of NCs (available on the internet and as CDs). Although the current CGE members are working on developing the next guidelines, no methods and tools are available for mitigation and adaptation at this moment. The guidelines would be set by next year, but parties are encouraged to apply any methods and tools currently available to them. Dr. Towprayoon (KMUTT, Thailand) supported Mr. Nguyen's point and expressed the need of capacity building support for mitigation options, and suggested that the CGE members could think about this scheme for the third NC. Mr. Hiraishi pointed to the essential difference between inventories and mitigations, i.e., it was either national or project level, and suggested that it would not be possible to develop any guidelines or capacity building until the rules were determined. He further suggested that it would be better if we discussed how to use already existing methods for the purpose of mitigations rather than waiting for the rules.

Dr. Simon Eggleston (IPCC) made a presentation on the IPCC inventory developments. He reported on the work that had been done by the IPCC after the completion of the 2006 IPCC Guidelines. He introduced various publications and meetings that dealt with AD for agriculture and land use within the past year, continuous development of the emission factor database (EFDB), and the development status of software for the 2006 IPCC Guidelines. Future developments were also introduced. [Abstract, p. 49]

Following his presentation, Mr. Mulyanto (MOE, Indonesia) asked if the IPCC would develop MRV guidelines. Dr. Eggleston answered that not the IPCC but the Convention decided what the MRV was. Therefore, the IPCC would not get involved until getting any specific requests.

3.2. Session I: Progress since WGIA7 and Summary of the Latest Inventories

Session I was chaired by Mr. Dominique Revet (UNFCCC), and the Rapporteur was Dr. Batimaa Punsalmaa (Ministry of Nature, Environment and Tourism, Mongolia).

Mr. Kamal Uy (MOE, Cambodia) presented an overview of Cambodia's current inventory. He introduced the national level actors within the climate change institutional framework and in particular for the inventory. Cambodia estimated GHG emissions/removal for 1994 and 2000 with the UNFCCC Software. Although Cambodia was a net sinker in 1994, it appeared to have become a net emitter in 2000. They further predicted that LULUCF, which was still a net sink in 2000, would also become a net source by 2020. Since both Agriculture and LULUCF are important sectors, they are planning to adopt the ALU Software, which allows moving to Tier 2 methodologies. They identified their major problems with the inventory development, and made suggestions to possible ways to overcome them. [Abstract, not

available]

Dr. Qingxian Gao (CRAES, China) presented an overview of China's current inventory. China included additional gases (HFCs, PFCs and SF₆), sources (Industrial Processes including aluminum and magnesium produce), and regions (Hong Kong SAR and Macao SAR) for the estimation in the second NC. Dr. Qingxian introduced the institutional arrangements for the second NC and in particular for the inventory. He stated that China's second NC including the inventory chapter would be completed within 2010 and submitted to the UNFCCC. [Abstract, p. 50]

Dr. Chhemendra Sharma (NPL, India) presented India's 2007 inventory. In 2009, India established "INCCA" (Indian Network for Climate Change Assessment) for addressing climate change, which makes it possible for India to prepare inventory biennially. India presented detailed GHG emission data from each category in 2007. Its emissions had increased by about 50% since 1994; while the LULUCF sector became a net sink (i.e., 14 to -177 million tonnes CO₂ eq.). India managed to bring their methodologies to higher tiers, not only tier 2 but also tier 3, both of which accounted for respectively 67% and 12% of the total GHG emission profile. They plan to keep on climbing the tier ladder, establishing a national GHG management system, and building capacity at institutional and individual levels for further inventory improvement. [Abstract, not available]

Mr. Minyoung Lee (GIR, RoK) presented RoK's recent steps taken after the declaration of the Green Growth Vision. RoK established the legal framework, set a voluntary mid-term emission reduction target, i.e., 30% cut from BAU by 2020, and established appropriate institutional arrangements for that. Regarding the inventory development, RoK also established the Greenhouse Gas Inventory & Research Center of Korea (GIR) in order to develop their inventory in a sustainable manner. He further presented RoK's GHG emission profile from 1990 up to 2007 and indicated that the increase in emissions was mainly from the Energy sector and the increase in CO₂. [Abstract, p. 51]

The information shared by the presenters was all found to be valuable to other experts for their own inventory improvement. In the discussion time, suggestion regarding the data sharing to the IPCC-EFDB was also made.

3.3. Session II: Future Activities beyond the Latest National Communications

Session II was chaired by Mr. Leandro Buendia (SEA GHG Project), and the rapporteur was Dr. Simon Eggleston (IPCC).

Future Activities of WGIA-member Countries

Mr. Taka Hiraishi (IGES, Japan) suggested some potential roles of regional networks for improving inventories in Asia by recalling the results of the analysis of 122 NCs conducted by the UNFCCC Secretariat (FCCC/SBI/2005/18/Add.2, October 2005). He summarized the perceived needs (e.g., relevant data, institutional and personnel capacity) and also identified possible future needs (e.g., development of more accurate, complete and elaborated inventories) for improving and simultaneously enhancing the use of inventories. He pointed out that the regional collaboration (e.g., sharing expertise, information and experience, development of a regional roster of experts and institutions, and mutual learning) would serve

this purpose. He also pointed out the importance of discussion concerning industrial development and inventory. [Abstract, not available]

Following his presentation, Mr. Sulayakham made a comment on the difficulty of data collection and judgment, whether they were reliable or not. He also asked if there was any acceptable level of data such as the level of uncertainty. Mr. Hiraishi answered that one should not mind too much of the uncertainty, as it was unavoidable, and pointed out that the documentation and making efforts to do one's best were more important.

Mr. Kiyoto Tanabe (NIES, Japan) proposed all experts to try mutual learning of inventories among WGIA-member countries. This activity was carried out twice among Japan and Korean waste experts and it was found to be useful for both countries to improve their own inventories in an efficient manner. He suggested that this activity could be conducted back-to-back with the next WGIA and that the WGIA Secretariat could invite inventory compilers from a couple of countries (on a first-come, first-served basis). However, several conditions such as the combination of countries, target category, etc. still need to be discussed among experts and the WGIA Secretariat. [Abstract, p. 52]

Following Mr. Tanabe's presentation Mr. Kamal asked regarding the selection of partners. He wondered how countries, which had limited experience with inventory development, could enhance inventory improvement through exchanging their limited experiences. He further asked about logistical and financial support for this activity. Mr. Tanabe pointed out that there were various points of view regarding partner selection and any points of view should work out and the selection was up to the country interested in this activity. Therefore, he asked everyone to contact him or the WGIA Secretariat if anyone was interested in this activity, and details of financial support would be discussed accordingly.

Ms. Masako Ogawa (JICA Indonesia) introduced JICA's capacity development project for climate change strategies in Indonesia. One of its sub-projects is the development of GHG inventory. It aimed at improving the inventory through the collection of good quality data by coordinating an appropriate institutional arrangement. [Abstract, p. 53]

Following these three presentations, the floor was open for discussion. Mr. Buendia pointed out, regarding the mutual learning, the importance of the presence of not only sectoral experts but also other experts, as some issues to be discussed were cross-cutting issues. Regarding the documentation, he stated that the use of the source-by-source documentation template made by the USEPA had been encouraged in this region. Dr. Nik (FRIM, Malaysia) wondered if GEF would support any of the REDD related issues. He found the idea of mutual learning good and suggested that cooperation not only between countries at a similar level, but also between countries at different levels would be good, as they could expand their knowledge in an efficient manner. He also expressed his interest in the outcomes of the JICA project in Indonesia. Mr. Hiraishi pointed out that the GEF would not support basic scientific research and that there was a need to elaborate the way of making funding to regional research possible. He suggested making the mutual learning, which would be held back-to-back with the next WGIA, open to other experts as observers, as most of the experts attending the WGIA would be present anyway. Dr. Heng (MOE, Cambodia) asked how the JICA project could contribute to minimize data uncertainty. Mr. Mulyanto answered that the collaborative work such as the one with JICA and the one with Australia, which established a

national carbon accounting system for the forestry sector, would provide more accurate and reliable data, as they were both associated with wide areas of activities. Mr. Buendia pointed to the difficulty with the emission factor development, as it required money and skills. He suggested another approach such as the use of data developed by research organizations located in Asia (e.g., IRRI). Dr. Swe (Yezin Agricultural University, Myanmar) shared information on the collaborative work between Myanmar and Thailand in the Agriculture sector and expressed her will to enhance this activity. She asked, therefore, if there was any financial support for this kind of activity, as the money for the first NC and particularly for the inventory was in shortage. Mr. Revet suggested Myanmar to first check the implementation agency if there was some flexibility before trying to look for other funding possibilities. Dr. Towprayoon shared her experience of the meeting between Laos and Thailand and the training activity between Myanmar and Thailand, and pointed out that these activities were already like the mutual learning and were found to be helpful for both countries. She further pointed out that mutual learning activities already existed and that availability of funds would enhance this kind of activity. Mr. Tanabe welcomed all forward-looking suggestions.

Mitigation Analysis by the AIM Model

Dr. Tatsuya Hanaoka (NIES, Japan) introduced the overview of the Asia-Pacific Integrated Model (AIM) which estimated GHG emissions and assessed policy options to reduce emissions. He further pointed to the gap between inventories and projections, and showed examples of mitigation scenario analyses in Japan. He explained also how to expand the use of the inventory to future projections. [Abstract, p. 54]

Following his presentation, Dr. Nik pointed out that the model required a considerable amount of expertise and data, and asked how to overcome it. Dr. Hanaoka explained that the AIM team applied substitute data from other countries with similar conditions when they faced the problem of lack of data. Ms. Reyes (DENR, Philippines) asked what the major limitations were when applying this model to developing countries where data were rather limited. Dr. Hanaoka answered that using the model in developing countries had some limitations; therefore, the model needed to be simplified in structure compared with the Japanese one. Mr. Buendia asked if projections in Asia had already been made using the model. Dr. Hanaoka said that projections for China, India and Thailand had been made and another Japanese team had made a future projection in a global scale as well. Dr. Heng expressed his interest in the model with the recognition of its difficulties. He pointed out that long-term projections appeared to be difficult to make, as the policies to be taken were determined in each country, and he asked if any comparison tests of the results with other models' outcomes had been carried out. Dr. Hanaoka explained that before applying a model for projection, it was important to determine the target period and then the model should be selected appropriately by understanding the model's characteristics. He pointed out that in spite of the same data set; different outputs were obtained because of the difference in model's characteristics. Dr. Garivait (KMUTT, Thailand) who had joined the AIM training workshop pointed to the limitations of the model for south-east Asia with mainly agric countries, as it had been developed on the energy basis. She also pointed out that the lack of data was the essential limitation. Therefore, inventory data would be the best foundation for developing this kind of model and the mitigation analysis starting with a snapshot in a different period of time would be good as the first step. Dr. Macandog asked about the validation of the model results. Dr. Hanaoka answered that validation of future projections was not possible, but he stressed that one needed to check the base year data carefully. Mr. Hiraishi supported the

limitations pointed out by Dr. Garivait for this model. For instance for the forestry sector, the inventory experts could contribute to this model. In the meantime, he wondered how inventory experts could benefit from these model studies. Dr. Hanaoka agreed that there were limitations with regard to the selection of sectors. He pointed out that the improvement of inventory data could provide modelers with more reliable data of not only GHG emissions but also the activity level of each country, and stressed the need to consider connecting different approaches to the inventory and to the model. Mr. Sulayakham asked how the model harmonized information of countries with different levels. Dr. Hanaoka acknowledged the difficulties and stressed the importance of regional work.

3.4. Hands-on Training Session: Mutual Learning for National Communications (The Inventory Chapter)

A simulative mutual learning exercise was conducted by looking at inventories from three countries that the secretariat had selected. The perused inventories were the ones extracted from UAE's second NC (April 2010), Mexico's third NC (August 2009) and Uzbekistan's second NC (December 2008). As a reference, the National GHG Inventory Report 2000 of Uzbekistan (2008) was also shared among experts. These inventories were perused with the following points of view: 1) what their good points were, 2) what points experts had questions/clarifications about, and points of improvement, and 3) what we could learn. It was noted by the participants that perusing other countries' inventories was useful in order to discover points of improvement for their own inventories.

3.5. Session III: Group Discussion on Sector-specific Issues

The participants split into four WGs (Inventory, Agriculture, LULUCF and Waste) and discussed sector-specific issues. The points of discussions and the outcomes of the individual WG are summarized in the following sections (3.5.1. - 3.5.4.).

3.5.1. Inventory Working Group

Introduction

NAI Parties under the UNFCCC are required to prepare GHG inventories as part of their NCs to be periodically submitted to the COP under the UNFCCC. Most of NAI Parties in Asia have already submitted GHG inventories as part of their initial NCs and are currently preparing second ones to be included in their second NCs. Under these circumstances, appropriate institutional arrangements are required more than before, in order to improve GHG inventories for future NCs. In the previous WG session held at the WGIA5 in 2007, possible strategies to improve institutional arrangements were discussed and at the WGIA6 in 2008, the importance of raising awareness was recognized.

Major topics of the discussion in this WG were as follows:

- How to set up or improve institutional arrangements for the next NCs and inventory preparation, and
- How to enhance long-term and inter-ministerial cooperation to ensure sustainable data collection and data organization.

There were 45 participants with a mixture of experts in the field and others who joined this WG in order to learn more about institutional arrangements. The WG was attended by representatives of 12 countries (Cambodia, China, Indonesia, Japan, RoK, Laos, Malaysia,

Mongolia, Myanmar, Philippines, Thailand, and Viet Nam), and members of the UNFCCC Secretariat, USAID, and JICA Indonesia. This session was chaired by Mr. Syamphone Sengchandala (WREA, Laos) and the rapporteur was Mr. Takeshi Enoki (MURC, Japan).

Presentations

Mr. Hiroshi Ito (NIES, Japan) made a brief introductory presentation. He summarized the outcomes of the previous Inventory WG sessions held at the WGIA5 and 6 and the points of discussion. [See Introduction]

Dr. Batimaa Punsalmaa (MNET, Mongolia) made a presentation on Mongolia's institutional framework to prepare its GHG Inventory. The Air Law of Mongolia declared that "the Designated Professional Authority (DPA) shall prepare national inventories of GHG emissions and removals," and the National Agency for Meteorology, Hydrology and Environment Monitoring of Mongolia is currently carrying the responsibility of DPA. In preparation of GHG inventories, all related ministries and agencies, institutions and private companies are obligated to provide the DPA with all data and reports of their activities for a certain year. In addition, for preparation of inventories, a "Manual of Procedures" is available. [Abstract, p. 55]

Ms. Yen Hoang Pham (MONRE, Viet Nam) made a presentation on institutional arrangements for the GHG inventory preparation in Viet Nam. The National Climate Change Steering Committee (NCCSC) has been providing consultations to MONRE on policies related to the development and management of climate change activities in the country for the second NC. NCCSC has been also providing guidance and advice to MONRE. The GHG Inventory Group, which takes on inventory preparation, comprises four sub-groups each in charge of: (1) Data and information collection; (2) Checking and verifying data; (3) Preparing a national inventory report and (4) Source and uncertainty analysis. Each sub-group involves experts and institutional bodies from five sectors. Potential problems to improve GHG inventories are lack of CS-EFs, lack of AD or poor data, difficulty to engage full-time staff, and the continued need for capacity building. [Abstract, p. 56]

Mr. Haneda Sri Mulyanto (MOE, Indonesia) made a presentation on the national GHG Inventory and the MRV Scheme in Indonesia. Coordinated by the Ministry of Environment, Indonesia is now preparing a regulation concerning the institutional set-up for the national GHG inventory. Such a regulation will be used as a legal basis for all relating sectors. Data will be collected by sector at the national and local level. It is expected that Indonesia will improve its national GHG inventory by developing its national inventory system. By having such a system, Indonesia could develop better estimation from emission reductions from mitigation actions. [Abstract, p. 57]

Dr. Sirintornthep Towprayoon (KMUTT, Thailand) made a presentation on Thai institutional arrangements. The Thai national focal point is located at the Climate Change Coordination Center, Office of Natural Resource, Environmental Policy and Planning. AD is mostly archived separately by relevant governmental agencies. Quality control of the inventory was done by internal meetings and expert group meetings while quality assurance was performed through the steering committee and national committee for the second NC. She proposed two approaches for a long-term and effective institutional arrangement. The first approach is building capacity of AD archiving agencies and enabling them to estimate for

the sectoral inventories. The second approach is to have the estimation and compilation done at the focal point with annual systematical flow of data from the AD archiving agencies. [Abstract, p. 58]

Mr. Min-Young Lee (GIR, RoK) made a presentation on Korea's institutional arrangements. Korea enacted a law to manage the GHG inventory, Framework Act on Low Carbon Green Growth, which establishes the national GHG information management system. Under this law, roles and responsibilities of relevant ministries are clearly set. Furthermore, a GHG Research center (GIR) has been established to verify the inventory data. [Abstract, p. 59]

Ms. Sun-Jung Moon (KECO, RoK) made a presentation on local government inventories. In response to the enforcement of the Low Carbon, Green Growth Law in Korea, local governments should prepare a 'local government's green growth plan'. Unlike the national GHG inventory, the local government GHG inventory cannot easily identify emissions, operational boundaries and sectors. Thus, a standard local government inventory guideline has been designed by KECO. Local government GHG inventories are utilized as basic data for defining emission sources and establishing a reduction strategy. Therefore, local governments will continue to prepare GHG inventories on their own, with a high reliability, and perform an important role for the 'National Green Growth Strategy'. [Abstract, p. 60]

Summary of Discussions

The participants discussed about how to improve institutional arrangements. They noted that arrangement depends on the country's national circumstances (resources, structure of ministries, data availability, etc.). Some participants pointed out that there was no ideal template for institutional arrangement. On the other hand, many countries already have a good foundation for preparing GHG inventories. These countries have a legal basis for inventory preparation and a single entity is given the responsibility of preparing inventories. The single entity coordinates inventory preparation with relevant organizations.

