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Proceedings of the 15th Workshop on Greenhouse Gas Inventories in Asia (WGIA15)

- Capacity Building for Measurement, Reporting and Verification -

11th-13th July 2017, Nay Pyi Taw, Myanmar

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

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Foreword

The international community now recognizes increases in anthropogenic emissions of greenhouse gases (GHGs) as the primary cause of climate change and its impacts. The 5th Assessment Report published by the Intergovernmental Panel on Climate Change (IPCC) in 2013 stated that "the atmospheric concentrations of the greenhouse gases carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) have all increased since 1750 due to human activity." Moreover, many GHG observatories including Mauna Loa Observatory in Hawaii have noticed that the yearly mean concentration of CO_2 surpassed 400 ppm since 2015. In order to address mitigation and adaptation to climate change, all of us on the globe have been making more efforts than ever in both scientific and political fields.

Furthermore, "Measurement, Reporting and Verification", abbreviated as MRV, are important for ensuring the transparency and accuracy of each country's mitigation actions by quantifying anthropogenic GHG emissions. In this respect, national GHG inventories, which provide information on GHG emissions and their trends over time, play a critical role as a basis for decision makers to design and implement strategies of their countries' mitigation actions for reducing GHG emissions.

In order to support the enhancement of capacities for national GHG inventories in Asian 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 (MOEJ). This workshop supports government officials, compilers, and researchers in the Asian countries to develop and improve their GHG inventories through enhancing regional information exchange. 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 CGER report serves as the proceedings of the 15th WGIA, which was held from July 11th to 13th, 2017, in Nay Pyi Taw, Myanmar. 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 the further progress of inventory development in Asia.

Hitoshi Mukai 

Director
Center for Global Environmental Research
National Institute for Environmental Studies

Preface

An important lesson that we have learned from experience in the history of the UNFCCC is the importance of "measurement, reporting and verification" (MRV). This includes measuring the effects of emission reduction initiatives; reporting the results of the measurement on the international stage; and verifying the status of reductions. MRV ensures the transparency and accuracy of reports on each country's mitigation actions.

For steady implementation of MRV, it is essential to develop national systems for preparation of national greenhouse gas (GHG) inventories and to improve the accuracy of the inventories. In the Paris Agreement, in order to build mutual trust and confidence and to promote effective implementation, the necessity of establishing an enhanced transparency framework is stated. The purpose of the framework for transparency of actions is to provide a clear understanding of climate change actions, including clarity and tracking of progress towards achieving Parties' individual nationally determined contributions (NDCs), and Parties' adaptation actions to inform the global stocktake. Each Party shall regularly provide a national inventory report and information necessary to track the progress made in implementing and achieving its NDC under the Paris Agreement. Such GHG inventories are being accepted more and more as being valuable because the inventories support transparency and accuracy of implementation of the national mitigation actions in a MRV manner.

Since its first session in 2003, WGIAs have been held fourteen times so far. WGIAs have contributed significantly to the construction and consolidation of a network of officials involved in GHG inventory preparation in Asian countries and other institutes, and to the identification and solution of common issues of relevance to the inventories.

This time, the 15th WGIA (WGIA15) was held from 11th to 13th July, 2017 in Nay Pyi Taw, Myanmar, as a capacity building workshop for MRV. The items set out for this workshop by taking into consideration the current situation of the member countries were all essential for the improvement of their inventories.

The outcomes of the WGIA15 are summarized in this report as Proceedings. It is our hope that this report will be found useful and will contribute to the further improvement of the GHG inventories of the WGIA-member countries.

In conclusion, we would like to thank all the attendees for their participation and active contribution to the success of the workshop.

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List of Acronyms and Abbreviations

AB	WGIA Advisory Board
AD	Activity Data
AFOLU	Agriculture, Forestry and Other Land Use
AIM	Asia-Pacific Integrated Model
APA	The Ad Hoc Working Group on the Paris Agreement
AR5	the IPCC Fifth Assessment Report
ASEAN	Association of South-East Asian Nations
BNERI	Brunei National Energy Research Institute
BUR	Biennial Update Report
BUR1 / 1st.BUR	The first Biennial Update Report
CFCs	Chlorofluorocarbones
CGER	Center for Global Environmental Research
CH_4	Methane
CITC	Climate Change International Technical and Training Center
CO	Carbon monoxide
CO_2	Carbon dioxide
COP	Conference of the Parties
CRAES	Chinese Research Academy of Environmental Sciences
CS	Country-Specific
CSEF	Country-Specific Emission Factor
EF	Emission Factor
EFDB	IPCC Emission Factor Database
FAO	Food and Agriculture Organization of the United Nations
FFPRI	Forestry and Forest Products Research Institute
FSV	Facilitative Sharing of Views
FY	Fiscal year
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GHG	Greenhouse Gas
Gg	Giga gram (10^9 g)
GIO	Greenhouse Gas Inventory Office of Japan
GIR	Greenhouse Gas Inventory and Research Center of Korea
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
GSP	Global Support Programme
GWP	Global Warming Potential
HCFCs	Hydrochlorofluorocarbons
HFCs	Hydrofluorocarbons
ICA	International Consultation and Analysis
IGES	Institute for Global Environmental Strategies, Japan
INC	Initial National Communication
INDC	Intended Nationally Determined Contribution
IP	Industrial Processes
IPCC	Intergovernmental Panel on Climate Change