Many countries face common problems, such as the lack of continuity of inventory preparations, scattered data or inconsistent data. Because most Asian countries are NAI Parties with no requirement for annual submission, establishing a foundation for annual inventory preparations is difficult. There are also funding difficulties in most Asian countries. These countries can submit applications to GEF for funding the next NC preparation which includes GHG inventory work before completing their current NCs in order to keep the work flowing. Participants suggested that the next inventory preparation should be based on the experiences gained through the previous inventory preparation process.

Furthermore, some countries have also developed local government inventories. These inventories, as a bottom up process, could be used for comparison with the national inventory. However, there is the issue of possible double-counting between the national government's inventory and local governments' inventories. Participants noted the possible role local inventories could play in taking mitigation actions.

Conclusions & Recommendations from the Working Group

The participants noted that different countries have different forms of institutional

arrangements to suit each of their national circumstances. However they still have the same problems such as the lack of continuity of inventory preparations. This is a key problem that most Asian countries face. It was also noted that improved institutional arrangements for inventory preparation may be linked to estimating emission reduction from mitigation actions such as NAMAs. The participants proposed to continue discussions on how WGIA can contribute to mitigation actions, and whether institutional arrangements for inventory preparation could also address the future needs for estimating emission reduction from mitigation actions.

In addition, the participants suggested making a manual for inventory preparation. The development of a manual both for data collection and for estimating emissions could help maintain “institutional memory”. Preparing detailed manuals for future inventory teams would also improve the continuity of the GHG inventory compilation process.

Annex

Participants:	Chan Thoeun HENG	(Cambodia)
	Chealy PAK	(Cambodia)
	Kamal UY	(Cambodia)
	Qingxian GAO	(China)
	Huading SHI	(China)
	Rizaldi BOER	(Indonesia)
	Haneda Sri MULYANTO	(Indonesia)
	Takeshi ENOKI	(Japan)
	Elsa HATANAKA	(Japan)
	Yuriko HAYABUCHI	(Japan)
	Takahiko HIRAISHI	(Japan)
	Hiroshi ITO	(Japan)
	Yusuke NAKAMURA	(Japan)
	Takako ONO	(Japan)
	Kiyoto TANABE	(Japan)
	Hiroyuki UEDA	(Japan)
	Masako WHITE	(Japan)
	Won-Seok BAEK	(RoK)
	Kyonghwa JEONG	(RoK)
	Byong-Bok JIN	(RoK)
	Chan-Gyu KIM	(RoK)
	Min-Young LEE	(RoK)
	Sung-Hwan MOON	(RoK)
	Sun-Jung MOON	(RoK)
	Inha OH	(RoK)
	Soukanh BOUNTHABANDITH	(Laos)
	Immala INTHABOUALY	(Laos)
	Amphayvanh OUDOMDETH	(Laos)
	Arup RAJOURIA	(Laos)
	Syamphone SENGCHANDALA	(Laos)
	Wan Rasidah KADIR	(Malaysia)

Abdul Rahim Bin NIK	(Malaysia)
Namkhainyam BUSJAV	(Mongolia)
Batimaa PUNSALMAA	(Mongolia)
Min Zaw OO	(Myanmar)
Charmion Grace San Gabriel REYES	(Philippines)
Natthanich ASVAPOOSITKUL	(Thailand)
Sirintornthep TOWPRAYOON	(Thailand)
Yen Hoang PHAM	(Viet Nam)
Hoa Xuan VUONG	(Viet Nam)
Rendra Kurnia HASAN	(JICA Indonesia)
Fitri HARWATI	(JICA Indonesia)
Aisyah SYAFEI	(JICA Indonesia)
Dominique REVET	(UNFCCC)
Barry Lynn FLAMING	(USAID)

3.5.2. Agriculture Sector Working Group

Introduction

The Agriculture Sector WG was held in WGIA3, 4, 6 and 7. Each session's summary is the following.

In WGIA3, a number of good practices, challenges and solutions were identified. (cf., WGIA3 Proceedings)

In WGIA4, the WG focused on Rice Cultivation and Enteric Fermentation. The rice ecosystem AD status (water regime management & organic amendment) in each country was summarized. (cf., WGIA4 Proceedings)

In WGIA6, the WG focused mainly on strategies to improve the reliability of agricultural data, on reporting current status of inventory preparation, and on challenges in the agriculture inventory. It was concluded that obtaining reliable data was a major challenge for the agriculture inventory, and this could be addressed by developing CS-EFs, estimating EFs based on literature data, and enhancing information exchange. The participants stressed the necessity of a framework, which included both international and domestic collaboration, for using the shared information in identification of challenges and solutions to the problems. Finally, the participants recommended each country to present CS-EFs developments and to exchange agriculture-related information at the next WGIA. Besides, soil carbon, sustainable agriculture production and enhanced international collaboration were also recommended as subjects to be discussed at future WGIA meetings. (cf., WGIA6 Proceedings)

In WGIA7, the WG focused on "Emission Factors utilized for the NCs". The following points were discussed: (1) Understanding of CS-EFs development and reporting the progress of NCs, (2) Availability of CS-EFs to other countries, and the possibility of joint research, and (3) Exchange of agricultural information including mitigation potential. As a result, since rice cultivation was the major GHG emission source for the member countries, CS-EFs were found to be well developed in many those countries. However, it was revealed that only a few

countries had developed CS-EFs for enteric fermentation, livestock manure management and agricultural soils. For these categories, however, participants shared the view that it was not always necessary to develop CS-EFs, since some EFs developed in one country could be applicable to neighboring countries. At the end of the session, participants made some recommendations for future WGs: (1) to share experiences in using software and other tools that helped to improve methodologies from simple tier 1 to tier 2, (2) to consider models (e.g., the ALU and the DNDC model), (3) to organize a joint WG of the LULUCF and Agriculture sectors, (4) to focus on the improvement of emission estimates for agricultural soil and livestock, and (5) to discuss mitigation options.

The theme of the Agriculture WG of WGIA8 was decided as "Estimation Methods and Development of Parameters" by taking into account the recommendations of WGIA7. The discussion points were the following:

- Improvement of estimation methods of Enteric fermentation and Manure management,
- Improvement of estimation methods of Agricultural Soils,
- Development of parameters by joint research.

The Agriculture WG was attended by 28 participants from 9 WGIA-member countries (India, Japan, Laos, Malaysia, Mongolia, Myanmar, Philippines, Thailand, and Viet Nam) and also from the SEA GHG Project and IPCC. The chairperson of this session was Dr. Kazuyuki Yagi (NIAES, Japan) and the rapporteur was Dr. Amnat Chidthaisong (KMUTT, Thailand).

Presentations

Mr. Kohei Sakai (NIES, Japan) made an introductory presentation. He introduced the background information and the theme of the WG, and the points of discussion. Following the presentation, participants introduced themselves. [See Introduction]

Dr. Takashi Osada (NARO, Japan) made a presentation on GHG measurement for manure management of livestock in Japan. He introduced various manure management systems practiced in Japan and illustrated an actual measuring system by showing photos and pictures. He mentioned that the emission measurement was also important for developing new GHG regulation technologies. [Abstract, p. 61]

Dr. Sultan Singh (IGFRI, India) made a presentation on enteric methane emissions of Indian livestock from prevalent feeding systems in different agro ecological regions. India is divided into 10 agro ecological regions to estimate CH₄ emission from enteric fermentation for cattle in India. Moreover, India classified 3 ration types, which were Maintenance, Growing and Lactating. [Abstract, p. 62]

Dr. Kazuyuki Yagi made a presentation on recent research progress for improving Japanese GHG inventories of agricultural soils. He introduced (1) the effect of improved water management on mitigating CH₄ emissions from rice cultivation, (2) the DNDC-Rice model method and (3) the national program for collecting updated activity data. In Japan, a DNDC model with GIS-based information has been prepared to estimate CH₄ emissions from paddy fields. [Abstract, p. 63]

Dr. Chhemendra Sharma (NPL, India) made a presentation on GHG emissions from

agriculture soils in India. Emissions in 1994 were estimated by using the 1996 IPCC methodology and default emission coefficients. In contrast, emissions described in the GHG emission inventory for India for the year 2007 were estimated by using CS-EFs. [Abstract, p. 64]

Dr. Amnat Chidthaisong (KMUTT, Thailand) made a presentation on GHG emissions from agricultural soils in Thailand. He explained that N₂O emissions from agricultural soils contributed 15% of agriculture sector emissions, which contributed to 20% of total GHG emissions. Default EF indicated in the 2006 IPCC Guidelines and a CS factor for crop residues were used in Thailand's second NC. Finally, he highlighted the importance and need of improvement of N₂O emissions from livestock-related activity to make a more reliable inventory. [Abstract, p. 65]

Dr. Khin Lay Swe (YAU, Myanmar) made a presentation on the progress in the national inventory of Myanmar. She introduced the estimation method, parameters, and AD for all categories in Myanmar and its agricultural status by showing photos. She also introduced a study visit with her colleagues to KMUTT in Thailand. In Myanmar, agriculture was a main source of GHGs, and rice cultivation was an important category in the agriculture sector. [Abstract, p. 66]

Summary of Discussions

Following each presentation, some clarifications and comments were made. For Dr. Osada's presentation, he emphasized that the nitrogen content of livestock manure should be estimated before applying the EFs or methods developed by him to other Asian countries. For Dr. Singh's presentation, it was pointed out that it would be better to develop EFs on a "per head" basis for emission by region, which would make it possible to compare EFs by region. For Dr. Chidthaisong's presentation, he explained that data of fertilization were basically obtained from statistics which was the result of research in Thailand, and it was used for the GHG inventory as well as for other purposes. For Dr. Swe's presentation, participants advised her on measuring method to enhance the reliability of data.

Each country's status for development of CS-EFs was confirmed by referring to the Annex of the Introductory Notes (p. 9). Some countries were found to have used CS-EFs. It was pointed out that it would not be a good idea to develop CS-EF from a small number of measuring data, as it could not be a representative value of the country. In this case, the CS-EF could be less reliable than the default EF, as the default EFs and scaling factors for CH₄ emissions from rice cultivation, for instance, were revised in the 2006 IPCC Guidelines by sampling data at several hundred sites in Asia. In addition, it was also told that since developing CS-EF was very expensive, developing region-specific EF would be better. From another aspect, registering EFs on the IPCC-EFDB might be effective. Other participant wanted to know the process of how the representative value was determined as the CS-EF in other countries.

Participants expressed their feeling that a 15 minute presentation was not enough to understand estimation methods and CS-EFs deeply. Therefore, the mutual learning proposed in Session II was found to be a good activity to let them understand methodologies and CS-EFs used by member countries. The ideas regarding the style of the mutual learning were shared. As an idea, it was suggested that a couple of countries could hold mutual learning as a

satellite meeting of the Agriculture WG, and the other country members could observe it. Participants suggested that the next Agriculture WG needed to focus on one specific issue to understand that issue more deeply.

Furthermore, participants shared information on mitigations in the Agriculture sector. It was emphasized that the development of CS-EF was important to reflect mitigation option. Water management in rice paddy fields was important for reducing GHG emissions in Asian countries.

Conclusions & Recommendations from the Working Group

After the submission of the second NC, participants hoped to integrate all CS factors and AD by the end of the year 2010, and they expressed that would like to use this in the Agriculture WG at WGIA9 as a basis for mutual learning and future cooperation to make new CS-EF or to improve EF.

The participants also discussed future WGIA activities and made the following recommendations: (1) to hold sessions for learning how to develop a CS parameter , (2) to learn inventory planning, (3) to link the CS parameter to mitigation measures, and (4) to focus on soil carbon.

Annex

Participants:	Sultan SINGH	(India)
	Chhemendra SHARMA	(India)
	Junko AKAGI	(Japan)
	Yasumasa HIRATA	(Japan)
	Tomonori ISHIGAKI	(Japan)
	Edit NAGY-TANAKA	(Japan)
	Takashi OSADA	(Japan)
	Kohei SAKAI	(Japan)
	Atsushi SATO	(Japan)
	Kazuyuki YAGI	(Japan)
	Chanthamany CILIYA	(Laos)
	Visuey INDAVONG	(Laos)
	Mone NOUANSYVONG	(Laos)
	Sisamouth PHENGSAKOUN	(Laos)
	Saysumphane SAPHARNKHAME	(Laos)
	Bandith SULAYAKHAM	(Laos)
	Sivixay THEPBOULY	(Laos)
	Mohd Fairuz SUPTIAN	(Malaysia)
	Dorjpurev JARGAL	(Mongolia)
	Khin Lay SWE	(Myanmar)
	Mya THEIN	(Myanmar)
	Damasa Magcale MACANDOG	(Philippines)
	Amnat CHIDTHAISONG	(Thailand)
	Savitri GARIVAIT	(Thailand)

Cuong Mong NGUYEN	(Viet Nam)
Simon EGGLESTON	(IPCC)
Masako OGAWA	(JICA Indonesia)
Leandro BUENDIA	(SEA GHG Project)

3.5.3. Land Use, Land-use Change and Forestry (LULUCF) Sector Working Group

Introduction

All Parties to the Convention are needed to submit their inventories as part of NCs to fulfill the requirements of the Convention (Article 4 and 12). The LULUCF (LUCF) sector is a component of the national GHG inventory. In addition, through the negotiations on the future framework of the Convention including the issues of reducing emissions from REDD, the need for development of estimation methodology for the forestry GHG inventory with a reasonable accuracy has also been recognized. The major challenge for many countries to set up LULUCF inventories is to overcome the data deficit for this sector. Therefore, since its 6th session, this WG has dealt with the RS and GIS as discussion topics, since they could contribute to overcoming the lack of AD as well as emission/removal factors. Each time, experts exchanged information on internationally available RS and GIS data, and their experiences with applying these data to their national inventories.

At the previous workshop, experts shared their views on the use of RS and GIS data: 1) Global GIS and RS data exist; however, uncertainty could be high while applying them to national context; 2) Sharing experience with Annex I countries for data collection and verification is needed; and 3) Special focus on forest/peat fires emission inventory using RS and GIS data should be emphasized for south-east Asia. Following the discussions, they recommended this WG discussing how to acquire relevant data nationally and globally for LULUCF inventories, including training GIS experts in deriving AD and EFs from global data, and enhancing cooperation among experts in Agriculture and LULUCF sectors and those in RS and GIS in the application of RS and GIS data for adopting the 2006 IPCC Guideline.

By taking into account these recommendations and the experts' interests in dealing with these RS and GIS related issues again, the WG was held to learn updated information on RS and GIS data, and the experiences with case studies from experts. The points of discussions for this time were:

- What kind of progress was made in RS technology and GIS data? (What kind of data are available now and could be available in the near future?)
- What kind of progress was made in the application to the LULUCF inventory in the WGIA countries? (Can we learn their good practices and apply to our own LULUCF inventories?)
- What kind of gaps and barriers are still to be overcome in the WGIA countries?
- How can we enhance the interaction between GHG inventory and GIS experts?

This WG was attended by 36 experts, including experts of the Agriculture sector, from 10 countries (Cambodia, Indonesia, Japan, RoK, Laos, Malaysia, Myanmar, Philippines, Thailand and Viet Nam) and from IPCC, JICA, SEA GHG Project, USAID and UNFCCC. This session was chaired by Dr. Abdul Rahim Nik (FRIM, Malaysia), and the rapporteur was

Dr. Savitri Garivait (KMUTT, Thailand).

Presentations

Dr. Junko Akagi (NIES, Japan) gave an introductory presentation. She introduced the outcomes and recommendations from the WGIA7 and the topics and objectives of this session and the points of discussions. [See Introduction]

Mr. Leandro Buendia (SEA GHG Project) presented the progress in the use of ALU software by participating countries to the SEA GHG Project. He introduced the project's overview, the issues to be addressed in the SEA countries and gave reasons for the development of the ALU software which makes countries possible move up higher tiers. In order to set up a LULUCF inventory, the completion of the ALU Workbook's primary and secondary data elements to be used for the software was found to be the major challenge for participating countries. He further introduced the case studies of the application of GIS data which can be directly imported into the software to Philippines' and Cambodia's LULUCF inventories. [Abstract, p. 67]

Dr. Yasumasa Hirata (FFPRI, Japan) delivered a presentation on the potential of RS/GIS data for GHG inventory in forest sector. He introduced the approaches and challenges in obtaining RS data, internationally available data (e.g., Landsat data from USGS³, Google Earth, ALOS-PALSAR), and sources of uncertainty in the steps of analyzing RS data (e.g., category definition, boundary, spatial resolution, phenology or seasonality, agricultural land with trees). He also introduced the data used for Japan's inventory. He pointed to the importance of using data in combination of RS and ground-based data for the LULUCF inventory. [Abstract, p. 68]

Ms. Noriko Kishimoto (GSI, Japan) presented the utilization of Global Map for GHG inventory. She first explained the outline of the Global Mapping project, which involves 180 countries and each country's national mapping organization is responsible for developing data for its own country. Global Land Cover and Vegetation (Percent Tree Cover) data at 1 km resolution in 2003 are currently available free of charge⁴. The second version of the map at 500 m resolution in 2008 is now under development. Secondly, she explained detail steps how to process the Land Cover and Vegetation data of Global Map data for a LULUCF inventory. For this process, the necessity for Global Map data, GIS software and fundamental GIS skills were pointed out. Finally, she introduced JICA's capacity building that has been conducted jointly with her organization since 1994. She said that lectures on GHG inventory and forest degradation were included this year by taking into account the WGIA7's conclusion. [Abstract, p. 69]

Dr. Rizaldi Boer (IPB, Indonesia) made a presentation on the development of GHG inventory for LULUCF in Indonesia. LULUCF sector is the major GHG emission source in Indonesia. He explained that AD was generated with a combination of official forestry statistic report derived from satellite images processing (LANDSAT7 ETM+) and statistical data series. Currently land cover change analysis for 1998-2010 is conducted for Indonesian National Carbon Accounting System (INCAS). He also introduced the development of new

³ The U.S. Geological Survey (free of charge): <http://edcns17.cr.usgs.gov/EarthExplorer/>

⁴ <http://www.iscgm.org>

methodology for estimating GHG emissions from peat fires which were not included in the second NC due to high uncertainty with RS data (MODIS) and field survey data. He said that the emissions could be estimated by taking into account relationships among the burnt area, the total number of hotspot within a week prior to fire events in 10 km domain, the depth of burnt peat, and rainfall events. The improvement of methodology for the estimation would make the uncertainty level lower for Indonesian LULUCF inventory. [Abstract, not available]

Dr. Savitri Garivait (KMUTT, Thailand) made a presentation on Thailand's experience with RS and GIS data. She firstly reminded of her talk at the WGIA7 regarding how the estimation of biomass burning in the Mekong river basin sub-region was developed using RS and GIS data. This time, she introduced the application of RS and GIS data to inventory of carbon stock at provincial scale (Ratchaburi). Two national land use maps in 2000 (1:125,000) and 2007 (1:50,000) and the land use change matrix developed based on the maps and on the land use classification of the 2006 IPCC Guidelines were presented. The application of ALU to Ratchaburi to support the development of low carbon society scenario, and regarding the biomass burning, the assessment of area burnt by using both RS data and ground based data were given as future work. [Abstract, p. 70]

Mr. Min Zau Oo (Forest Department, Myanmar) introduced Myanmar's LUCF inventory for the first time in the WGIA. He said that the project for the first NC was launched by the National Commission of Environmental Affairs (NCEA) in 2008, and it would be completed within this year. For emission/removal estimates, Myanmar has already used methodologies given in the 2006 IPCC Guidelines. The results in 2000, which is the base year for Myanmar's first NC, indicated that Myanmar was the net sink country, and this status would be the same by 2030 at the current deforestation rate. At the end of talk, he indicated data gaps and constraints in inventory preparation. [Abstract, p. 71]

Summary of Discussions

Following the presentations, some clarifications and additional information were provided. This WG's discussions are summarized as follows.

Available RS and GIS data

Several experts shared information on available RS and GIS data; NASA and USGS distribute Landsat data for free of charge. The Google Earth showed their strategy to obtain RS data with high resolution of a world scale. Therefore, it was suggested that these data would be widely used by many countries. It was pointed out that the problem would be of setting the base year (or period) of the data collection and also a consistency, as past data can not be obtained with high resolution.

Regarding the case studies of Philippines and Cambodia presented by Mr. Buendia, the GIS data were developed by the colleagues from the Colorado State University, and the data with csv format could be directly imported into the ALU software. In order to develop the GIS data for these case studies, land cover map, climate map and soil map were needed. The land cover map and climate map were from the European Space Agency (ESA)⁵ and the soil map was from the ISRIC - World Soil Information⁶. The need of verification with a geo

⁵ http://www.esa.int/esaEO/SEMxB7TTGOF_index_0.html

⁶ <http://www.isric.org/>

reference was stressed as part of the GIS data development process.

The land cover map of the Global Map is available for free. The accuracy of the Global Map is about 70% based on the verification done by national mapping organization etc.

Regarding the resolution of RS and GIS data, there seemed to be no clear consensus among experts in using them for inventories. However, it was pointed out that data with 30 m resolution was available and could be used for LULUCF inventory.

Limitation of RS and GIS data

The importance of verification of RS and GIS data with ground based data was emphasized.

RS experts pointed out that more research was needed to distinguish deforestation and forest degradation and to identify the degree of forest degradation with a RS data.

The applicability of ALOS-PALSAR to dense forests with high carbon stock was questioned. Dr. Hirata said that some papers identified indeed a limitation of its applicability to the dense forests (e.g., the forest with more than 100 t/ha). Nevertheless, this RS is recognized as a good tool for monitoring cloudy forests and identifying deforestation area. The combination with other resources was recommended.

Dr. Boer shared his experience with the identification of hotspots in the peat land. He said that the location of hotspots identified from the RS data and the location of fire events identified in the field survey differed. For this reason, the domain approach was used in his study. It was suspected that RS might recognize ground surface with high temperature as hotspot because of strong sunshine in a dry condition. As RS data might not always provide correct information, the verification of RS data with ground based data was strongly recommended.

Selection of appropriate emission/removal factors

The importance of selecting appropriate emission/removal factors for a country was pointed out in particular for those with high carbon stock in forests, since small change in a factor might result in making the carbon pool huge sink or huge source. The experts shared their views that selecting an appropriate factor for their countries out of the default values given in the 2006 IPCC Guidelines was still difficult.

Inventory reporting

Developing of a land use matrix was recognized as a challenging work. In the development process, check was recommended if the land use change detected in a country was reasonable before applying it to inventory. When the matrix was based on the RS data, the use of statistical data together with the RS data was strongly recommended for verification.

Myanmar had already used the 2006 IPCC Guidelines for their LUCF inventory. They found difficulties in using the 2006 Guidelines mainly due to lack of data.

There was certain confusion in allocating emissions to appropriate categories in Myanmar. Therefore, assuring appropriate allocation was strongly recommended.

Uncertainty

Uncertainty for emissions or removals is derived from those of AD and emission/removal factors. Therefore, increasing the number of sampling would contribute to reduce uncertainty of emission/removal estimates. It was encouraged to obtain more data set from field survey for AD and emission/removal factors.

Other

Some experts expressed their interests in contacting with the map-making experts participating in the capacity building program implemented by the GSI, since the interaction between inventory and GIS experts could be developed and enhance the improvements of LULUCF inventory.

Conclusions & Recommendations from the Working Group

The experts reaffirmed that the RS and GIS were useful for overcoming data deficit for the LULUCF sector. However, the need of verification of these data with ground based data was reiterated. Since several RS and GIS data which were available from Global Map, USGS, the Google Earth, the ESA, etc. were introduced, member countries were encouraged to access these data to support their inventory. Through this WG discussion, the experts revealed the following needs for future activities for the member countries to improve their own LULUCF inventories:

- Need of further discussion on how to use RS to quantify forest (case study of LANDSAT or other RS data use might be good)
- Need of developing methodology for quantifying C stock change in the region using RS and GIS data (e.g., criteria for selection of base year, RS data, soil data, climate data, reference level)
- Effort on estimation of peat emissions should be pursued in the region, in particular, Indonesia and Malaysia (e.g., water drainage, uncertainty analysis, uncertainties due to RS data)
- Getting updates of new available data is required for member countries (e.g., Satellite WG, other new free high resolution data available)
- Getting updates on available software to support LULUCF GHG inventory (e.g., the ALU software, the 2006 Guidelines software)
- GIS map of soil, climate and land use of SEA is required to facilitate the use of software dedicated to support LULUCF GHG inventory
- Need of strengthening the coordination of GHG inventory and RS and GIS expert initiatives: Training and WS
- Interaction between GHG inventory and REDD should be strengthened
- Need of discussion on MRV issues (e.g., institutional issues, need to know other country's systems, how to define baseline and link to NAMAs)

Annex

Participants:	Chan Thoeun HENG	(Cambodia)
	Chealy PAK	(Cambodia)
	Rizaldi BOER	(Indonesia)

Junko AKAGI	(Japan)
Takeshi ENOKI	(Japan)
Elsa HATANAKA	(Japan)
Takahiko HIRAISHI	(Japan)
Yasumasa HIRATA	(Japan)
Noriko KISHIMOTO	(Japan)
Takako ONO	(Japan)
Kohei SAKAI	(Japan)
Atsushi SATO	(Japan)
Kazuyuki YAGI	(Japan)
Sung-Hwan MOON	(RoK)
Soukanh BOUNTHABANDITH	(Laos)
Thounheuang BUIHAVONG	(Laos)
Chanthamany CILIYA	(Laos)
Immala INTHABOUALY	(Laos)
Mone NOUANSYVONG	(Laos)
Chansamone SAYYALAT	(Laos)
Syamphone SENGCHANDALA	(Laos)
Bouathong THEOTHAVONG	(Laos)
Abdul Rahim NIK	(Malaysia)
Min Zaw OO	(Myanmar)
Khin Lay SWE	(Myanmar)
Damasa Magcale MACANDOG	(Philippines)
Charmion Grace San Gabriel REYES	(Philippines)
Amnat CHIDTHAISONG	(Thailand)
Natthanich ASVAPOOSITKUL	(Thailand)
Savitri GARIVAIT	(Thailand)
Cuong Mong NGUYEN	(Viet Nam)
Simon EGGLESTON	(IPCC)
Masako OGAWA	(JICA Indonesia)
Leandro BUENDIA	(SEA GHG Project)
Dominique REVET	(UNFCCC)
Barry Lynn FLAMING	(USAID)

3.5.4. Waste Sector Working Group

Introduction

In order to enhance the improvement of GHG inventories in Asian countries, we have discussed issues such as data collection, waste streams, waste water handling, and some others in the past WGAs. In WGIA8, we planned to identify problems of each country's waste sector inventory and to discuss how we could enhance the improvement for our future inventories. The themes for discussions of the WG were as follows:

- Finding out current status and/or problems of Waste Sector Inventory preparation of Asian countries
- Information sharing on the mitigation actions in waste sector and on the inventory

improvement

In the first half of the WG (Session I), we focused on the current status of waste sector inventory of each country. Prior to the workshop, the WGIA Secretariat conducted questionnaire survey to find out each country's situation. In the WG, Dr. Oda introduced the results of the survey (pp. 81-89). Following his report, the experts from each country supplemented detailed information on his/her countries' waste sector inventory.

In the latter half of the WG (Session II), we discussed our achieved inventory improvement and solutions applicable to the problems of each inventory. Also some experts provided the issues of the mitigation options as desirable topics to discuss in future WG.

This WG was attended by 36 participants from 12 WGIA-member countries (Cambodia, China, India, Indonesia, Japan, RoK, Laos, Malaysia, Mongolia, Myanmar, Thailand and Viet Nam) and also from the JICA Indonesia. The chairperson of this session was Dr. Tomonori Ishigaki (NIES, Japan), and the rapporteur was Dr. Qingxian Gao (CRAES, China).

Presentations

Session I

Dr. Takefumi Oda (NIES, Japan) made an introductory presentation of the Waste Sector WG. Introducing the past agendas of the WG, he stressed the importance of understanding the current inventory status of each country. After that, he reviewed the result of the survey. The survey clarified the responsible agencies of inventory compilation, transparency of the estimation methodologies and comparability, and identified the Not Estimated "NE" sources for each country's waste sector inventory. Also he showed the other findings of the methodologies in completeness, consistency and accuracy by using handout materials. [See Introduction]

Mr. Mya Thein (MEP, Myanmar) made a presentation on the waste sector inventory and waste management in Myanmar. Myanmar will submit the first NC in the near future. Myanmar in 2000 has generated 1,514 Gg/day of Municipal Solid Waste (MSW) estimated by its population. Although most part of collected MSW is disposed to unmanaged disposal site, 8% of the MSW is incinerated in the open sites. Total of CH₄ emission from sources of unmanaged disposal site and domestic/commercial waste water treatment have increased from 135 Gg of 2000 to 149 Gg of 2005. [Abstract, p. 72]

Dr. Dorjpurev Jargal (EEC Co., Ltd, Mongolia) made a presentation on estimation methodology of CH₄ emission from Solid Waste Disposal Site (SWDS) and Wastewater treatment in Mongolia. The estimation of missions from both sources employed Tirel method of IPCC Guidelines. He explained the references of whole parameters used on the methodology. Total amount of emissions has been constantly increasing from 4.59 Gg in 1990 to 6.55 Gg in 2006. He mentioned that waste minimization in Mongolia was more serious than small amount of GHG emissions from waste sector. [Abstract, p. 73]

Dr. Retno Gumilang Dewi (ITB, Indonesia) made a presentation on the status of inventory preparation, institutional arrangement, compilation systems, emissions, and technology for mitigation options in Indonesia. Indonesian second NC defined the country-specific subcategories for SWDS for Empty Fruit Bunch (EFB) solid waste from Crude Palm Oil

(CPO) mills; while the GHG emissions from other categories were partially estimated. The AD for the emissions are estimated from the population or industrial production capacities. The emissions from open burning for solid waste are included in SWDS in Indonesia. [Abstract, p. 74]

Dr. Qingxian Gao (CRAES, China) made a presentation on the progress of improvement for inventory in China. China newly estimated N₂O emissions from wastewater treatment and CO₂ emissions from waste incineration in the second NC. China also used the AD from statistics of yearbooks to estimate the emissions from SWDS by using newly employed the FOD method. The time series of MCF, which are used in the estimation as one of parameter, sometimes notably fluctuate for the status of economy in that period. [Abstract, p. 75]

Session II

Dr. Kosuke Kawai (NIES, Japan) made a presentation on the result of the survey for the amount of MSW collected by the Urban Environment Companies (URENCOs) in Vietnam. There are two ways to record the amount of MSW in Vietnam; one is with weighbridge and another way is estimation with waste volume. The former way makes a good correlation between the amount of waste generated and the subject population like Japan's data collection system. For accurate data collection, the installation of weighbridge in Vietnam municipalities appeared to be needed. [Abstract, p. 76]

Mr. Wonseok Baek (EMC, RoK) made a presentation on the improvement for waste sector inventory in 2007. Korea estimated emissions from SWDS in 2007 by using country-specific parameters for Degradable Organic Carbon (DOC) and by subtracting methane recovery. Now Korea is trying to employ the FOD method for SWDS. The estimations for emission from biological treatment of solid waste were newly established in the inventory in accordance with the 2006 IPCC Guidelines. Korea is conducting experts peer review for national GHG inventory annually to construct national inventory system of Annex I countries level. [Abstract, p. 77]

Dr. Sirintornthep Towprayoon (KMUTT, Thailand) made a presentation on the improvement of inventory and on the mitigation options in Thailand. Thailand estimates CH₄ emissions from SWDS with Tier 2 method. The reduction of waste generation and increase of recycle ratio are applicable to the mitigation options for this source driven by policy. On the other hand, Thailand has employed higher tier method with AD by industry and by technology in the estimation for GHG estimation from industrial waste water handling. Such detailed AD for wastewater handling becomes a key to select mitigation options driven by technology. [Abstract, p. 78]

Mr. Hiroyuki Ueda (Suuri Keikaku, Co. Ltd., Japan) made a presentation on inventory improvement for MRV mitigation actions in waste sector. He mentioned that mitigation action in waste sector could be classified into three ways based on the GHG reduction mechanisms; 1) Reduction of waste/wastewater, 2) Reduction of GHG emissions ratio per waste/wastewater treatment, 3) Reduction of GHG emissions in other sectors/categories by utilization of waste as raw material or energy. He stressed that the third way was the most effective action to reduce the GHG emissions. [Abstract, p. 79]

Summary of Discussions

In the session I, Dr. Dewi proposed information exchange and cooperation for inventory improvement among countries, which have similar industrial structure and are in a similar climate zone such as Indonesia, Malaysia and Thailand.

In the session II, Dr. Towprayoon presented the estimation of future waste generation based on the GDP and population growth. Dr. Kawai made some comments on her estimation that, although developing countries need to estimate waste generation in the future, it was not easy to estimate it with GDP, and the relationship between waste generation and GDP was not simply correlated but the tendency was like the shape of mountain. Mr. Uy pointed out that poor people generate more waste than rich people do due to their life style based on his literature review. Dr. Hanaoka supplemented the above comments with his advanced analysis that the waste generation saturates in the field of high GDP per capita.

Mr. Ueda proposed that the next WG should discuss not only the topic for inventory improvement but also the information exchange to promote mitigation actions in a MRV manner. Dr. Dewi pointed out that there were mitigation options in Japan without NAMA. Mr. Tanabe gave a response to her point that industries in Japan did not have a duty to reduce emissions from waste sector. He introduced an example of Japan's cement production process, for which waste materials are used as raw material, and it was not regarded as a mitigation option in Japan.

Conclusions & Recommendations from the Working Group

This WG clarified the recent status of inventory preparation of each participated country, and proposed the theme of inventory improvement for NAMAs in a MRV manner to next WGIA. Although waste sector inventory in NCs which will be submitted by each country in the near future has been improved in many points from the previous submissions, a lot of figures were made up with by the expert judgments. Collection of the appropriate country-specific data is necessary to compile waste sector inventory for NAMAs in a MRV manner. To enhance the improvement, the chairperson suggested the collaboration among member countries, such as the implementation of mutual learning between countries on similar situation of economy and/or environment. Also the chairperson recommended the WGIA Secretariat to follow up the conducted survey.

The participants agreed to consider the following topics at the next WGIA:

- Country-specific AD and EFs for improving inventory and for nationally appropriate mitigation options;
- Follow up the collaborations between the countries;
- Follow up the results of survey;
- Widen the scope of discussion, not only focus on the improvement of inventory, but also mitigation actions in waste sector.

Annex

Participants:	Kamal UY	(Cambodia)
	Qingxian GAO	(China)
	Huading SHI	(China)
	Chhemendra SHARMA	(India)

Sultan SINGH	(India)
Retno Gumilang DEWI	(Indonesia)
Haneda Sri MULYANTO	(Indonesia)
Tatsuya HANAOKA	(Japan)
Yuriko HAYABUCHI	(Japan)
Tomonori ISHIGAKI	(Japan)
Hiroshi ITO	(Japan)
Kosuke KAWAI	(Japan)
Edit NAGY-TANAKA	(Japan)
Yusuke NAKAMURA	(Japan)
Takefumi ODA	(Japan)
Kiyoto TANABE	(Japan)
Hiroyuki UEDA	(Japan)
Masako WHITE	(Japan)
Wonseok BAEK	(RoK)
Byong-Bok JIN	(RoK)
Min-Young LEE	(RoK)
Sun-Jung MOON	(RoK)
Sisamouth PHENGSAKOUN	(Laos)
Saysumphane SAPHARNKHAME	(Laos)
Manilay SOUVANHNALATH	(Laos)
Mohd Fairuz MD SUPTIAN	(Malaysia)
Dorjpurev JARGAL	(Mongolia)
Namkhainyam BUSJAV	(Mongolia)
Mya THEIN	(Myanmar)
Suthum PATUMSAWAD	(Thailand)
Sirintornthep TOWPRAYOON	(Thailand)
Yen Hoang PHAM	(Viet Nam)
Hoa Xuan VUONG	(Viet Nam)
Rendra Kurnia HASAN	(JICA Indonesia)
Fitri HARWATI	(JICA Indonesia)
Aisyah SYAFEI	(JICA Indonesia)

Handout: - Result of the Survey for Waste Sector Inventory Status of Each Country (pp.81-89)

3.6. Wrap-up Session

This session was chaired by Mr. Kiyoto Tanabe (NIES, Japan). In this session, the rapporteurs from the plenary sessions, hands-on training session and WGs provided summaries of the discussions including the findings and recommendations, which were followed by the final discussion to conclude the workshop. The following are the major outcomes of this workshop.