IPCC/ TFI	IPCC, Task Force on National Greenhouse Gas Inventories,
IPCC/TFI/TSU	Technical Support Unit of the IPCC Task Force on National Greenhouse Gas Inventories
LUCF	Land-Use Change and Forestry
LULUCF	Land Use, Land-Use Change and Forestry
ML	Mutual Learning
MoEFCC	Ministry of Environment, Forest and Climate Change, India
MOEJ	The Ministry of the Environment, Japan
MONRE	Ministry of Natural Resources and Environment, Vietnam
MONREC	Ministry of Natural Resources and Environmental Conservation of Myanmar
MRV	Measurement, Reporting and Verification Measureable, Reportable, and Verifiable
MURC	Mitsubishi UFJ Research and Consulting Co., Ltd., Japan
Mt	Million tonnes
N	Nitorogen
NAI	Non-Annex I
NAMA	Nationally Appropriate Mitigation Action
N_2O	Nitrous oxide
NC	National Communication
NDC	Nationally Determined Contribution
NDRC	National Development and Reform Commission, China
NIES	National Institute for Environmental Studies, Japan
NIR	National Inventory Report
NMVOC	Non-methane volatile organic compounds
NOx	Nitrogen Oxides
OC	WGIA Organizing Committee
ODS	Ozone Depleting Substance
ONEP	Office of Natural Resources and Environmental Policy and Planning, Thailand
PGHGIMRS	Philippine Greenhouse Gas Inventory Management and Reporting System
QA	Quality Assurance
QC	Quality Control
REDD	Reducing Emissions from Deforestation and forest Degradation in developing countries
REDD+	Reducing Emissions from Deforestation and forest Degradation, and the Role of Conservation, Sustainable Management of Forests, and Enhancement of Forest Carbon Stocks
SBI	the Subsidiary Body for Implementation
SBSTA	Subsidiary Body for Scientific and Technological Advice
SNC	Second National Communication
SF_6	Sulfur hexafluoride
SOx	Sulfur oxides
SPM	Summary for Policymakers
TA	Technical Analysis
TACCC	Transparency, Accuracy, Completeness, Comparability and Consistency
TGO	Thailand Greenhouse Gas Management Organization (Public Organization)

TNC	Third National Communication
TTE	Team of Technical Experts
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
US EPA	United States Environmental Protection Agency
WGIA	Workshop on Greenhouse Gas Inventories in Asia
1996GLs	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories
2006GLs	2006 IPCC Guidelines for National Greenhouse Gas Inventories

Photos of the Workshop

Welcome Address

Mr. Ohn Winn
Minister of MONREC, Myanmar

Welcome Address

Mr. Yoshio Nakura
Low-Carbon Society Promotion Office,
Global Environment Bureau, MOEJ

Chairpersons for the Plenary Sessions

Opening Session

Mr. Hla Maung Thein
MONREC

Session I

Mr. Takahiko Hiraishi
IGES

Session II

Prof. Rizaldi Boer
Center for Climate Risk and Opportunity Management in Southeast Asia and Pacific, Bogor Agricultural Univ.

Session III

Dr. Sumana Bhattacharya
Iora Ecological Solutions Pvt ltd

Session IV

Dr. Sirintornthep Towprayoon
The Joint Graduate School of Energy and Environment, King Mongkut's University of Technology Thonburi

Wrap-up Session

Prof. Yukihiro Nojiri
Manager of GIO, Japan

Mutual Learning Sessions

LULUCF sector:
Lao PRD - Myanmar

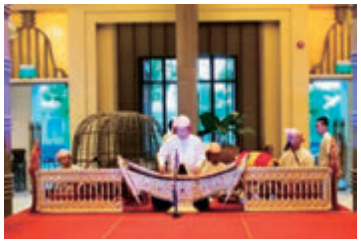
Energy sector:
Mongolia - Vietnam

Waste sector:
China - Philippines

Discussions
in the Plenary Sessions

Discussions
in the Poster Session

Information Exchange in Tea Breaks & Reception



1. Executive Summary of WGIA15

Proceedings of the 15th Workshop on
Greenhouse Gas Inventories in Asia (WGIA15)
CGER-I137-2017, CGER/NIES

1 Executive Summary of WGIA15

Summary

The Ministry of the Environment of Japan (MOEJ) and the National Institute for Environmental Studies (NIES) convened, together with the Ministry of Natural Resources and Environmental Conservation of Myanmar (MONREC), the "15th Workshop on Greenhouse Gas (GHG) Inventories in Asia (WGIA15)" from July 11 (Tuesday) to 13 (Thursday), 2017, in Nay Pyi Taw, Myanmar.