Summary of the Opening Session

This session was chaired by Mr. Kiyoto Tanabe and the rapporteur was Dr. Damasa Magcale Macandog (UPLB, Philippines). Dr. Macandog summarized the presentations and discussions of the Opening Session. The outline and abstract of each presentation are given on pp. 17-19 and pp. 47-49, respectively.

Summary of Session I

This session was chaired by Mr. Dominique Revet (UNFCCC) and the rapporteur was Dr. Batimaa Punsalmaa (MNET, Mongolia). Dr. Punsalmaa reported the summary of presentations and discussions of Session I. All four countries (Cambodia, China, India and RoK) reported their progress in inventory development, methodologies and the latest inventory data, and the points of future improvements. It was found that all these countries had very impressive institutional arrangements for inventory. Nevertheless, they all raised quite a few points of improvements in the future. The major points were to establish a national GHG management system and to build capacity at both the institutional and individual level. Their information was extremely valuable for other member countries. For more information on the recent progress made by WGIA-member countries including the above mentioned four countries are summarized in Annex of the Introductory Notes (p. 9).

Summary of Session II

This session was chaired by Mr. Leandro Buendia (SEA GHG Project) and the rapporteur was Dr. Simon Eggleston (IPCC). Dr. Eggleston presented the summary of presentations and discussions of Session II. The issues to be addressed and future directions pointed out by experts during this session are summarized in Table 1.

Table 1 Summary of Session II

Items	Points
Issues with current Inventories	<ul style="list-style-type: none"> • Missing activity data and inappropriate EFs • Differences in statistics (e.g. incomplete energy statistics, LUCF) • Forest definitions/classifications differ • Lack of institutional capacity and lack of continuity • Do inventories meet future needs? Are estimates verifiable?
Future Needs	<ul style="list-style-type: none"> • To study mitigation and co-benefits or to support CDM and industrial development, better inventories are needed • More detailed inventories <ul style="list-style-type: none"> – More industrial sub-sectors – Geo-referenced land use & complete LULUCF estimates – Time series – Improved accuracy and transparency • Improved Activity Data (they also improve projections as input into models e.g. AIM) • Inventories need to be reportable and verifiable
Finance & Technology needed to:	<ul style="list-style-type: none"> • Create and support stable, experienced teams and institutions • Establish GHG inventory database systems • Improve data collection and sustainable statistics collection (especially LUCF) • Research into categories which need more appropriate factors and data • Collaboration between experts • Capacity building
Regional Networks	<ul style="list-style-type: none"> • Regional cooperation can <ul style="list-style-type: none"> – Share expertise, experience and activity data & Emission Factors – Provide capacity building – Share inventory databases and research – Share approaches to QA/QC – Encourage wider participation • Regional roster of experts/institutions • Co-ordinate and prepare inputs into mitigation and modelling studies • More formalized mutual informal review (i.e., mutual learning)
Mutual Learning	<ul style="list-style-type: none"> • Exchange of information in WGIA has concentrated mostly on results not on “how to” – not on solutions • Japan/Korea have held peer review of each other’s waste emissions <ul style="list-style-type: none"> – real experts, latest inventories, two-way review • Benefits: identify useful data; find examples on transparency; improve understanding; enhance capacity; detect errors; improve transparency; get ideas on data collection; recognize strengths and weaknesses; build co-operation • Why don’t you do this? WGIA “dating agency” will provide help and support
Regional Co-operation	<ul style="list-style-type: none"> • Financial assistance not enough to undertake research programmes (i.e. from NC funding), prepare for NAMA/MRV type activities and other future needs • Regional co-operation can help address some of the issues <ul style="list-style-type: none"> – Mutual Learning – Sharing of experience, information and expertise • There are already some examples of regional co-operation <ul style="list-style-type: none"> – “Aid” projects such as JICA Indonesia, Regional studies “AIM”, Myanmar/Thailand co-operation on CH₄ measurements and training and Thai/Lao training.

Summary of Hands-on Training Session

Ms. Elsa Hatanaka (NIES, Japan) summarized and reported the outcomes of the eight groups arranged in this session. Experts noted that perusing other countries' inventories was useful in order to discover points of improvement for their own inventories.

Summary of Session III

Inventory WG

Participants discussed how to set up or improve institutional arrangements for the third NCs and inventory preparation, and how to enhance long-term and inter-ministerial cooperation to ensure sustainable data collection and data organization. They noted that different countries had different forms of institutional arrangements to suit each of their national circumstances. It was noted that improved institutional arrangements for inventory preparation might be linked to estimating emission reduction from mitigation actions such as NAMAs. It was found out that most of member countries still faced the same problems such as the lack of continuity of inventory preparations. The development of a manual both for data collection and for estimating emissions could help maintain "institutional memory" and future inventory teams.

Agriculture WG

Participants exchanged information on the improvement of estimation methods of Enteric Fermentation, Manure Management and Agricultural Soils, and the development of parameters by joint research. After the submission of their NCs currently under preparation, they hoped to integrate all country-specific factors and AD by the end of the year 2010, and they expressed their interests in using this in the Agriculture WG at the WGIA9 as a basis for mutual learning and future cooperation to make new CS-EFs or to improve EFs. Furthermore, they expressed their interests in learning how to develop a CS parameter and how to link the parameter to mitigation measures, learning inventory planning, and focusing on soil carbon.

LULUCF WG

Participants exchanged information on currently available RS and GIS data and shared their experiences and lessons learnt from applying these data to their LULUCF inventories. They reaffirmed the usefulness of RS and GIS data for overcoming data deficit for the LULUCF sector. However, the need of verification of these data with ground based data was reiterated. Since several RS and GIS data which are available from various sources (e.g., USGS, the Google Earth, and the ESA) were introduced, member countries were encouraged to access these data to support their inventory. Through this WG discussion, the experts expressed their interests in sharing information on case studies of the application of RS and GIS data to LULUCF inventories, learning available data and tools for reporting, enhancing interaction among experts with different expertise, and discussion on MRV issues.

Waste WG

Participants exchanged information on the current status of each country's Waste inventory preparation and on the mitigation actions for this sector. They found out that each country's Waste inventory had been improved significantly compared to the previous one. However, they also noted that many countries used parameters based on expert judgments. In order to improve inventory quality, participants agreed to deal with the following topics in the

future WGIA: 1) CS-EFs and AD for improving inventory and for NAMAs options; 2) follow up of collaborations among member countries; 3) follow up of the results of survey; 4) expand the scope of discussion, not only focus on the improvement of inventory, but also including mitigation action in waste sector.

Overall

The overall discussions were opened by a basic question by Mr. Tanabe, i.e., if this workshop should be continued and if it was worthwhile to have this workshop again next year. Firstly he shared his view of justification for holding this workshop again next year:

- Many countries should have published the second NC data by the time the next WGIA was held. Therefore, we can share each other's results at the next session.
- Various recommendations of new activities among our group member states were made, e.g., mutual learning between member countries by focusing on specific sectors included in the second NC.
- Each WG proposed various issues, e.g., how to combine mitigation and inventory, how to enhance the interaction of inventory and REDD experts, how to contribute to mitigation monitoring.

Many experts supported his view and expressed their interests in continuing this activity. They found this workshop very useful, as they could exchange inventory-related information among regional experts in an effective and efficient manner, and they knew that regional experts provided them with a good potential for enhancing regional collaborative work such as mutual learning and research activities in developing CS-EFs. This could further enhance regional supporting activities such as SEA GHG Project, SWGA and JICA's regional projects.

Among others, the idea of implementing mutual learning was strongly supported, since it was considered as a good activity to enhance inventory improvement of member countries. It was also pointed out that this activity would enhance capacity building by finding weaknesses of the inventory. Some experts shared their views on the selection of partners for this activity. They stated that the partners did not have to be countries at a similar level in their economic status and/or in the same climate region, but this activity could be implemented even between Annex I and NAI Parties to the Convention. The details of how the mutual learning could actually be carried out were still to be discussed among the experts and the WGIA Secretariat following this workshop.

Many experts found it useful to peruse other countries' inventories to get hints for improving their own inventories through the hand-on training. As an idea for the next hands-on training, the review of EFDB was suggested. The WGIA Secretariat welcomes any kind of suggestions for this session.

Many experts expressed their concerns about mitigation. They expressed their interest in discussing how to link inventory to mitigation, and also inventory to the Clean Development Mechanism (CDM). Experts shared their view that it would be a major challenge for them. It was pointed out that emphasis of co-benefits and consideration of costs were important for this discussion.

Some experts expressed their interest in exchanging information and experiences on MRV at both national and sectoral levels, on nationally appropriate mitigation actions (NAMAs),

and on setting up the base line for mitigation actions.

To enhance more inventory development work, the importance of approaching to and supporting policymakers was pointed out, as the inventory experts could not develop inventories all by themselves. The experts may be able to obtain financial support from policymakers by making up the Summary for Policymakers (SPM) and providing it to them, in which not only inventory but also mitigation and CDM should be stressed.

The importance of applying for funding for the next NC before completing the NCs currently under preparation was stressed. All countries which have almost completed their current NCs were strongly encouraged to do so.

Besides, the following discussion topics were suggested to be dealt with at future WGIA8:

- Information on the third NC
- Institutional arrangements
- QA/QC
- How to move up tiers (methodology)
- Development of time-series data and recalculation
- Uncertainty assessment
- Key category analysis (as a tool for prioritizing improvement)
- Capacity building for both national and local level

At the end of the overall discussions, Mr. Tanabe summarized the points of overall discussions of the WGIA8:

- ◆ Mutual learning of inventory was found to be helpful;
- ◆ Experts paid more and more attention to how to link inventory to mitigation;
- ◆ Development of local level inventory might be useful in a national context;
- ◆ Discussions of technical aspects of inventory should be covered;
- ◆ Continuity of information exchange on inventory work was found to be important at the workshop and even during the time away from it;
- ◆ Production of a national inventory development manual would be helpful for inventory compilers of the country. The one developed in a country would become a good reference for all member countries;
- ◆ Archiving of information and data for inventories was important;
- ◆ Contribution to the IPCC-EFDB was encouraged;
- ◆ Application for funding for the next NCs before completing the current NCs was strongly recommended.

Even though various suggestions for future discussion topics were made, it was pointed out that the agenda for the next session should be determined by also taking into account the progress and outcomes of international negotiations. Therefore, experts were encouraged to watch out for the negotiation process as well.

Closing remarks were delivered by Mr. Syamphone Sengchandala, Director of Climate Change Office, Department of Environment, WREA, Laos, and Dr. Yukihiro Nojiri, Manager of GIO, Japan. They thanked all participants for their presentations and contributions to the fruitful discussions in the workshop.

4. Abstracts

Overview of WGIA8

Junko Akagi

Greenhouse Gas Inventory Office of Japan (GIO/CGER/NIES), Japan

Abstract

Non-Annex I (NAI) Parties under the United Nations Framework Convention on Climate Change (UNFCCC) are required to prepare GHG inventories as part of National Communications (NCs) to be periodically submitted to the Conference of the Parties (COP) under the UNFCCC. Most of NAI Parties in Asia have already submitted GHG inventories as part of their initial NCs and are currently preparing second ones to be included in the NC2 (Note: NC1 for Myanmar; while NC3 for Republic of Korea). Although they had gained knowledge and experiences through preparing their first inventories, they still face a number of problems.

The Workshop on GHG Inventories in Asia (WGIA) organized by the Ministry of the Environment of Japan (MOEJ) and the National Institute for Environmental Studies (NIES) has been held on an annual basis since 2003. Since its 6th session, the WGIA has been held as a capacity building workshop for measurability, reportability and verifiability (MRV) by taking into account the Bali Action Plan (Dec. 2007) and the G8 Environment Ministers Meeting in Kobe (May 2008). The importance of reliable GHG inventory and its further improvement has been continuously considered in the international negotiation process, as it is the key to the evaluation of Nationally Appropriate Mitigation Actions (NAMA).

The upcoming WGIA8 is to be held 13-16 July 2010 in Vientiane, Lao PDR and convened by the MOEJ and NIES together with the local host organization, Water Resources and Environment Administration (WREA). By taking into account the international negotiation process and the outcomes of the past WGIAs, the WGIA8 aims at exchanging information and opinions on: 1) progress made by member countries since the WGIA7, 2) their latest inventories (to the extent possible), 3) future activities beyond the latest inventories, 4) MRV-related information, and 5) the sector-specific issues.

About 90 participants are expected to be present in the workshop. They are government officials and researchers from 14 countries in Asia (Cambodia, China, India, Indonesia, Japan, Republic of Korea, Lao P.D.R., Malaysia, Mongolia, Myanmar, Philippines, Singapore, Thailand and Viet Nam) and are experts from international organizations (UNFCCC, IPCC/TSU), USAID and a project (SEA GHG Project).

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Access to relevant information

<http://www-gio.nies.go.jp/wgia/wgiaindex-e.html>

Japan's Climate Change Policies and MRV Initiatives

Yusuke Nakamura
Ministry of the Environment, Japan

Abstract

Having a clear understanding of the current state of GHG emissions and taking appropriate countermeasures to combat climate change are important for both developed and developing countries to achieve the UNFCCC's ultimate goal. Although developed countries should make more efforts to reduce their emissions, the need for action by developing countries concerning emission projection is also increasing.

In order to enhance the PDCA cycle to tackle global warming, building clear understanding of the current state of GHG emissions is the first step to take. This is why GHG inventories have been recognized as a key to the mitigation actions. The importance and needs for support for developing countries to set up reliable GHG inventories has been slowly but surely recognized at the various international meetings such as the G8 Environment Ministers Meeting in 2008, the 15th Conference of the Parties to the UNFCCC in 2009, and the subsequent sessions of the AWG-LCA in 2010. The Copenhagen Accord, taken note of by the COP15, became a basis for discussions at the 10th AWG-LCA, where more frequent submissions of GHG inventories (e.g., every two years) have been suggested. In order to support developing countries aiming at improving their inventories in an efficient manner, Japan offers relevant workshops such as WGIA and SWGA.

Japan itself, as one of the developed countries, is also making efforts to reduce its GHG emissions. Japan's total greenhouse gas emissions in FY 2008 were 1,282 million tonnes of CO₂ equivalents. This was an increase of 1.6 % compared to the base year under the Kyoto Protocol and a decrease of 6.4% compared to FY 2007. The primary reason for the decrease was the drop in energy demand within all the sectors, including the Industries sector, due to the severe economic recession induced by the financial crisis in the second half of FY 2008. Further analysis was done on the contribution of factors to emission trends by breaking down emissions into a product of three factors; basic unit of CO₂ emissions; basic unit of energy consumption; and the amount of activity. This analysis further enables the adaptation of effective measures to tackle the issue.

Japan has also set GHG reduction targets; as for the Mid-term Goal, the target is 25% reduction below 1990 levels by 2020; and as for the Long-term Goal, the target is 80% reduction below 1990 levels by 2050. The Japanese Cabinet submitted "the bill of Basic Law on Climate Change" to the National Diet on March 12, 2010. The key points of the bill are that it specifies the Mid- and Long-term goals and the three Key Policy Measures: 1) Domestic emission trading scheme, 2) "Greening" tax system, and 3) Feed-in Tariff system. Although this bill did not become law at the last Diet session due to the political situation, the Cabinet will re-submit the bill to the next Diet session. Japan will mobilize all political instruments to achieve our reduction goals.

Access to relevant information:

Japan's GHG emissions in FY 2008:

<http://www.env.go.jp/en/headline/headline.php?serial=1314>

Bill of the Basic Act on Global Warming Countermeasures:

http://www.env.go.jp/en/earth/cc/bagwc/overview_bill.pdf

IPCC Inventory Developments

Simon Eggleston
IPCC

Abstract

Following the completion of the 2006 Guidelines the TFI has focused on providing assistance to users of all the IPCC Guidelines. These activities include expert meetings, developing software and the EFDB and providing assistance on our web site.

We held an Expert Meeting “Datasets for use in the IPCC Guidelines: FAO data and how it can be used in the IPCC Agriculture and Land Use” at IFAD, Rome, Italy in 2009. The outcome was a report that lists the data items (largely activity data) needed to compile an inventory and where to find it on the FAO web site, or FAO contacts.

Earlier in 2009 we held another expert meeting “Revisiting the Use of Managed Land as a Proxy for Estimating National Anthropogenic Emissions and Removals” at INPE, São José dos Campos, BRAZIL. This meeting concluded that the IPCC’s advice in the 2006 Guidelines that the anthropogenic component of emissions and removals from forestry and land use is the component which occurs on managed land is still appropriate for global use.

A meeting in Yokohama in February, 2010 on “National Forest GHG Inventories – A Stock Taking” identified areas where additional guidance would be useful: design of forest monitoring systems, combining ground based inventories, remote sensing and modelling; using remote sensing in forest GHG inventories, and selectively logged forests.

A meeting on Uncertainty and Validation of Emission Inventories decided on the need for some additional “Q & A” on the web site to introduce the guidelines. The meeting also considered remote sensing and modelling used for validation of Inventories as premature for general use but recognized these as techniques that will develop and become more useful in the future.

Work is also continuing on developing and improving the Emission Factor Database (EFDB) and on new software for the 2006 Guidelines that should be ready in early 2011.

An expert meeting in August in Sydney will look at the use of Tier 3 Models and Measurements and how to validation, reports and documentation them. A second expert meeting will also be held at the request of UNFCCC (SBSTA) looking at developments in Harvested Wood Products, Wetlands and N₂O from soils.

References

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Access to relevant information

<http://www.ipcc-nggip.iges.or.jp/>

The Study Progress on National GHG Inventory in China

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Abstract

In this presentation, the newly progress of SNC of China is summarized. Comparing with Chinese INC, the Gases include in inventory of SNC increase from 3 gases to 6 gases. The emission sources also increased according to Chinese situation, such as in IP sector, the more products are included. The inventory of Hong Kong SAR and Macao SAR are also included as an annex of Chinese SNC. The institutional arrangement of SNC is briefly introduced in this presentation. Finally, the newly progress of GHG inventory is introduced.

GHG Reduction Policy and Status of Inventory

Lee, Minyoung

GHG Inventory & Research Center of Korea (GIR), Republic of Korea

Abstract

- Korea's new vision, 'Low Carbon, Green Growth'
 - Background of Green Growth
 - ◆ Climate impact is very evident
 - ◆ Vulnerable in terms of energy security
 - ◆ Falling into economic slowdown
 - Real action
 - ◆ The Presidential committee on Green Growth
 - ◆ The Framework Act on Low-carbon Green Growth
 - ◆ National midterm reduction goal
 - ◆ GHG inventory & Research Center of Korea
- Korea's GHG Inventory from 1990 to 2007
 - ◆ In 2007, total GHG emissions increased 2.9% from 602 Mt CO₂ in 2006.
 - ◆ In 2007, total CO₂ emissions increased 4.6% per year since 1990.
 - ◆ For CO₂ from fuel combustion, the increasing rate of emissions was slowdown.

Implementation of “Mutual Learning” among WGIA Countries

Kiyoto Tanabe

Greenhouse Gas Inventory Office of Japan, Japan

Abstract

Two meetings for peer review of each other’s GHG inventory, focusing on the waste sector, were held in 2008 and 2009 between Republic of Korea (RoK) and Japan. These meetings were motivated by interest taken by inventory compilers to learn details of methods and data used for inventory compilation in each other country. The objective was to learn from each other, and not to criticize or audit each other’s inventory. It is therefore considered more appropriate to call this activity “mutual learning” rather than “review” in order to clearly distinguish it from the UNFCCC review of GHG inventories submitted by Annex I Parties.

These meetings between RoK and Japan demonstrated that “mutual learning” with other countries can be of great benefit to inventory compilers.

First, by studying other country’s inventory and asking questions of those who produced it, inventory compilers will be able to:

- ✓ obtain useful information/data that could be used for your own inventory;
- ✓ find good examples to follow to make your own inventory report more transparent; and
- ✓ better understand the methodologies for inventory.

Second, receiving questions and comments from others will help inventory compilers to:

- ✓ detect and correct errors in their inventory;
- ✓ improve transparency of their inventory; and
- ✓ get an idea on how they can obtain better data which themselves have not been aware of.

Third, by meeting face to face and having frank discussion, inventory compilers from both countries will get friendlier with each other, which will eventually enhance cooperation between two countries.

Key factors for success of “mutual learning” are: (1) active participation of experts who actually produced the inventories; (2) two-way communication of questions and answers (not one-way communication like examiner vs. examinee); and (3) forward-looking motivation shared by participants.

The WGIA secretariat considers this “mutual learning” is helpful and should be promoted among WGIA countries. As a first step, it proposes that some of the WGIA member countries implement “mutual learning” back-to-back with the 9th WGIA in 2011. Subject to the availability of funds, inventory compilers from a couple of WGIA countries could be invited to form one or two combinations for this purpose. Because of the budgetary limitations, the financial support will be provided to only a couple of countries that apply for entry into this activity on a first-come-first-served basis.

On-going JICA Project in Indonesia

Masako Ogawa

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Abstract

In response to the Indonesian policy development for mitigation of climate change, JICA will start the project of Capacity Development for Climate Change Strategy in 2010.

This new project has 3 components; 1) Capacity Development for NAMA and NAPA, 2) Capacity Development for Vulnerability Assessment, and 3) Capacity Development for National GHG Inventory.

Regarding the issues to be discussed during WGIA 8, expected output of the sub-project 1) includes NAMA with MRV through better understanding on MRV, and action plan and workshops for capacity development on MRV. The output of sub-project 2) includes preparation of NIR and institutionalization of Inventory development through training, data collection and compilation, QA/QC activities, etc.

JICA hope to report further progress of the project in the next WGIA and UNFCCC meetings, and to share lessons learnt with participating countries and experts.

Bridge the Gap between Statistics, Inventories and Projections in Asia — Mitigation Analysis by the AIM Models —

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Abstract

The AIM (Asia-Pacific Integrated Model) comprises three main models - the greenhouse gas emission model (AIM/emission), the global climate change model (AIM/climate), and the climate change impact model (AIM/impact). The AIM/emission model estimates GHG emissions and assesses policy options to reduce them. The AIM/climate model forecasts concentrations of GHG in the atmosphere and estimates the global mean temperature increase. The AIM/impact model estimates climate change impacts on natural environment. The AIM model has been used to provide global and regional emission scenarios and regional impact assessments to the IPCC, Eco Asia (the Congress of Asian Ministers for the Environment), the Global Environmental Outlook Program of UNEP, etc.

With regard to the AIM/emission model, there are several models both in a global scale and in a national scale, and both by a bottom-up approach and by a top-down approach. In addition, there are various element models for estimating socio-economic dynamics such as population and household dynamics, building dynamics, transportation demand, etc. These models have been contributed to discussions on Japan's midterm reduction target (~ 2020) and Japan's long term reduction target (~ 2050).

It is necessary to reduce GHG emissions drastically to stabilize GHG concentrations in a global scale. Japan is also required to assess long-term mitigation policies in the context of achieving a global GHG stabilization, thus the project named "Japan Low-Carbon Society (LCS) scenarios toward 2050" has been launched from 2004 to 2008. The desired Japan 2050 future images with a 60-80% GHG reduction were set and pathways considering economic impact, technological possibility, institutional and lifestyle change were simulated objectively and consistently by using AIM models. Based on experience of the Japan LCS study, since 2009, as a next step, we have expanded this LCS scenarios study to Asia regions. However, in order to discuss LCS scenarios in Asia, there are several barriers of availability of various statistics, thus it is essential to enforce MRV (Measurable, Reportable, and Verifiable) inventory systems in Asia. Without sufficient statistics, it is very difficult to estimate future emissions and discuss mitigation actions. It is important to bridge the gap between statistics, inventories, and projections in Asia.

Access to relevant information

Asia-Pacific Integrated Model (AIM): <http://www-iam.nies.go.jp/aim/index.htm>

Japan Low Carbon Society Scenarios toward 2050: <http://2050.nies.go.jp/index.html>

2050 Low-Carbon Society Scenarios in Asia: <http://2050.nies.go.jp/LCS/>

Mongolia's Institutional Framework to Prepare GHG Inventory

Batimaa P., B. Namkhainyam and J. Dorjpurev

Project on Strengthening Integrated Water Resources Management in Mongolia

Abstract

The Article 16 of the Air Law of Mongolia declared that "The Designated Professional Authority (DPA) shall prepare national inventories of GHG emissions and removals in accordance with the National Manual of Procedures approved by the Central Government Organization responsible for Environmental Matters".

Therefore, firstly the Central Government Organization responsible for Environmental Matters, namely Ministry of Nature and the Environment of Mongolia should appoint the Designated Professional Authority (DPA) responsible for preparation of GHG inventories in accordance with the comparable international methodologies for inventories of GHG emissions and removals approved by the Conference of Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC). DPA will have responsibilities to prepare National GHG Inventories on behalf of the Government of Mongolia. Today, the National Agency for Meteorology, Hydrology and Environment Monitoring of Mongolia is caring the responsibility of DPA.

In preparation of GHG inventories, all related ministries and agencies, institutions and private companies, whose activity data and information are necessary for estimating emissions by sources and removals by sinks, are obligated to provide the DPA with all data and reports of their activities for the certain year.

Data flow chart between the responsible ministries and organizations and its responsibilities are set up.

Institutional Arrangement for the GHG Inventory in Vietnam

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Abstract

Since ratifying the United Nations Framework Convention on Climate Change (UNFCCC) in 1994 and the Kyoto Protocol (KP) in 2000, the Government of Vietnam assigned the Ministry of Natural Resources and Environment (MONRE) as the National Focal Point Agency for implementing the UNFCCC and KP in the country.

Vietnam completed five national greenhouse gas (GHG) inventories within several projects supported by the Government and some international organizations such as the Asia Development Bank, the United Nations Environment Programme and Global Environment Facility.

For the First National Communication of Vietnam under the UNFCCC, the Hydro-Meteorological Service (MONRE now) was the national focal point and coordinating agency and the GHG inventory was compiled with the cooperation of relevant ministries, institutes, NGOs, etc.

Under the Second National Communication, the GHG inventory is executed by MONRE and carried out by the Department of Meteorology, Hydrology and Climate Change of MONRE in cooperation with various related ministries as well as private sector, local communities and NGOs. The National Climate Change Steering Committee¹ (NCCSC) which consists of representatives from 14 ministries and agencies has been providing consultations to MONRE on policies related to development, management of climate change activities in the country. Besides, NCCSC has been also providing guidance and advisories to MONRE, the Project Management Team and the National Study Team on issues related to climate change, including the GHG inventory.

The GHG Inventory Group which is one of component of the National Study Team is composed of a number of experts drawing from both public and private sectors including NGOs. The GHG Inventory Group comprises four sub-groups: (1) Data and information collection; (2) Checking and verifying data; (3) Prepare national inventory report and (4) Source and uncertainty analysis. Each sub-group involves experts and institutional bodies from five sectors: Energy, Industrial process, LULUCF, Agriculture and Waste.

Up to now, the Decision No.47/2007/QĐ-TTg dated 06 April 2007 of the Prime Minister on approval of the Kyoto Protocol implementation Plan under the UNFCCC for the period of 2007-2010 serves as the legal basis for developing the GHG inventories in Vietnam.

References

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MONRE, 2010. National GHG Inventory Report for the year 2000 of Vietnam (not published yet).

¹ The NCCSC was renamed as the "National Steering Committee for the UNFCCC and KP" and now consists of representatives from 18 ministries and agencies.

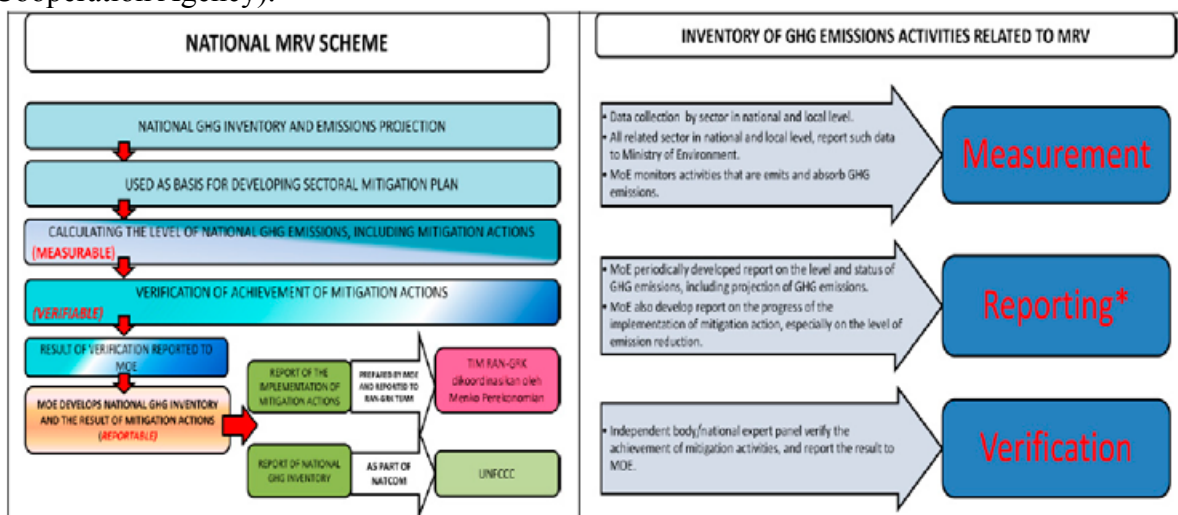
National GHG Inventory and Measurement, Reporting and Verification (MRV) Scheme in Indonesia (setting-up process)

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Abstract

In 1994, Indonesia has ratified International legal instrument, named United Nations Framework Convention on Climate Change (UNFCCC). By ratifying such instrument, Indonesia should develop its national communication including its national communication and other elements in accordance with article 12.1 and 12.5 of the Convention. Thus, in decision 1/CP.13 (Bali Action Plan), it says that all developed countries should do their nationally appropriate mitigation commitments or actions (NAMAC) in a MRV manner. Developing countries also develop their nationally appropriate mitigation actions (NAMAs) enabled and supported by finance, technology and capacity building in a MRV manner.

Having such condition, Indonesia also declares its national emissions reduction target by 26% under BAU by 2020. In national level, some preparations have been made with regards to achieve its national goal. Coordinated by Ministry of Environment in a MRV manner, Indonesia is now preparing its regulation concerning national GHG inventories. Such regulation will be used as a legal basis for all relating sectors to do specific GHG inventories in their activities. Ministry of Environment will collect all related data (including activity data, emission/removal factors, mitigation actions, etc) from related sectors and maintain it in one comprehensive national tabulation data. Therefore, to have a good GHG inventory it should be accompanied by a good MRV scheme. Several activities to develop better understanding on MRV scheme and its correlation with national inventory system have been implemented through bilateral cooperation with European Union and JICA (Japan for International Cooperation Agency).



It is expected that Indonesia could improve its national GHG inventory by developing its national inventory system in a MRV manner. By having such system, Indonesia could develop better mitigation actions that are matching with national circumstances shown by the GHG inventory report.

Thai Institutional Arrangement

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Abstract

Thai national focal point is located at the Climate Change Coordination Center, Office of Natural Resource, Environmental Policy and Planning. Preparation of national communication including greenhouse gas inventory was done by contract out to outside competent institute with experience on national GHG inventory. Activity data are mostly archived separately by relevant governmental agencies. Reliable and long historical records of energy data were stored at Ministry of Energy. National statistical data was kept in Agriculture Statistical office, Ministry of Agriculture while data of land used and forestry were in separated agencies. Quality control of the inventory was done by the internal meeting and expert group meeting while quality assurance was performed through steering committee and national committee. In order to improve national greenhouse gas inventory, good database system is required. Two approaches are proposed for the long term and effective institutional arrangement. First approach, building capacity of activity data archiving agencies enable to estimate sectoral inventory and national focal point performs the compilation of NGHGI. Second approach is to have the estimation and compilation done at the focal point with annual systematical flow of data from activity data archiving agencies. Advantage and disadvantage of both approaches are discussed.

Korea's Institutional Arrangement

Lee, Minyoung

GHG Inventory & Research Center of Korea (GIR), Republic of Korea

Abstract

Korea enacted a law to manage the GHG inventory, 'the Framework Act on Green Growth'.

- Two main purpose of GHGs management
 - To achieve the reduction goal
 - To verify the estimate of GHG emissions
- Establishing GIR
 - Follow up to the national reduction goal
- Objectives of GIR
 - GHG reduction potential analysis
 - Enhancing cooperation with experts
 - Performing domestic verification
- Structure of IA
 - Each ministry: estimating related GHG emissions
 - GIR: review the emissions data submitted by each ministry

Local Government GHG Inventories in Korea

Sun-Jung Moon

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Abstract

In response to enforcement of low carbon, green growth law in Korea, the Local government should prepare ‘local government’s green growth plan’ in order to implement local government level harmonized with ‘National green growth strategy’. The local government should quantify and report its own GHG Inventories in this reason, however due to the lack of skilled experts and usage of non comparable methodologies, the Korea Environment Corporation (KECO) perform the local government GHG inventory project by signing the contract with the local government. This project has been not only estimate the local government GHG inventories but also foster local climate change & inventory experts enable to perform the local government GHG inventory

Unlike the national GHG inventory, local government GHG inventory is difficult to identify emissions, operational boundaries and sectors due to unlimited movement of products, waste, mobile vehicles across local boundaries and to correspond perfectly with local government’s different levels of activity data following to 2006 IPCC G/L. Thus a standard local government inventory guideline is designed by KECO to inventory emissions considering local operational boundaries and country specific circumstances based on LGO protocol and 2006 IPCC G/L. Our guideline provides separate categories which are direct managing sources, indirect managing sources, direct emissions (Scope1), indirect emissions (Scope2) and overall emissions (covering direct and indirect emissions) to create a reasonable, feasible strategy in order to reduce emissions for local government.

Local government inventory was estimated by KECO from 2000 to 2007 for 16 Province last year. This result shows a general tendency that massive steam power plants located in ‘Chungnam’ Province and power stations and iron industry facilities located in ‘Junnam’ Province produced a significant amount of GHG emissions on direct emissions category. A wide variety of industrial facilities in ‘Ulsan’ Province produced the most GHG emissions on direct emissions per capita. Indirect emissions category is deeply associated with the increase of population and consumption of electricity.