The annual workshops have been held since 2003 in order to support non-Annex I (NAI) Parties in Asia to develop and improve their GHG inventories and to facilitate the enhancement of cooperative relationships towards improvement in the accuracy of national GHG inventories in the Asian region. This year, in total, 120 participants attended WGIA15, including government and research representatives of fourteen countries (Brunei, Cambodia, China, India, Indonesia, Japan, Lao P.D.R., Malaysia, Mongolia, Myanmar, the Philippines, Republic of Korea, Thailand, and Vietnam), in addition to representatives of the Intergovernmental Panel on Climate Change Task Force on National Greenhouse Gas Inventories (IPCC/TFI), the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC), United Nations Environment Programme (UNEP), and Department of the Environment of Australia.

Opening session

As host countries, a Minister from MONREC of Myanmar and a representative from Japanese government individually made welcome addresses. Japan presented its climate change policies including "Plan for global warming countermeasures" which is based on the Paris Agreement. Then, Myanmar's government made a presentation on integrated approaches in strategies and action plans for achieving sustainable development goals in Myanmar.

The potency of subsidies from carbon tax revenue which are used for private sector's research and development of low-carbon technologies, as well as the importance of coordination among countermeasures for climate change policies implemented by the overarching committee and working groups and other national policies were shared.

Updates on NCs and BURs

Brunei, Philippines, Cambodia, and China talked about their submitted National Communications (NCs) or first Biennial Update Reports (BURs) and reported their most updated emission amount, mitigation activities, and relevant data.

Though the UNFCCC reporting guidelines do not formally request NAI Parties to use the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (2006GLs), the reporting guidelines are the minimal requirements, and the Parties may use the 2006GLs. The conclusion in the forty−second session of the Subsidiary Body for Implementation (SBI42) refers to the need of capacity building in the 2006GLs. It was acknowledged that the 2006GLs reflected the latest scientific knowledge, and applying the 2006GLs was encouraged.

Countries' Experience with the ICA Process and Support for Strengthening Transparency in Reporting from Non-Annex I Parties

Indonesia, Malaysia and Thailand introduced their experience of the ICA process. The secretariat of UNFCCC made a presentation on some of their capacity building projects and trainings for strengthening transparency and updated information about the status of negotiation on the transparency framework under the Paris Agreement.

Some countries mentioned that they had received questions about non-GHG (CO, NOx, Non-methane volatile organic compounds (NMVOC), SOx) /SF_6 emissions during the technical analyses.

The reporting status of other WGIA countries for those gases were shared.

Fluorinated Gas Emissions from Non-Annex I Parties

GIO made a presentation on WGIA countries' reporting status of F-gases such as HFCs, PFCs, and SF_6. MOEJ showed policies and measures of Japan for the Kigali Amendment to the Montreal Protocol. A representative of IPCC/TFI explained the methodology of estimating F-gas emissions. India, China and Korea introduced their reporting status of fluorinated gas emissions.

In the session, the participants shared the understanding of the importance of F-gas emissions from refrigeration and air conditioning, and it was noted that the 2006GLs may contribute to improving the accuracy of emission estimations. The difference of Global Warming Potential (GWP) values between the Kigali Amendment to the Montreal Protocol and the UNFCCC was pointed out, and it was noted that collaboration was needed between the GHG inventory community and Montreal Protocol/mitigation community to enhance the work of both groups. It was acknowledged that reporting F-gas emissions will be encouraged.

GHG Inventories, Projections and Mitigation Actions

First, NIES talked about mitigation actions and projections of fluorinated gas emissions using the Asia-Pacific Integrated Model (AIM). Australia introduced their national system for GHG inventory compilation. Then, Technical Support Unit of the IPCC/TFI (IPCC/TFI/TSU) explained recent activities of IPCC TFI, such as the 2019 Refinement to the 2006GLs. Lastly, UNEP explained the interlinkages between GHG inventories and projections and mitigation actions, and introduced some typical technical mistakes in the preparation of inventories and mitigation/NDC actions.

In the session, participants discussed some methodological issues of potential emissions and actual emissions for F-gas emission estimations, and showed a common understanding of the importance of improving the accuracy of GHG inventories which contributed to the implementation of emission reduction targets and evaluation of mitigation actions. It was noted that, in order to improve the accuracy of GHG inventories, constructing continuous national systems and reflecting the latest scientific knowledge including the latest IPCC GLs were needed, and it was acknowledged that it was important to provide related support for the improvement of GHG inventories.

Mutual Learning of each sector's GHG inventories

The participants preliminarily exchanged materials and questions to learn about the inventory and institutional arrangements of the counterpart country. For each session, two countries engaged with each other, by following up on the Q&A which had taken place over the course of two and a half months preceding the Workshop. In this WGIA, the mutual learning was held on the following three GHG inventory sectors: Energy sector (Mongolia and Vietnam), LULUCF sector (Laos and Myanmar), and Waste sector (China and the Philippines).

Through these sessions, specific issues of partner countries were discussed. Basic information such as statistics system and information for further elaboration such as segmentation of estimation categories and development of country-specific emission factors, was also studied. Since detailed background of other country's inventory was very helpful, they expressed their wish to actively take part in ML in the future.

Poster Session

This was held to share the latest research results and deepen the discussion on specific issues. Eleven posters were displayed during the workshop and active discussions were made at the session. Many participants welcomed the poster session and looked forward to it at the next WGIA.

2. Workshop Report

2 Workshop Report

Please note that all presentation materials can be downloaded from the website of Greenhouse Gas Inventory Office of Japan (GIO):
http://www-gio.nies.go.jp/wgia/wg15/wg15index-e.html

2.1 Opening Session

The opening session was chaired by Mr. Hla Maung Thein (Myanmar), and the rapporteur was Mr. Naofumi Kosaka (GIO).

The welcome address was delivered by H. E. U Ohn Winn, Union Minister, Minister of the Ministry of Natural Resources and Environmental Conservation, Myanmar (MONREC), followed by the welcome address delivered by Mr. Yoshio Nakura, Director of the Low-Carbon Society Promotion Office, Ministry of the Environment, Japan (MOEJ).

Mr. Hiroshi Ito (GIO) gave an overview of WGIAs. He introduced the organization of WGIA in progress, its objectives, participants, and agenda. The objectives of WGIA15 were:

- To enhance sector-specific capacity for inventory compilation (Mutual Learning);
- To share information on national GHG inventories for national communications (NCs) and biennial update reports (BURs) (Session I);
- To explore good practices for International Consultation and Analysis (ICA) of BUR (Session II);
- To enhance the understanding of methodology of estimating fluorinated gas emissions (Session III); and
- To promote the relationship among GHG inventory, projections and mitigation actions (Session IV).

Mr. Ito emphasized that an accurate inventory of NCs and BURs will contribute to the planning and assessment of the emission reduction target in Intended Nationally Determined Contribution (INDC) /Nationally Determined Contribution (NDC).

Mr. Takumi Ichikawa (MOEJ) made a presentation on Japan's climate change policies as well as the current situation of Japan. He reported that Japan's national greenhouse gas emissions in fiscal year (FY)2015 were 1,325 million tonnes of carbon dioxide equivalents (Mt CO_2 eq.). He also showed the reduction target of "3.8% or more emission reduction compared to FY2005" and a 26.0% reduction by FY2030 compared to FY2013 (25.4% compared to FY2005), as shown in Japan's INDC. Furthermore, he introduced a variety of policies and measures including public campaign for reducing GHG emissions by using carbon tax revenue, making full contribution to the implementation of the Paris Agreement.

Mr. Than Aye (Myanmar) made a presentation on Myanmar's national climate change policies, strategy and action plan. He overviewed the national circumstances and policy measures of climate change in Myanmar. He also showed integrated approaches in strategies and action plans for resilience, low-carbon green growth, and environmental sustainability for achieving sustainable development goals.

In the discussion, Japan's carbon pricing was discussed. Mr. Ichikawa explained that the subsidies from the tax revenue were used for private sector's research and development of low carbon technologies. Also, Myanmar's institutional arrangement was confirmed, and Mr. Than Aye explained that the overarching committee produced national environmental policy. Six working committees were formed under the national-level environmental conservation and climate change committee, and they

produced policies including climate change, green economy strategies, and waste management strategies. Mr. Than Aye pointed out that the coordination among these policies was challenging, each working committee monitoring and evaluating the progress of policy implementation.

2.2 Session I: Updates on the National Communications (NCs) and Biennial Update Reports (BURs) from Non-Annex I Parties

This session was chaired by Mr. Takahiko Hiraishi (IGES) and the rapporteur was Mr. Naofumi Kosaka (GIO).

Non-Annex I (NAI) Parties shall, as per COP 16 decision, submit national GHG inventories as a part of their BURs or NCs every two years. Under such circumstances, participant countries have started preparations for their BURs and/or NCs. In this session, representatives from Brunei Darussalam, the Philippines, Cambodia, and China gave presentations about their latest BUR and NCs.

Dr. Takefumi Oda (GIO) made an introductory presentation of this session. He overviewed relevant articles of the Convention for NCs, first BUR and ICA of BURs. He also showed the submission status of NCs and BURs in Asian countries in recent years.

Mr. Muhammad Nabih Fakhri Matussin (Brunei) gave a presentation on Brunei Darussalam's Initial NC. He explained that Brunei National Energy Research Institute (BNERI) had compiled the INC which included the 2010 inventory by using the Revised 1996 IPCC guidelines for National Greenhouse Gas Inventories (1996GLs) and the Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (GPG 2000). He also pointed out that net GHG emissions from Brunei had been 6.61 million tonnes CO_2-eq. (with LUCF) in 2010. Furthermore, he showed the mitigation measures in his country on the energy, LUCF and waste sectors.