The local government GHG inventories in Korea enables to compare with national and each local governments in a quantifiable and transparent way, moreover to utilize it efficiently as basic data for defining emission sources and establishing reduction strategy. Therefore the local government will estimate a distinct GHG inventory on its own with high reliability and perform an important role for ‘National green growth strategy’ based on the local government GHG inventories

References

Local Government Operations Protocol for the quantification and reporting of greenhouse gas emissions inventories , version 1.0, California Air Resources Board, September 2008
2006 IPCC Guidelines for National Greenhouse Gas Inventories, 2006, IPCC

GHG Measurement for Manure Management of Livestock

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Abstract

Animal products are important source of protein, medicines and clothing. We receive many benefits from these productions. Because of creating of environmental problems not only around their neighbor but global, animal production has been accused. Still now, we have very big uncertainty in our inventory data concerning agricultural sector, we need to acquire the gas data under various conditions. So, we developed a system for the quantitative measurement of emissions from manure managing systems using a large dynamic chamber in an experiment. With a small scale apparatus it seemed to be difficult to discuss the various changes of the gas emission rate in actual manure management in farm. In the present report, I would like to introduce our measurement system to evaluate the emission materials produced by composting using a large chamber, and some measurement results with this system (Osada et al. 2001, 2005). According to the results of this measurement experiment, the composting-manure emission factors of CH₄ and N₂O varied significantly between livestock types, moisture contents of the pile materials and ambient temperature. Those factors should also depend on manure treatment type. This can be important information not only for inventory data but for the development of greenhouse gas regulations and technologies. In Asian countries, the compost process is widely used for the treatment of livestock waste. However, the exact amount of greenhouse gases generated from actual composting is not known. Not only the compost, but the emission factor of each treatment system should be evaluated under each countries procedure and general conditions, because those factors might be widely varied. It is important that each country has the measurement technique of GHG emission, not only for inventory data but for the development of greenhouse gas regulations and technologies.

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Access to relevant information

<http://nilgs.naro.affrc.go.jp/org/lrtgw/osada-HP/english01.html>

Enteric Methane Emissions of Indian Livestock from Prevalent Feeding Systems in Different Agro Ecological Regions

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Abstract

India ruminant livestock subsist mainly on crop residues with green fodders and concentrate based diets. Animals are reared on 3 feeding systems/diets viz. maintenance (M), growth (G) and lactation/production (L) based on animal physiological status consisting locally available roughages and feeds in 10 Agro ecological regions (AEs).

Livestock population was classified into different groups based on sex, age and production type (Singhal et al, 2005). Data on body weight of Indian breeds was taken from Nivsarkar et al. 2000. Growth diets were used for calves and heifers. For breeding, working, milking and breeding plus working, L ration was used, while for dry and other animals M ration was taken. DMI calculated for different diets of AEs based on their chemical constituents was used to estimate animal intake on a particular diet. IVDMD estimated using ruminant's inoculums was used to calculate the CH₄ production per kg of digestible dry matter intake (DDMI).

CP contents varied from 6.8 to 15.2 % across AEs. NDF, ADF and cellulose contents were low in L than M ration. Feeding systems/diets of AE3 and AE8) were higher in NDF, ADF and cellulose. Soluble protein was more in diets of AE3 and AE4 and lower in AE2 and AE10. P_A protein fraction was more in L ration of AE3, AE4 and E5 and lowest in AE2 and AE10. Unavailable protein fraction (P_C) was more in rations of AE 2 and AE10. PC was more in M than G and L rations. TCHO were more in feeding system of AE 6 and AE 7 than AE 2 and AE 10. Insoluble fraction of carbohydrate (C_C) was more in rations of AE2 and AE 8. DMI and DDM was more in L ration than M rations. Within the agro ecological regions feeding systems of AE 9, AE 6 and AE 10 had higher DMI and DDM than AE1 and AE8.

CH₄ production (g/g DDM) was higher from M, G and L diets of AE-4 and AE- in buffalo inoculums. Energy loss as CH₄ from these diets was 11.56, 9.46 and 10.83 % for AE-4 and 10.32, 12.56 and 10.04 % for AE-7 respectively. Lower CH₄ production was recorded from M, G and L diets of AE-2 and AE-10. Energy loss as CH₄ from these rations was 6.48, 8.11 and 7.11 % for AE-2 and 8.54, 8.86 and 6.84 % for AE-10, respectively. Methane production (g/Kg DMI and g/Kg DDMI) from diets of AE-2, AE-10 and AE-8 was lower and higher from AE-4 and AE-7diets.

OM was positively related (P<0.05) and EE was negatively related (P<0.05) with CH₄ production in buffalo, sheep and goat inoculums. NDIP, ADIP and PB3 were negatively and soluble protein, NPN and PA fractions were positively (P<0.05) correlated with CH₄ production in inoculums of ruminant species.

CH₄ production from growing calves, producing and dry/other crossbred cattle worked out was 124.16, 371.11 and 98.51 Gg. CH₄ production from growing calves, producing and dry & other indigenous cattle was 642.27, 2998.20 and 576.50 Gg, respectively. Growing, producing and dry & other buffalo's CH₄ production was 649.34, 1380.61 and 678.32 Gg, respectively. Total CH₄ from indigenous and crossbred sheep was 26.42 and 167.10 Gg, respectively. Growing, lactating and dry goats produced 69.70, 148.30 and 73.10 Gg CH₄. CH₄ production was highest from buffalo (female) followed by indigenous cattle (female). CH₄ production was highest from AE-6 and AE-7 (1.56 and 1.57) and lowest from AE-10 (0.06 Tg). Methane production from growing, lactating and non producing (maintenance) animals was 1.51, 6.16 and 1.43 Tg, respectively. The total CH₄ emission estimated for Indian livestock was 9.18 Tg.

Recent Research Progress for Improving Japanese GHG Inventories of Agricultural Soils

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Abstract

The Tier 2 approaches are used for calculating most of the emissions from agricultural soil categories in the current national greenhouse gas inventories of Japan (GIO, 2010). Further research activities are carrying over improving the inventories for these categories.

Some researches focus on evaluating mitigation potentials of agricultural management options. A national campaign to test the effects of elongated mid-season drainage on mitigating CH₄ emissions was conducted for 2 years. The results indicated that the option successfully reduced the emissions at 8 out of 9 sites, and that the rate of reduction averaged about 30%. The results of campaign taught us that net-working filed experiments are useful to demonstrate the effects of options at diverse rice environment. However, they also indicated relatively large uncertainties.

At the same time, another research developed a process-based model, the DNDC-Rice model, to simulate CH₄ emissions from paddy fields. The model validation using site-scale observation data from different paddy fields in Japan indicated that the model gave acceptable predictions of variation in daily CH₄ fluxes and seasonal CH₄ emissions due to changes in different management, including water regime and organic amendment (Fumoto et al., 2009). The model is applied to make regional estimation of the emission rates as the Tier 3 approach of inventory development.

On the other hand, a national program for collecting updated activity data is conducting during FY2008-2012. The program carries out a survey of agricultural land management to about 3,200 farmers all over the country. The survey asks land use, crop type, the rates and timing of chemical and organic fertilizer use, the ways of management such as tillage, water, and crop residue. The data are summarized and analyzed for developing new activity data for agricultural soil greenhouse gas emissions.

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GHG Emissions from Agriculture Soils in India

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Abstract

The agriculture soil emits N₂O due to nitrogen inputs to it through direct and indirect pathways, including the volatilization losses from synthetic fertilizer and animal manure applications, leaching and run-off from applied nitrogen to aquatic systems. The applied nitrogen includes synthetic fertilizer, animal manure, sewage sludge etc. Agriculture soils are the largest source of N₂O emissions in India. As per the India's Initial National Communication, it contributed 146 Gg of N₂O in the year 1994. This constituted about 81 per cent of the total N₂O emissions in terms of CO₂ equivalent for the year 1994. These estimates were made using the 1996 IPCC methodology and default emission coefficients. Recently, the Indian Network for Climate Change Assessment (INCAA) has published GHG emission inventory for India for the year 2007 where in the N₂O emission from agriculture soils have been estimated to be 140 Gg which is about 13% of the total agriculture sector emissions in terms of CO₂ equivalent. The reduction of about 16% in the total N₂O emissions from agriculture soils in India in 2007 with respect to 1994 estimates have been attributed to the use of India specific emission factors in the 2007 estimation which are lower by about 30% compared to default emission factors. The revised emission factors used for rice-wheat system are 0.76 kg ha⁻¹ N₂O-N for rice and 0.66 kg ha⁻¹ N₂O-N for wheat for urea application without inhibitors. For the 1994 estimation, default emission factor of 0.93 kg ha⁻¹ N₂O-N for all types of crop regimes was used. The results of INCAA GHG emission inventory clearly demonstrate the usefulness of country specific emission factors in capturing the country circumstances and thereby reducing uncertainties in estimation. Efforts are also being made in the country to develop N₂O emission factors based on annually integrated N₂O emission fluxes from agriculture soils covering the crop as well as fallow periods which is expected to further reduce the uncertainties in the emission estimates.

Emissions of N₂O from Agricultural Soils in Thailand

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Abstract

For 2000, agriculture sector contributes about 23% of total greenhouse gas emissions in Thailand. Methane emission from rice cultivation is the biggest contributor (ca.60%), followed by methane emission from enteric fermentation (16%) and N₂O emission from agricultural soil (15%). For N₂O emission from agricultural soil, it is estimated using the 1996 IPCC Revised Guidelines. Thus, the estimates include direct emissions from use of synthetic fertilizers, manure application to soil, and agricultural residue, manure from grazing animal, and indirect emissions from volatilization as NH₃ and NO_x, leaching and run-off. About 70% of N₂O is emitted from direct emissions. For Thailand in 2000, direct emission from synthetic fertilizer is divided into emissions from paddy fields and from other crops, using the emission factors suggested in 2006 IPCC Guidelines. About 48%, 30% and 19% of direct N₂O emissions are from grazing animal, synthetic fertilizer and manure application, respectively. The large contribution from grazing animal suggests that attention should be paid to this source category for further improvements. However, except the population size, most data and factors including are based on those suggested in the IPCC guidelines. Acquiring the country specific factors such as nitrogen excretion rate for the main animal types, thus, are the priorities to help improve N₂O inventory. In addition, Thailand also needs data on manure management and the accurate rate of manure application. Although not complete, Thailand has a relatively good data collection on the total amount of fertilizer and the residue to crop ratio of major crops (rice, sugarcane, maize, beans). More disaggregated fertilizer data such as the mode and amount of use for major crop types may be useful, but only when similar levels of disaggregated emission factors are available.

National Inventory of GHG Emissions in Myanmar

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Abstract

National Committee for Environmental Affairs (NCEA) of Myanmar has been launching an INC project since 2008. Summary of GHG emissions in Myanmar for the year 2000 stated that the total net emission amounting to 67863.14 Gg CO₂e, of which emissions from energy sector are observed at 7863.47 Gg CO₂e. Most methane emissions are observed in agriculture sector with 963.58 Gg. Land use change and forestry is the only sector to absorb which leads the country's net emission to - 67 863.14 Gg CO₂e. Therefore Myanmar can be said that still green as a result of being covered by vast natural forests. Rice is the main staple food and it grows well in all agro-ecological regions of Myanmar. For boosting the rice production, farmers are making all-out efforts for expanding the sown area as well as increasing the rice yield per acre. However, flooded rice fields act as a major emitter of CH₄. In accordance with the Revised 1996 IPCC Guidelines and using GHG Inventory Software, CH₄ emissions from rice cultivation in 2000 were estimated to be 507.23 Gg CH₄ yr⁻¹.

The total N₂O emission from agricultural soils in 2000 was estimated to be 8.27 Gg N₂O yr⁻¹ of which direct N₂O emissions and indirect N₂O emissions were 7.45 Gg N₂O yr⁻¹ and 0.82 Gg N₂O yr⁻¹, respectively. Farmers usually burn down the residues of previous crops including weeds left in their fields at the land clearing time. In Myanmar where the animal feed and fuel are generally scarce, the residues are used for cattle feeding and some for household fuel.

Almost all the land cultivation is done by draught cattle and buffaloes. In 2000, the number of cattle is 10.98 million and buffalo is 2.44 million. Livestock farming in Myanmar relies heavily on the agriculture, agro-industrial by-products and natural grassland. Default emission factors of the 2006 IPCC guidelines were applied for cattle, buffalo and swine. In 2000, CH₄ emissions from enteric fermentation and manure management were 404.43 Gg and 51.92 Gg, respectively and total methane emission from the livestock sector was 456.35 Gg.

Progress in the Use of ALU Software by Participating Countries to the SEA GHG Project

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Abstract

Land-use Change and Forestry (LUCF) and Agriculture sectors were key sources of greenhouse gas emission in Southeast Asia which contributed 74% and 8%, respectively, to total emission in 2000 (WRI, 2008). Improving the estimates of emission and removal from these key sources is important to policymakers. Though SEA countries have the technical expertise, the region still lacks activity data, emission factors, and tools to implement the IPCC *good practice guidance* in national GHG inventory.

The “Regional capacity building for sustainable national greenhouse gas inventory management systems in Southeast Asia or SEA GHG Project”, to address these concerns, introduced the Agriculture and Land Use Software (ALU Software) which was developed by Colorado State University, USA. The SEA GHG Project conducted in-country ALU Trainings in the region. Trained experts appreciated the ALU Software as a useful tool for better understanding and implementing of the IPCC Guidelines and Good Practice Guidance. They found it to be a significant improvement of the UNFCCC Software since it allows moving to higher tier approach. They recognized that the software enhances transparency to inventory process and its quality assurance and quality control (QA/QC) feature could guide users to ensure that data and assumptions are checked.

The difficulty in completing the ALU Workbook’s primary and secondary data requirements remains the big challenge to using the ALU Software in Southeast Asia. Users, however, are aware that these data requirements are based on the IPCC Guidelines and Good Practice Guidance. Despite these challenges, SEA countries see opportunities in using the ALU Software for GHG inventory in areas related to reduced emissions from deforestation and forest degradation or REDD, forest management, rice cultivation, and livestock. Some case studies are currently being undertaken in the region using the ALU Software. SEA countries believe that more exposures to GHG inventory tools/software would mean more chances of having a ‘sustainable national inventory management’. So experts can come and go, but inventory continues and meets needs of policymakers.

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Access to relevant information

For the ALU Software see <http://www.nrel.colostate.edu/projects/ghgtool/>

Potential of RS/GIS Data for GHG Inventory in Forest Sector

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Abstract

In developing countries, it is sometimes difficult to prepare the data for greenhouse gas (GHG) inventory in forest sector because of an absence of national forest inventory as well as forest monitoring system. Monitoring using remote sensing (RS) is a unique technique of forest monitoring widely and retrospectively and an essential tool to identify deforestation and forest degradation in developing countries. In addition, ground-based forest inventory is also required for the accurate estimation of carbon stocks and their changes. In COP15, the Parties requested developing countries to establish robust and transparent national forest monitoring systems and, if appropriate, sub-national systems as part of national monitoring systems that use a combination of remote sensing and ground-based forest carbon inventory approaches for estimating, as appropriate, anthropogenic forest-related greenhouse gas emissions by sources and removals by sinks, forest carbon stocks and forest changes.

Some choices of methodology are required when remote sensing monitoring is done; namely, wall-to-wall or sampling approach, interpretation, pixel-based or object-oriented classification, and so on. Spatial understanding of land-cover classes and/or forest types from RS data should be converted to GIS data for GHG inventory in forest sector. In monitoring of forest carbon stock changes, not only deforestation but also forest degradation and increment should be identified, but monitoring of the latter is more challenging. Advanced methodology might be developed using new remote sensing techniques.

When we use RS data, we have to recognize that RS data analysis includes much uncertainty in various steps as well as in definition. Some land surface cannot be assigned to a certain category, and there is gap between definition of category and RS observation. Other factors such as phenology, seasonality, data continuity, should be considered for preparation GIS data for GHG inventory not only in forest sector but also in LULUCF sector.

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Access to relevant information

The U.S. Geological Survey is providing extensive data including Landsat satellite data.
<http://edcns17.cr.usgs.gov/EarthExplorer/>

Utilization of Global Map for GHG Inventory

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Abstract

Outline of the Global Mapping Project: The Global Mapping Project is an international initiative in which National Mapping Organizations (NMOs) from 180 countries and regions of the world develop Global Map (GM) through international cooperation. The objectives of the project are to contribute to solving global environmental problems and achieving sustainable development. GM is digital geographic dataset of the whole globe which consists of eight thematic layers: boundaries, drainage, population centers, transportation, elevation, land use, land cover and vegetation. The GM data is updated every five years. GM data is freely downloadable for non-commercial use through <http://www.iscgm.org/>.

The GM version 1, which includes the data of Global Land Cover and Vegetation (Percent Tree Cover), developed using MODIS data of 1 km resolution observed in 2003, was released in 2008. Currently we are developing GM version2 toward releasing the data observed in 2013. The data source of Global Land Cover and Vegetation for GM version2 is MODIS data of 500 m resolution in 2008.

For GHG Inventory: In GHG inventories, GM Land Cover and Vegetation data can be used for area calculation to estimate emissions and removals of GHGs in Land Use, Land-Use Change and Forestry (LULUCF) sector and its cross check for countries with insufficient statistical data and geographic information on land use and land cover. The procedure using GM Land Cover data are:

1. Calculate each area of 20 categories of GM Land Cover
2. Estimate emissions and removals of GHGs for 20 categories of GM Land Cover
3. Integrate the amount of GHGs into LULUCF 6 categories

Capacity Building: The project also focuses on Capacity building activities. As an example, Japan conducts the group training course on Global Mapping for experts from developing countries. The training course is sponsored by JICA and implemented by GSI. From the end of July to the early September of this year, 8 GIS and Remote Sensing experts participate in this training course from 8 countries mainly in Asia: Bangladesh, Bhutan, Kenya, Malaysia, Myanmar, Philippines, Timor-Leste and Uzbekistan. This year we newly added a lecture of GHG inventory by NIES and deforestation by FFPRI in the curriculum to improve the participation of GIS and Remote Sensing expert into GHG inventory field.

Access to relevant information

<http://www.iscgm.org/>

Thailand's Experience with Remote Sensing and GIS Data

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Abstract

Our experience in Remote Sensing (RS) and GIS data utilization started by the end of 2004, when we started to estimate air pollutants emissions from biomass open burning, including forest fires and agricultural burning, in Mekong River Basin Sub-region (MRBSR) covering Cambodia, Lao PDR, Thailand and Vietnam. This research work on biomass burning emissions was motivated by the need to better understand the ASEAN Trans-boundary Haze Pollution, the role of biomass burning in regional climate change, and the feedback of global change on future frequency and intensity of biomass open burning in southeast Asia region, which are predicted to continuously increase from present to 2100 according to the outputs from climate model simulations. In this research, we used RS data derived from Fire Hot Spots (FHS) detected by Moderate Resolution Imaging Spectrometer (MODIS) embarked on TERRA and AQUA satellites to identify the fire positions, then overlaid these FHS with land-use map to classify fire vs. vegetation types. In addition, we developed a gridded emission map using emission estimate methodology equivalent to that recommended in the IPCC. One of the major results obtained from the study was the determination of MRBSR risk areas to biomass open burning haze pollution. Details of this study were presented during WGIA 7 in Seoul, South Korea.