Ms. Maria Delia Cristina M. Valdez (the Philippines) gave a presentation on Philippine's Second NC, which contained the inventory for 2000. Net GHG emissions from the Philippines were 21.8 million tonnes CO_2-eq. (with LUCF) in 2000. She also explained that beside the SNC submission, the Philippines institutionalized the Philippine Greenhouse Gas Inventory Management and Reporting System (PGHGIMRS) in 2014. Within this year, the Philippines will draft a new GHG inventory under the PGHGIMRS.

Mr. Leang Sophal (Cambodia) gave a presentation on Cambodia's Second NC. He explained that Cambodia's SNC included the inventory for 2000 compiled by using the 1996GLs. Net GHG emissions in 2000 from Cambodia were 0.22 million tonnes CO_2-eq. (with LUCF). He also introduced Cambodia's potential actions for GHG mitigation to address climate change identified in the INDC.

Prof. Gao Qingxian (China) gave a presentation on China's first BUR which was compiled by National Development and Reform Commission (NDRC) and included the inventory for 2012, and explained GHG emission control actions and their effects in the 12th five-year plan for the period of 2011-2015, as well as targets and tasks by the end of the 13th five-year plan period in 2020.

In the discussion, participants became aware of the technical advantages of applying the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (2006GLs) in their inventory preparation. While the UNFCCC reporting guidelines do not formally request NAI Parties to use the 2006GLs, the reporting guidelines are the minimal requirements and the parties may apply them. The SBI42 conclusion refers to the need of capacity building on the application of the 2006GLs. Updated emission factors and calculation tools are currently offered by the 2006GLs, IPCC Inventory Software and IPCC

Emission Factor Database. Some participants indicated interest in applying the 2006GLs, or a combination of these guidelines and the previous 1996GLs in their next reports due to the new guidelines' own advantages.

2.3 Session II: Countries' Experience with the ICA Process and Support for Strengthening Transparency in Reporting from Non-Annex I Parties

This session was chaired by Prof. Rizaldi Boer (Advisory Board (AB) / Bogor Agricultural University), and the rapporteur was Mr. Naofumi Kosaka (GIO).

As many of the WGIA member countries have completed their ICA process for their first BURs, experiences of the process have been accumulated. The third round of Facilitative sharing of views (FSV) for BURs have just been completed in SBI 46, including India, Indonesia, Malaysia and Thailand. Thus, the session was held with the aim of sharing experiences, inviting Indonesia, Malaysia and Thailand, to give experience-based presentations.

Furthermore, the second aim of this session, "Support for strengthening transparency in reporting from NAI Parties", was set to lead participants to the next step for understanding future transparency framework under the Paris Agreement.

Ms. Atsuko Hayashi (GIO) made an introductory presentation. She showed an overview of past sessions related to the ICA process and indicated where we were at present and what we would need for the future. She also explained the process of ICA with data showing the figures of parties' status in the process.

Dr. Joko Prihatno (Indonesia) started off the session with a presentation entitled "Indonesia Experience of the International Consultation and Analysis (ICA) Process". He gave an overview of Indonesia's first BUR, including key categories. He also made a detailed explanation over the Technical Analysis (TA) process with the timeline Indonesia had. Furthermore, he shared a part of the Summary Report of TA and concluded that Team of Technical Experts (TTE)'s recommendations could be used as feed-back to improve the accuracy of calculation of GHGs, and as a means to identify areas with the need for improvement in capacity building.

Dr. Elizabeth Philip (Malaysia) also made an experience-based presentation. She showed an overview of Malaysia's BUR with their timeline of the ICA process. Furthermore, she told about the challenges in operating a robust MRV system, implementing mitigation actions, collecting data for shifting to adopting the 2006GLs and some other issues related to lack of human resources. She also told that the ICA process helped enhance Malaysia's understanding of reporting requirements to increase its transparency.

Dr. Patthra Pengthamkeerati (Thailand) introduced Thailand's experience of the ICA process. She showed many of the key questions raised by TTEs and their answers to TTEs, so that practical aspects of the TA process could be shared. She also told about the good practice conducted in Thailand, i.e., Thailand started to establish a structure for the reporting system, and all related agencies have been engaged, because of this ICA process.

Mr. Dominique Revet (UNFCCC) introduced some capacity building projects and training courses for strengthening transparency, and updated information about the status of negotiation on the transparency framework was shared.

The floor discussed TTE's intention with the question about the coverage on non-GHG emissions

raised during the TA. It was concluded that TTE's intention was completeness. The chairperson raised a question asking about more information on continuous availability in capacity building provided by UNFCCC's secretariat. Mr. Revet agreed with the continuous need for training and gave additional information on provided training courses; one is the ordinary face-to-face training and the others are various types of online training courses. He mentioned that some courses were provided in Spanish. He also mentioned about the shortage in financial resources for holding a certain number of face-to-face training.