In order to better evaluate land-use change or land conversion using fires in Thailand, the national GIS land-use maps of 2000 and 2007 were compared using IPCC 2006 Guidelines for GHG Inventory land classification methodology. In order to support our work on development of low carbon society scenario development at national and provincial or city scale, we focused the comparison on Ratchaburi province. It was observed that land-use was effectively changed between 2000 and 2007, but using only GIS land-use maps could not provide sufficient information for land-use change assessment due majorly to incorrect classification of land. Consequently, we revised the GIS data with RS and ground surveys. Then, the revised GIS maps of 2000 and 2007 were used to assess the change in Forest Land based on change in living biomass for GHG removal and forest fires for GHG emissions using IPCC 2006 Guidelines for GHG Inventory methodology for estimation. The obtained results showed that Forest Land in Ratchaburi can remove annually about 6 million tons CO₂ and that biomass burning emissions were less than 300 t CO₂eq.

GHG Inventory in LULUCF Sector of Myanmar

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Abstract

Myanmar ratified UNFCCC on 25 November, 1994 as a non-Annex I Party. Article 12.5 of the UNFCCC requires non-Annex I Parties to prepare their initial national communications. In Myanmar, the preliminary greenhouse gas (GHG) inventory and mitigation options assessment were undertaken during the ALGAS study in 1997. To prepare and report Myanmar's Initial National Communication (INC), National Commission for Environmental Affairs (NCEA) of Myanmar has been launching an INC-project since 2008 with the financial assistance from GEF/UNEP. GHG inventory and mitigation option analysis team (GHG study team) is one of the six expert groups who are working separately for INC preparation under this project.

GHG study team successfully accomplished national GHG inventories for 2000 in energy, industrial processes and product use, agriculture, forestry and other land use, and waste sectors. The GHG inventories of emissions by sources and removals by sinks covered CO₂, CO, CH₄, N₂O and NO_x for the year 2000. Total net emission in Myanmar for the year 2000 was estimated to be - 67863.14 Gg CO₂e. Energy sector, industrial processes and product use sector, and waste sector emitted 7863 Gg, 463 Gg and 2827 Gg respectively while emissions in agriculture sector (agriculture plus livestock) amounted to 22800 Gg. Land use change and forestry sector showed the highest emissions (40404 Gg), however, the only mechanism to absorb CO₂ was the LUCF sector in which 142221 Gg CO₂e were sequestered.

GHG inventory in LUCF sector followed 2006 IPCC guidelines. Annual changes in carbon stocks in biomass for a land use category were calculated by Gain-Loss Method. Equations 2.7, 2.9 and 2.11 of IPCC guidelines are the main methodology for the inventory. Because of the lack of country specific emission factors, the GHG inventory in this study used mostly the emission factors and default values described in IPCC 2006 Guidelines.

The main carbon sinks in LUCF sector included natural forests and forest plantations in forest lands, road side trees and home gardens in settlements and other lands. Natural forests absorbed 129 838.59 Gg CO₂ while forest plantations, road side trees and home garden trees sequestered 11 750.04 Gg, 162.49 Gg and 470.07 Gg of CO₂ respectively.

The sources of emissions in LUCF sector included biomass burning for site preparation in forest plantations and shifting cultivation in the forest land remaining forest land category, and deforestation in the forest land converted to other land category. Loss of carbon by wood removal and fuelwood removal were estimated just for information because they were not included in national totals. Thus, emissions from site preparation in forest plantations, shifting cultivation and deforestation accounted for 1863 GgCO₂e, 1200 GgCO₂e and 37340 Gg CO₂e.

Many gaps in data as well as in knowledge still exist. However, this study explored further needs of refined national data on sources of emissions and sinks, technical information on the GHG inventories and useful research activities which will provide invaluable country specific emission factors/default values for further GHG inventories with high-level reliability.

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GHG Emissions from Waste Sector of Myanmar

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Abstract

When waste is not properly treated, it is not only ugly sight, but also poses the risk of releasing hazardous elements into the ecosystem. When waste is properly treated, it can issue valuable results. Biogas (i.e., methane) and steam can be produced for generating electricity and can also produce Compost (fertilizer) and RDF (Refused-derived fuels).

Thus we can replace waste as resources for sustainable development approach. In MSW, a combination of household, commercial and Institutional waste materials generated in a given area. For National Greenhouse Gas inventories, estimation of carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) emissions from waste is to be calculated. In Myanmar, solid waste disposal is unmanaged and uncategorized. No biological treatment and incineration of solid waste are practiced. While the legislation on waste management has been adopted in recent years, national data cannot be applied still now. Uncertainty assessments of Myanmar's GHG inventory relied on quantitative Tier I method and an uncertainty analysis recommended by IPCC (GPG). Country-specific input uncertainties were determined via expert judgment, on the basis of the standard IPCC guidance-2006.

Urban solid waste in Myanmar has high percentage of organic matter. There are no recycling method (even composting) to reduce the quantity of organic matter disposed in landfills, is the source of methane emissions. Existing solid waste disposed sites do not have methane recovering systems. Still now, we have no practice to achieve the processes such as incineration, composting, Refused-Derived fuel production and Anaerobic digestion to get methane for the production of Electricity, steam, and also for the volume reduction of MSW in dumping sites so as to decrease the size of landfill sites .So we need the help of the **developed countries** for BOT practices or by some ways for Solid Waste Solutions by Waste-to-Energy plants establishments.

Mongolia's GHG Inventory - Waste Sector

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Abstract

The GHG emissions from Waste sector are calculated according to the IPCC guidelines and include Methane Emission from Solid Waste Disposal Sites, Methane Emissions from Domestic and Commercial Wastewater Treatment and Industrial waste water. In Mongolia, most domestic and commercial wastewater is treated by sewer systems with aerobic treatment. Methane emissions from waste were estimated at 4.59 Gg in 1990 and this amount increased to 6.55 Gg in 2006. During the period of estimations, about 37% of CH₄ emissions came from solid waste disposal sites and 63% came from waste water treatment. The trend for emissions shows that the annual emissions of CH₄ from solid waste disposal sites and waste water treatment have increased continuously year after year.

Mitigation of GHG emissions from the waste sector is generally not a high priority because the methane emissions associated with this sector are relatively low. But waste disposal is a problem in Mongolia in terms of land use and sanitation, especially in Ulaanbaatar. Almost half of Mongolia's population lives in the capital city. At present, the total amount of waste generated in UB is estimated to be 552.8 tons per day. Of this waste, 321.6 tons (58.2% of the total amount) is thought to be brought to final disposal sites, while 21.4% is dumped illegally in open spaces. All collected waste in the city of Ulaanbaatar is disposed in three landfills without any further processing. The management of municipal waste is emerging as a problem of prime importance.

The following mitigation options can be implemented:

- Improve solid waste disposal facilities;
- Improve Storage and collection system;
- Recycling;
- Incineration.

Indonesia's Progress in Waste Inventory

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Waste Experts of Indonesian Second National Communication

Abstract

In the Indonesian SNC, the GHG inventory of waste sector is developed based on IPCC 2006 guideline with the 2000 as the base year. According to the guideline, types of GHGs that have to be covered in the waste sector comprise CH₄, N₂O, and CO₂. The CH₄ is generated from anaerobic decomposition processes of solid waste (domestic as well as industrial waste), domestic waste water, and industrial wastewater. The solid waste decomposition occurs in landfill sites. The CH₄ from domestic waste water are released from untreated wastewater (discharge to sea, river, lake and stagnant and flowing sewers) and treated wastewater (anaerobic, digester, septic system, and latrine). The CH₄ from industrial wastewater are released from wastewater treatment facilities. The N₂O are released from biological treatment (composting process) and burning process of solid waste and biological process of domestic wastewater. The CO₂ is released from solid waste combustion processes. The CO₂ from wastewater is not covered in the inventory because it is considered as biogenic origin.

The GHG emissions of waste sector are estimated from emission factor and activity data relevant to the sources of GHG emission. Concerning the emission factor, the SNC used default value of the IPCC 2006 guideline except for CPO mills which used local emission factor available from MoE study on emission factor. The activity data are obtained primarily from national data that are released by the government office, association, and other industry statistical data. The activity data that are covered in the SNC includes domestic solid waste, domestic waste water, and industrial waste water. Compare to INC, which covered only one emission, i.e. CH₄ and only single type of waste, i.e. domestic solid waste, the SNC includes more sources of emissions (from various wastes) and GHG components (CO₂, CH₄, and N₂O) as mandated in 17/CP8 Kyoto Protocol.

This presentation discusses the progress of waste sector inventory and its projection for 2010-2025, methodology used in estimating the GHGs potential, key sources activity and emissions factors, compilation system, transparency, comparability, completeness, consistency, accuracy, key sources category; Institutional arrangement in developing GHG inventory of waste sector; etc.

The Progress in Waste Sector [China]

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Abstract

In this presentation, the newly progress of Waste sector inventory is summarized. The methodologies used in calculating are introduced. The Activity Data (AD) and Emission Factor (EF) as well as relevant parameters are introduced in different sub-sector, such as Municipal Solid Waste in landfill, Industry waste water; domestic and commercial waste water, and waste incineration. The uncertainty in different sub-sector is also introduced.

Accuracy of Municipal Solid Waste Data in Vietnam

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Abstract

The challenges of municipal solid waste (MSW) data collection can be divided into three stages:

Stage 1 Local municipalities collect MSW data for managing MSW

Stage 2 Central governments centralize MSW data from local municipalities

Stage 3 GHG inventory office utilizes MSW data shared with central governments

Some local municipalities in Vietnam collect MSW data such as collection amount and disposal amount, however, central governments don't have a function to centralize the MSW data. The objectives of this study are to centralize the MSW data in some local municipalities in Vietnam through the network of the association related to MSW management, and to discuss the accuracy of collection amount of MSW.

We distributed the questionnaire on MSW management to 90 urban environment companies (URENCOs) on November 2009, which are the organizations in charge of managing MSW. It took six month to prompt the answers by telephone and fax. We finally received the answers from 83 URENCOs (response rate: 92%).

The 83 URENCOs collected MSW from 18.9 million population or 21.9% of total population of Vietnam (86.2 million). According to the answers, 96% of MSW was disposed of in landfill sites and 4% was treated at composting sites.

The generation amount correlated with covered population much strongly in Japan based on the reliability of the data on the generation amount of MSW and the population in Japan. On the other hand, the collection amount of MSW in Vietnam correlated with covered population more weakly than in Japan. Then, we divided the collection amounts of MSW into two types; (1) the collection amounts recorded with weighbridge, and (2) the collection amounts recorded without weighbridge. Collection amounts recorded with weighbridge correlated with covered population more strongly than those recorded without weighbridge.

It is no wonder that install of weighbridge improves the accuracy of MSW data. The URENCOs without weighbridge also reported the collection amount of MSW by weight (ton). It refers that the URENCOs estimated the weight in one way or another. The way of estimating the collection amount of MSW in the municipalities which can't afford to install the weighbridge should be improved.

Improvements in the Process of Estimating GHG Emission for Waste Sector in Republic of Korea

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Abstract

Article 4 and Article 12 require Non-Annex 1 Parties to submit National Communications, which includes national inventory of emissions and removals of all greenhouse gases. Korea had ratified UNFCCC in 1993, published Initial National Communication in 1998, Second National Communication in 2003, and is now preparing Third National Communication.

To prepare the report, Korea estimates National GHG emission annually. This presentation intends to introduce improvements made and issues remaining in GHG inventory of waste sector in Korea based on the inventory of 2007.

Greenhouse gas emission from waste sector in 2007 amounts to 15,285 kilotonnes of CO₂ equivalent (Kt CO₂_eq) which accounts for 2.5% of total GHG emissions in Korea. Approximately 30% of emission came from landfill, about 59% were from incineration and the others made up 11%.

Korea is improving the quality of national GHG inventory. We estimated emission from biological treatment according to 2006 IPCC guideline, which had not been included in the Second National Communication. Also Korea applied country-specific value for degradable organic carbon (DOC) content and recovered methane gas (R).

Although Korea endeavors to make advancements continuously, still there are many issues for each source to be dealt with. Above all, it is urgent to upgrade Tier level of estimation methodology for landfill sector. Currently Korea is applying Tier 1 (Mass Balance Method) of 1996 IPCC Guideline and IPCC GPG 2000 to estimate emissions from landfill sites. However, we are trying to use Tier 2 (First Order Decay Method) which is widely used among Annex I parties. The following is the summary of several problems arising when applying Tier 2.

[Issues arising from changing estimation method (Tier 1→Tier 2) in waste disposal on Land]

Division	Issues	Note
Emission	Gap in emissions when applying Tier2 and Tier1	Researching cases
Activity Data	Need for assumption of activity data over past 50 years	Applying assumption method of IPCC guideline
Emission Factor	Application of methane generation rate constant(k) for waste composition or waste bulk	Developing country-specific value for waste bulk

Korea is conducting experts peer review for national GHG inventory annually to construct national inventory system of Annex I countries level. We have performed GHG inventory peer review with Japan on waste sector since 2008. Korea is hoping these experiments of learning by doing help reduce trial and error of other countries.

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Access to relevant information: <http://www.keco.or.kr>

Linkage of Greenhouse Gas Inventory to Mitigation Options

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Abstract

Comparison of methane emission from solid waste disposal on land (SWDL) in waste sector using Tier 1 and Tier 2 method were performed with almost two times higher in Tier 1 approach. The time series calculation of methane emission from SWDL was done from 2000-2005. Projection of BAU emissions was estimated from 2005 to 2050 for mitigation options study. Driver of projection focused on GDP and population growth. Selected mitigation options were control waste generation rate and increasing recycle ratio. It was found that estimation using Tier 1 approach facilitate calculation of emission reduction rather than using Tier 2 approach due to the nature of policy-like options. In contrast to SWDL, moving up to higher tier with disaggregate activity data of industrial wastewater handling such as by types of industries and by technologies are the key issues to choose for appropriate mitigation options. Change to low emission technology of designated industrial types can be proposed as the mitigation option. Accurate activity data of national greenhouse gas is benefit for technology- based options rather than policy-based options. It is interesting on how to deal with different level of calculation and gap estimation between inventory and mitigation to the monitoring, reporting and verification (MRV) issues in the future.

Inventory Improvement for MRV Mitigation Actions in Waste Sector

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Abstract

Waste management policy should be given high priority against environmental problems like disease, fires, odor, contamination of water and soil, air pollution, accidents, landslides at landfill sites, resource problems, scenery, etc. However, in general, waste management leads to GHG emissions increase in waste sector. Therefore, in order to reduce GHG emissions in waste sector, mitigation actions consistent with national waste management policy should be taken into consideration.

Mitigation action in waste sector could be classified into 3 ways by GHG reduction mechanism.

1. Reduction of waste/wastewater
2. Reduction of GHG emissions ratio per waste/wastewater treatment
3. Reduction of GHG emissions in other sectors/categories by utilization of waste as raw material or energy

“3” is the waste sector specific GHG reduction mechanism and could reduce more GHG than “1” or “2”. For effective promotion of mitigation actions in wastes sector, GHG from waste/wastewater treatment activities must be compared and reduction targets must be found. And also, potential GHG reduction in each mitigation option must be evaluated in order to select the best mitigation.

Effect of mitigation actions should be reflected to Inventory accurately, completely, and transparently because Inventory is the only official tool for national GHG estimations. In Japan’s experience, frequent improvement of emission factors, GHG estimation methodologies, and statistics for activity data and parameters based on mitigation mechanism contributes to appropriate reflection of effect of mitigation actions to Inventory. Consequently, measurability, reportability, and verifiability of mitigation actions would be promoted by continuous Inventory improvement.

In the next WGIA9 Waste working group, information exchange about mitigation will help continuous improvement of Waste sector Inventory and promotion of measurability, reportability, and verifiability of mitigation actions in WGIA countries.

Result of the Survey for Waste Sector Inventory Status of Each Country

Takefumi Oda

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As the themes for the Waste Sector WGs in the past WGIA8 to enhance the capacity building of GHG inventories in Asian countries, we had discussed issues such as data collection, waste streams, waste water handling, and some others. In WGIA8, we planned to identify the problems of waste sector inventory of participating countries and to discuss the improvement for their future inventory. Prior to the workshop, the secretariat conducted survey by the questionnaire for the current status of waste sector inventory in each country.

Surveyed items are as follows:

1. Inventory compilation system;
2. Transparency (Preparation of documentation for explanations);
3. Comparability (Estimation for source category in line with IPCC Guidelines);
4. Completeness (Estimation for all sources by gas);
5. Consistency (Time series, Methodology and Recalculations);
6. Accuracy (Methodology, Emission Factors, and Parameters);
7. Key Category Analysis.

Respondent countries are as follows:

Cambodia, China, Indonesia*, Japan, Korea, Malaysia, Mongolia, Myanmar**, Laos*, Philippines, Thailand, and Vietnam.

(*: Not analyzed for late answer, **: Not analyzed for insufficient answer)

1. Inventory Compilation System

Q1 Inventory preparation agency in waste sector and inventory compilation system

Compilation of inventory needs a lot of processes such as data collection, verification for the methodology, coordination among relevant agencies, conducting some kind of surveys, and so forth. Therefore, it is necessary to establish well-resourced inventory compiling and/or confirmation agency, and the participation of specialized agencies in the inventory compilation processes by category.

This survey confirmed the facts that specific agency that is government agency; university, research institute and/or temporal project team take charge of inventory compilation in waste sector in every participating country.

The survey also showed that every participating country has established the compilation system to support inventory confirmation.

<Discussion for future inventory improvement>

- Is it possible that current compilation agency continuously improve future inventory in waste sector?
- If it is not possible, what improvement will be necessary in human resources, budget, sustainability of agency, and faculty/and or staff members of inventory compilation?

Table 1 Responsible agency

Countries	Responsible Agency			Compilation system
	Government or relevant agency	University or Research institute	Temporarily project team	
Cambodia	○			○
China		○		○
India	NA	NA	NA	NA
Indonesia	NA	NA	NA	NA
Japan		○		○
Korea	○			○
Laos	NA	NA	NA	NA
Malaysia	○			○
Mongolia	○		○	○
Myanmar	NA	NA	NA	NA
Philippines		○		○
Singapore	NA	NA	NA	NA
Thailand		○		○
Vietnam	○		○	○

Q2 Continual calculation

Continuous compilation of each country's inventory is very important in understanding the status of the emissions appropriately and considering its mitigation actions. The continuous compilation also maintains and/or improves the ability of inventory compilation agency.

In this survey, Japan, Korea, Malaysia, Philippines and Thailand answered that they would continuously prepare the inventory. However, the other countries responded negatively with the following problems.

<Discussion for future inventory improvement>

What solutions are there for the following problems? Have the countries continuously compiling inventory dealing with problems?

- No legal obligation to compile the inventory
- Lack of human resources
- Lack of budget
- Lack of inventory calculation system
- Lack of time

2. Transparency

Q1 Preparation of documentation for explanation

Disclosure of sufficient explanation for the inventory is important to maintain its transparency. However, the survey made it clear that several countries have not prepared documents with enough explanation for the inventory. This problem has been caused by

lack of clear obligation, budget, human sources, and time in these countries.

On the other hand, it is true that once we prepare such documents, we only have to update with partial changes.

Table 2 Preparation of documentation for explanation

Countries	Documentation for explanation
Cambodia	×
China	○
India	NA
Indonesia	NA
Japan	○
Korea	○
Laos	NA
Malaysia	○
Mongolia	×
Myanmar	NA
Philippines	○
Singapore	NA
Thailand	○
Vietnam	○

○: prepared, ×: not prepared

<Discussion for future inventory improvement>

- What actions did the countries preparing the detailed documentation take to solve the problems such as “lack of clear obligation, budget, human sources and time”?
- Are current detailed documents for the inventory transparent enough? If it is not transparent enough, what improvement should they need?

3. Comparability

Q1 Source categories in line with IPCC Guidelines

Most of the countries estimate the GHG emissions for the categories in line with IPCC Guidelines. Judging from the answer for other questions, the categories of the countries answering in the negative (× (○) of Table 3) seems to meet the requirement of IPCC Guidelines. Establishment of common category by source is very helpful for the comparison of each country’s emissions by activity. It would be said that participating countries are taking such good practice.

Table 3 Estimation for Source categories in line with IPCC Guidelines

Countries	Category in IPCC Guidelines
Cambodia	× (○)
China	○
India	NA
Indonesia	NA
Japan	○
Korea	○
Laos	NA
Malaysia	× (○)
Mongolia	× (○)
Myanmar	NA
Philippines	○
Singapore	NA
Thailand	○
Vietnam	× (○)

○: categorized in line with IPCC Guidelines
 ×: categorized differently from IPCC Guidelines
 × (○) seems to meet the requirement of IPCC Guidelines.

Q2 Use of CRF tables

Several countries have not generated the CRF tables for the inventory. Actually, there are no obligation to prepare the CRF tables for NA I countries. However, the CRF tables are very helpful and guiding means to compare GHG emissions and methodology by source between countries all over the world. It also becomes useful tool to verify the completeness of estimation of emissions.

Table 4 Generation of CRF tables

Countries	CRF tables
Cambodia	×
China	×
India	NA
Indonesia	NA
Japan	○
Korea	○
Laos	NA
Malaysia	×
Mongolia	×
Myanmar	NA
Philippines	×
Singapore	NA
Thailand	○
Vietnam	×

○: CRF tables have been generated. ×: CRF tables have not been generated.

<Discussion for future inventory improvement>

- Lack of knowledge and experience are listed for the barriers of generating the CRF tables in inventory compilation. It will be an option that conducting the hands-on training of generating CFR tables in the future WGIA. If it is actually conducted, would you participate in such event?
- Do you have any note (e.g. participants in WGIA are not inventory compiler) or request (e.g. providing CRF generation or calculation tools) on such trainings?

4. Completeness

<Discussion for future inventory improvement>

- In inventory preparation, it is necessary to complete the estimation of emissions from all sources. Therefore in the WG, overviewing the status of each country's inventory and identifying the problems of it, we will discuss what approach we can take to calculate the emissions from sources Not Estimated (NE) by participating countries.

Solid Waste Disposal on Land (6A)

[CO₂]

Usually this source does not emit anthropogenic CO₂ in most countries.

[CH₄]

Malaysia does not estimate CH₄ emissions from “Unmanaged Disposal Site (6A2)”, and is planning to estimate activity data.

Philippines also do not estimate CH₄ emissions from “Unmanaged Disposal Site (6A2)” for lack of information of depth on unmanaged disposal site. Philippines are conducting the survey on strict implementation of Republic act 9003 to solve the problems.

Vietnam partly estimates CH₄ emissions from this source.

Wastewater Handling (6B)

[CH₄]

Korea, Malaysia, Philippines and Vietnam do not or partly estimate CH₄ emissions from “Industrial Waste Water (6B1)”.

Korea is planning to investigate the sludge stream analysis for the lack of sludge activity data.

Malaysia estimate CH₄ emissions from two industries, and are planning to estimation from more industries.

Philippines are planning to closely coordinate with private industries to obtain data of COD loadings. Philippines also do not estimate sludge data of category 6B1.

[N₂O]

The estimations for N₂O emissions from “Industrial Waste Water (6B1)” are not obligated presently by IPCC Guidelines. However, Cambodia, China and Japan estimate them. And Korea and Thailand realize that they do not estimate them.

There are two options to estimate N₂O emissions from human sewage. One is assumption by using population statistics, and the other is calculation for individual sources. Korea and Thailand distinguish the emissions of individual sources as NE. And Philippines distinguish it as NA. Malaysia distinguishes the whole N₂O emissions from this category as NA.

Waste Incineration (6C)

[CO₂]

Japan and Korea estimate CO₂ emissions from this source. China partly estimates the emissions. Most countries distinguish the emissions of this source as Not Applicable (NA). It seems that waste incineration is not commonly operated in the countries.

[CH₄]

The estimations for CH₄ emissions from “Waste incineration (6C)” are not obligated presently by IPCC Guidelines. However, Japan and Thailand estimate the emissions from this source. Korea distinguishes them as NE.

[N₂O]

Japan and Korea estimate N₂O emissions from this source.

Other (6D)

[CO₂]

Japan estimates CO₂ emissions from “Decomposition on petroleum derived surfactants” for “Other (6D)”.

[CH₄, N₂O]

Japan and Korea estimate CH₄ and N₂O emissions from “Biological treatment of solid waste (composting)” for “other (6D)”.

5. Consistency

<Discussion for future inventory improvement>

- Overviewing the status of each country’s inventory and detecting the problems of it, we will share the information of participating countries’ inventory to solve their problems.

(1) Time Series

Cambodia, China and Vietnam have not completed the time series data from 1990 in their inventory. Malaysia and Philippines have partly completed them. The specific solutions for these problems are planned in each country.

Solid Waste Disposal on Land (6A)

Cambodia, China, Philippines, and Vietnam have not completed the time series data for this category. Cambodia and Philippines are planning the solutions to obtain it by using population statistics and estimated waste generation per capita.

Malaysia has not completed the time series for “Unmanaged Waste Disposal land (6A2)”.

Wastewater Handling (6B)

Cambodia, China and Vietnam have not completed the time series data for this category.

Cambodia are planning to solve the problem for “Industrial wastewater (6B1) by using the consumption assessment by industrial source, and to do it for “Domestic and Commercial Wastewater” (6B2) by using BOD/CDO generation per capita.

Malaysia did not complete the historical time series for “Domestic and Commercial Wastewater” (6B2) before waste water treatment was started from 1994 by private companies.

Waste Incineration (6C)

Cambodia, China and Vietnam have not completed the time series for this category.

(2) Methodology

The estimation methods for GHG emissions are consistency in each country’s inventory.

(3) Recalculations

After the latest inventory submission, the recalculations have been conducted for several categories by Japan, Korea, Malaysia, and Philippines. Such efforts are desirable for all countries since continuous revision of the methodology involving the activity data and emission factors are necessary for the quality improvement of the inventory.

6. Accuracy

Solid Waste Disposal on Land (6A)

[CO₂]

[CH₄]

Cambodia, Korea, Malaysia, Mongolia, and Vietnam use Tier 1 methods for this source. China, Japan, Philippines, Thailand use Tier 2 or Tier 3. Most of countries use country-specific DOSs for this category. Japan and Thailand use country-specific parameters for k value. For MCFs, China, and Thailand use country specific values.

Wastewater Handling (6B)

[CH₄]

Japan, Korea, Philippines, and Thailand use Tier 2 or country specific methods for this source.

Cambodia, China, Malaysia, Mongolia, and Vietnam use Tier 1 methods. However, China and Malaysia use many country specific parameters in their estimations.

[N₂O]

Japan and Philippines use Tier 2 or country specific methods for this source. The other countries use Tier 1 method.

Waste Incineration (6C)

[CO₂]

Japan and Korea use country specific or Tier 2 methods with many country specific parameters for this source. Mongolia use Tier 1 methods for this source.

[CH₄]

Japan uses country specific methods for this source. China, Mongolia, and Thailand use Tier 1 methods for this source.

[N₂O]

Japan and Korea use country specific or Tier 2 methods with many country specific Emission factors for this source.

Other (6D)

[CO₂]

Japan use country specific methods to estimate emissions from “Decomposition of Petroleum-derived surfactants”.

[CH₄, N₂O]

Japan and Korea use Tier 1 methods to estimate emissions from “Biological treatment of Solid waste (composting)”.

7. Key category analysis

Most of the participating countries distinguish CH₄ emission from “Solid Waste Disposal on Land (6A)” as key category in their inventory. Several countries also distinguish CH₄ emission from “Wastewater Handling (6B)” or CO₂ emissions from “Waste Incineration (6C)” as key categories. Mongolia, Myanmar, and Philippines did not report key category analysis.

<Discussion for future inventory improvement>

- Implementation of key category analysis is desirable for all countries. What are barriers of it for non-implemented countries?
- If we WGIA secretariat conduct hands on training for Key Category Analysis in future WGIA, would it be favorable for you?

Annex I: Agenda

Day 1, Tuesday 13 th July		
09:00~09:30	Participant Registration	
09:30~11:00	Opening Session	Grand Ballroom
	Chair: Kiyoto Tanabe	Rapporteur: Damasa Magcale Macandog
09:30~09:35	Yusuke Nakamura	Welcome Address (MOE, Japan)
09:35~09:40	Syamphone Sengchandala	Welcome Address (WREA, Laos)
09:40~09:50	Junko Akagi	Overview of WGIA8
09:50~10:00	All	Q&A
10:00~10:15	Yusuke Nakamura	Japan's Climate Change Policies and MRV Initiatives (MOE, Japan)
10:15~10:30	Syamphone Sengchandala	Laos' Climate Change Policies (WREA, Laos)
10:30~10:40	Dominique Revet	Update on non-Annex I National Communications
10:40~10:50	Simon Eggleston	IPCC Inventory Developments
10:50~11:00	All	Discussion
11:00~11:20	Group Photo & Tea Break	
11:20~12:30	Session I: Progress since WGIA7 and Summary of the Latest Inventories	
	Grand Ballroom	
	Chair: Dominique Revet	Rapporteur: Batimaa Punsalma
11:20~ 11:35	Kamal Uy	National GHG Inventories and the Way forward
11:35~ 11:50	Qingxian Gao	The Study Progress on National GHG Inventory in China
11:50~ 12:05	Chhemendra Sharma (Sumana Bhattacharya)	India: Greenhouse Gas Emissions 2007
12:05~12:20	Min-Young Lee	GHG Reduction Policy and Status of Inventory
12:20~12:30	All	Discussion
12:30~14:00	Lunch	
14:00~15:40	Session II: Future Activities beyond the latest NCs	
	Grand Ballroom	
	Chair: Leandro Buendia	Rapporteur: Simon Eggleston
14:00~ 14:20	Taka Hiraishi	Potential Role of Regional Networks for Improving GHG Inventories
14:20~ 14:35	Kiyoto Tanabe	Implementation of "Mutual Learning" among WGIA Countries – Advantage and Potential Problems
14:35~ 14:50	Masako Ogawa	On-going JICA Project in Indonesia
14:50~ 15:10	All	Discussion

15:10~ 15:30	Tatsuya Hanaoka	Bridge the Gap between Statistics, Inventories and Projections in Asia - Mitigation Analysis by the AIM Models -
15:30~ 15:40	All	Discussion
15:40~16:00		Tea Break

16:00~17:00	Hands-on Training Session Rapporteur: Elsa Hatanaka	Grand Ballroom
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16:00~ 17:00	All	Mutual Learning for National Communications (Inventory Chapter)
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18:30~ **Dinner (at Plaza Hall)**

Day 2, Wednesday 14th July

Session III: Group Discussion on Sector-specific Issues

Participants split into 2 groups in the morning and 2 groups in the afternoon.

9:30~12:30	WG 1: Inventory WG	Plaza Hall
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Theme: Institutional Arrangements

Chair: Syamphone Sengchandala Rapporteur: Takeshi Enoki

Hiroshi Ito	Introductory Presentation (GIO)
Batimaa Punsalmaa	Mongolia's Institutional Framework to prepare GHG Inventory
Pham Hoang Yen	Institutional Arrangement for the GHG Inventory in Vietnam
Haneda Sri Mulyanto	Indonesia's perspective – Measurable, Reportable, and Verifiable (MRV)
Sirintornthep Towprayoon	Thai Institutional Arrangement
Min-Young Lee	Institutional Arrangement of South Korea
Sun-Jung Moon	Local Government GHG Inventories in Korea Discussion

9:30~12:30	WG2: Agriculture WG	Plaza III
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Theme: Estimation Methods and Development of Parameters

Chair: Kazuyuki Yagi Rapporteur: Amnat Chidthaisong

Kohei Sakai	Introductory Presentation (GIO)
Takashi Osada	GHG Measurement for Manure Management of Livestock
Sultan Singh	Enteric Methane Emissions of Indian Livestock from Prevalent Feeding Systems in different Agro Ecological Regions
Kazuyuki Yagi	Recent Research Progress for Improving Japanese GHG Inventories of Agricultural Soils
Chhemendra Sharma	GHG Emissions from Agriculture Soils in India
Amnat Chidthaisong	Emissions of N ₂ O from Agricultural Soils in Thailand

Khin Lay Swe Progress in National GHG Inventory in Myanmar Discussion

12:30~14:00

Lunch

14:00~17:00	WG 3: LULUCF Sector	Plaza Hall
Theme: Follow up of the WGIA7 (Remote-sensing and GIS data)		
Chair: Abdul Rahim Bin Nik Rapporteur: Savitri Garivait		
	Junko Akagi	Introductory Presentation (GIO)
	Leandro Buendia	Progress in the Use of ALU Software by Participating Countries to the SEA GHG Project
	Yasumasa Hirata	Potential of RS/GIS Data for GHG Inventory in Forest Sector
	Noriko Kishimoto Hosonuma	Utilization of Global Map for GHG Inventory
	Rizaldi Boer	The Development of GHG Inventory for LULUCF-Indonesia
	Savitri Garivait	Thailand's Experience with Remote Sensing and GIS Data
	Min Zaw Oo	GHG Inventory in LULUCF Sector of Myanmar Discussion
14:00~17:30	WG 4: Waste Sector	Plaza III
Theme: Information Exchange on the Current Status of the Inventory Preparation for Waste Sector in each Asian Country		
Chair: Tomonori Ishigaki Rapporteur: Qingxian Gao		
Current status and /or problem of Waste Sector Inventory preparation of Asian countries		
	Takefumi Oda	Introductory Presentation (GIO); Result of the Survey for Waste Sector Inventory Status of each Country
	Mya Thein	GHG Emissions from Waste Sector of INC of Myanmar
	Dorjpurev Jargal	Mongolia's GHG Inventory - Waste Sector
	Retno Gumilang Dewi	Indonesia's Progress in Waste Inventory
	Qingxian Gao	The Progress in Waste Sector [China] Discussion
Proposal for the Waste Sector WG in future WGIA; information sharing for the mitigation actions in waste sector and the inventory improvement		
	Kosuke Kawai	Accuracy of Municipal Solid Waste Data in Vietnam
	Wonseok Baek	Improvements in the Process of estimating GHG Emission for Waste Sector in Republic of Korea
	Sirintornthep	Linkage of Greenhouse Gas Inventory to Mitigation Options
	Towprayoon	Inventory Improvement for MRV Mitigation Actions in Waste Sector
	Hiroyuki Ueda	Discussion

Day 3, Thursday 15 th July		
9:30~12:30	Wrap-up Session Chair: Kiyoto Tanabe	Grand Ballroom
	<i>Rapporteurs will present the summary of each session and WG</i>	
9:30~9:45	Opening Session	Summary of Opening Session
9:45~10:00	Session I	Summary of Session I
10:00~10:15	Session II	Summary of Session II
10:15~10:25	Hands-on training	Summary of Hands-on training
10:25~11:25	Session III	Summary of WG1: Inventory (Cross-cutting issues) Summary of WG2: Agriculture Sector Summary of WG3: LULUCF Sector Summary of WG4: Waste Sector
11:25~11:45	Tea Break	
11:45~12:20	All	Discussion and Wrap-up
12:20~12:25	Syamphone Sengchandala	Closing Remarks (WREA, Laos)
12:25~12:30	Yukihiro Nojiri	Closing Remarks (GIO/NIES, Japan)

Day 4, Friday 16 th July	
9:00~16:30	Excursion

Annex II: List of Participants

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