2.4 Session III: Fluorinated Gas Emissions from Non-Annex I Parties

This session was chaired by Dr. Sumana Bhattacharya (AB/ Iora Ecological Solutions Pvt ltd.) and the rapporteur was Mr. Naofumi Kosaka (GIO).

The session focused on the new requirements under the Kigali Amendment to the Montreal Protocol, estimation methodology for fluorinated gases, and challenges/good practices in reporting. A wide range of experts gave presentations and participants exchanged views on how to estimate and report F-gas emissions.

Ms. Elsa Hatanaka (GIO) made an introduction to the session and presented the status of reporting by WGIA countries of fluorinated gases under the UNFCCC. Although the reporting of F-gases such as HFCs, PFCs, and SF_6 is not mandatory for NAI countries, some WGIA countries are reporting such gases. However, it is still difficult to grasp the general picture of F-gas emissions because it is often unclear: 1) whether it is a true zero-emission situation (NO) or whether it is just a lack of data (NE), 2) whether it is a conscious choice not to report (intentional NE), or 3) whether the reported data are true (not under-estimated or overestimated).

Mr. Masahiko Suzuki (MOEJ) presented an overview of the Kigali Amendment to the Montreal Protocol and policies on fluorocarbons in Japan. The Kigali Amendment will require a phasedown of HFCs, and in response to this, Japan will be enhancing its policies and measures through the Act on Rational Use and Proper Management of Fluorocarbons.

Mr. Kiyoto Tanabe (IPCC/TFI) introduced IPCC estimation methodologies for fluorinated gases. F-gas emissions occur from manufacturing industries and from F-gas product use. Although actual emissions estimation is more complex, with the bank to be taken account of, the IPCC Inventory Software enables this.

Dr. Sumana Bhattacharya (India) talked about assessing F-gases in India's context. India has phased out CFCs and halons and is planning for HCFC phase-out. HFCs, PFCs, and SF_6 are assessed in the inventory, and HFC consumption will be phased down by 85% by 2047 under the Montreal Protocol's Kigali Amendment.

Prof. Jianxin Hu (China) gave an overview on hydrofluorocarbon emissions in China through an inventory for 2005−2013 and projections to 2050. China's HFC emissions during the 2005-2013 period have increased, due to the rapid growth in the consumption of HFCs with higher GWPs. According to his and his colleagues' study, HFC emissions are projected to be a significant component of China's future GHG emissions.

Ms. Min-Sun Kim (Korea) explained the F-gas emission trends in the Republic of Korea. Korea has HFC and SF_6 emission data for 1990 to 2014, and PFC data for 1992 to 2014. There is a general upward trend, and the accuracy could be improved by the acquisition of activity data (AD) for specific

sub-categories.

Following the above presentations, some comments were given and questions were raised. Mr. Takahiko Hiraishi (IGES) raised the issue of what GWP should be used under the various reporting schemes. He pointed to the fact that the Kigali Amendment required countries to estimate using specified GWPs, but also noted that UNFCCC reporting for NAI countries required the use of IPCC-SAR GWP values upon conversion to CO_2 equivalent values.

Mr. Hiraishi also pointed to the importance of collaboration between GHG inventory experts and mitigation experts. In the case of the Kigali Amendment, regulative measures are to be taken in terms of production or consumption of HFCs, but we would need to know what measures lead to reduction in the emissions of HFCs.

Mr. Stanford Mwakasonda (UNEP) stressed that there were no countries without refrigerants and that it was important to allocate more effort to this sub-sector. He also cautioned against using the potential emissions approach (1996GLs Tier 1) in estimation because of its large margin of error, especially with regard to when emissions occur.

Seeing the enthusiastic responses of participants, Dr. Bhattacharya concluded by saying that she expected to have more discussions on this theme of F-gases in future WGIAs.

2.5 Session IV: GHG Inventories, Projections and Mitigation Actions

This session was chaired by Dr. Sirintornthep Towprayoon (AB/ King Mongkut's University of Technology Thonburi) and the rapporteur was Mr. Naofumi Kosaka (GIO).

The session focused on the interlinkages between GHG inventories, projections and mitigation actions. The aim of the session was the following:

- To understand how better inventories and national systems can help improve projections and mitigation actions;
- To understand key issues to consider in the development of inventories, projections and mitigation actions; and
- To gain knowledge on support programs to improve GHG inventories.

A wide range of experts gave presentations, and participants exchanged views on the interlinkages between GHG inventories, projections and mitigation actions.

At the outset, Dr. Midori Yanagawa (GIO) made an introduction to the session and explained the aim of the session.

Dr. Tatsuya Hanaoka (NIES) made a presentation on the importance of developing fluorocarbon emission inventories in Asia and conducting emission mitigation analysis. Reduction of emissions of all GHGs, including fluorocarbons is needed in order to achieve the two degree Celsius target under the Paris Agreement. HFC emissions are projected to raise, but measures against CFC and HCFC emissions remain important, since they have large GWPs. It is therefore important to develop fluorocarbon emission inventories in Asia and conduct emission mitigation analysis. Recovery and decomposition of fluorocarbons need to be promoted in this context.

Mr. Haakon Marold (Australia) made a presentation on Australia's National Inventory System for GHG inventory reporting. He stressed that its success was in large part due to key investments in data

collection and centralized data management systems. Data collection is underpinned by legislation such as the National Greenhouse and Energy Reporting Scheme, and the Australian Greenhouse Emissions Information System supports a high quality and transparent inventory consistent with international requirements.

Dr. Baasansuren Jamsranjav (IPCC/TFI/TSU) explained IPCC-TFI's recent activities. Their main focus now is preparing the "2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories." This report is to be completed by May 2019, and the first order draft is scheduled for Expert Review at the end of this year. She also introduced recent activities regarding the IPCC Inventory Software, IPCC Emission Factor Database (EFDB), and support for inventory-related capacity building programmes.

Mr. Stanford Mwakasonda (UNEP/UNDP GSP) spoke about national GHG inventories for the development of mitigation or NDC actions. He explained how GHG inventories were essential for the development of Business-As-Usual (BAU) baseline projections, and mitigation actions or implementation of NDC goals. He offered advice on institutional arrangements such as strengthening existing ties between national entities involved in collection of activity data and inventory/NC/BUR agencies, but also creating a national MRV team that goes beyond preparing these reports and thinks ahead to future development. He also offered insight regarding common mistakes made during national inventory preparation.

Mr. Ajay Raghava (India) raised a question on the accuracy of the potential (top-down) emissions approach to estimate F-gas/Fluorocarbon emissions while acknowledging that there were problems faced when there was a lack of detailed data to estimate actual (bottom-up) emissions. Dr. Hanaoka acknowledged this challenge of acquiring detailed data but stressed the importance to move to estimating actual emissions. Ms. Philip commented that the potential emissions approach might be helpful as a first step in starting estimation.

Following the above presentations, some comments were given and questions were raised. Dr. Aaron J.M. Russell (Myanmar) commented that there seemed to exist no-regret policies that could be taken regardless of the absence of statistics or other data, and Dr. Hanaoka responded that collection/destruction of F-gases/Fluorocarbons or replacement of certain gas species with lower GWP gases were surely good polices that would reduce emissions, however quantification of actual emissions remained to be important to understand the effort needed.

Mr. Takahiko Hiraishi (IGES) raised the issue of what GWP should be used under the various reporting schemes. Mr. Dominique Revet (UNFCCC) noted that UNFCCC reporting rules for NAI countries required that emissions were reported on a gas-by-gas basis and in units of mass, and that IPCC Second Assessment Report (SAR) GWPs were required if converting to CO_2 equivalent values. Mr. Mwakasonda pointed out the fact that in BUR technical analysis, SAR GWPs were recommended. Dr. Hu noted that the Kigali Amendment required countries to estimate using the IPCC-AR4 GWPs. It was noted by Dr. Towprayoon that countries needed to be mindful of this difference, and that consistency in reporting would be ideal.

Mr. Hiraishi, although acknowledging that the rules on which IPCC guidelines should be used by NAI countries were defined by Decision 17/CP.8, pointed out that this decision was taken a while ago, and that new SBI conclusions have been taken requesting training on the use of the 2006GLs. To this, Mr. Mwakasonda responded that the decision, however, specified the use of the 1996GLs, and TA of BURs were done based on it.

In response to a question from Dr. Elizabeth Phillip (Malaysia), Ms. Jamsranjav clarified that Tier 2 estimation methodologies for some categories in the non-AFOLU sectors had been incorporated into the IPCC Inventory Software. Dr. Phillip commented on the usefulness of this in the context of F-gas emission estimation.

On the issue Dr. Phillip raised on how to retain GHG inventory experts within each country's national systems, Mr. Mwakasonda commented that he felt it important to maintain the motivation in the experts. He drew on the example of his experience of joining the Annex I country inventory review and meeting new international peers but also expanding his thinking on issues. He also suggested that each country had a basic institutional arrangement that could utilize consultants without overly relying on them for institutional memory.

Dr. Sung-kyun Kim (KEEI) shared the information that Korea was having difficulties in utilizing the inventory for domestic mitigation policy-making, since IPCC/UNFCCC classifications of sectors/categories were viewed by some to be written in stone. Mr. Kiyoto Tanabe (IPCC/TFI) explained that from a purely IPCC perspective, its function was to provide sound methodological guidance, and it was up to countries/entities to decide what to do. Mr. Revet noted that the UNFCCC reporting rules specified that IPCC Guidelines were to be used. Ms. Hatanaka (GIO) commented that she felt that the inventory was ultimately a tool used to fulfill international commitments, and explained that in Japan's case, press releases that better fit the domestic policy-making needs were simultaneously prepared, using different classification/names of categories etc. to explain the state of emissions to the public.

2.6 Wrap-up Session

This session was chaired by Prof. Yukihiro Nojiri (GIO). In this session, the rapporteurs from the Mutual Learning session and plenary sessions provided summaries of the discussions including findings and recommendations, which were followed by the final discussion to conclude the workshop.

Summary of the Plenary Sessions

Mr. Naofumi Kosaka (GIO), the rapporteur of the Plenary Sessions, reported a summary of the presentations and discussions of the Opening Session through Session IV.

After his report, Mr. Takahiko Hiraishi (IGES) made a comment that holding a side event in parallel to the mutual learning session would be beneficial in the next WGIA. This was left to the AB/Organizing Committee (OC) meeting for consideration.

Summary of the Mutual Learning

Dr. Takefumi Oda (GIO) presented the background and objectives of the Mutual Learning (ML) programme as well as the outcomes of past MLs. He also summarized the ML held in this workshop.

After his report, many participants of ML expressed their appreciation. They said that the ML was informative and beneficial because they could share problems and knowledge. It was suggested that ML would be more effective if countries with similar national circumstances were chosen as counterpart when matching countries. Another suggestion was that ML should deal with cross-cutting issues such as key category analysis, uncertainty analysis, and QA/QC. Generally, it was agreed that the ML was useful and should be continued.

Closing Remarks

The closing remarks were delivered by Mr. Hla Maung Thein (Myanmar) and Prof. Yukihiro Nojiri (GIO). They thanked all for their active participation.

3. Abstracts

3 Abstracts

In this section, the abstracts of the presentations are compiled. The abstracts are attached unedited, in the same form as they were received from the presenters.

3.1 Opening Session

Latest Japanese Climate Change Policies

Takumi Ichikawa
Ministry of the Environment, Japan

Abstract

Japan succeeded in reducing its emissions in the recent 2 years, overcoming challenges of the Great East Japan Earthquake. In 2015, Japan's total emissions were estimated to be 1,325 megaton carbon dioxide equivalent ($MtCO_2$ eq.). In the recent years GDP has been growing but the GHG emissions have been decreasing, so they show a decoupling trend.

Japan is committed to achieve following emission reduction targets.

By 2020: 3.8% or more emission reduction compared to 2005

By 2030: 26.0% (25.4%) reduction compared to 2013(2005) (Japan's NDC)

Japan established "the Plan for Global Warming Countermeasures" that helps to implement a variety of policies and measures, requires continuous progress review, and promotes government and public-private partnerships to achieve the reduction targets. The plan also sets a long-term goal to aim to reduce greenhouse gas emissions by 80% by 2050, while pursuing the global warming countermeasures and the economic growth at the same time under international coordination. This plan is Japan's foundation to progress the global warming countermeasures.

With regard to Long-term low GHG emission development strategy, Japanese government established domestic committees by experts among relevant ministries to consider and discuss the issue. But the strategy's submission timing is yet to be decided.

Central Environment Council of Ministry of the Environment published "Long-term Low-carbon Vision" as a basis to consider the strategy. The vision aims to clarify the role of Japan in addressing climate change and to show images of targeted future vision.

Information

National Greenhouse Gas Inventory Report of Japan (April, 2017)
Global Warming Countermeasures Plan
Long-term Low-carbon Vision
General Energy Statistics of Japan (April, 2017)
Annual Report on National Accounts
IPCC AR5 The Synthesis Report Figure 2.3

Access

Japan's Assistance Initiatives to address Climate
Change<https://www.env.go.jp/press/files/en/698.pdf>

3.2 Session I

Brunei Darussalam's Initial National Communications

Muhammad Nabih Fakhri Matussin and Abdul Matiin Haji Muhd Kasim
Brunei National Energy Research Institute (BNERI)
Brunei Darussalam

Abstract

Brunei Darussalam ratified the United Nations Framework Convention on Climate Change(UNFCCC) on 7 August 2007, which subsequently entered into force on 5 December 2007. Brunei Darussalam's Initial National Communications, submitted in 2016, comprises the national inventory of GHG for the year 2010 and measures representing policy and actions that contribute to reduction of GHG and address climate change impacts during this period. GHG emissions were estimated using the Revised 1996 IPCC Guidelines for National GHG Inventories. Emission estimates were based on the sectoral and reference approaches and were made using the default conversion and emission factors provided for in the Revised 1996 IPCC Guidelines. The Tier 1 methodology was used for emission estimates.

Brunei Darussalam's GHG emissions excluding LUCF totaled 9,488.6 Gg of CO_2e in 2010. LUCF had contributed to the removal of 2,876.2 Gg CO_2e. The net GHG emissions including LUCF were approximately 6,612.4 Gg CO_2e. Brunei Darussalam GHG emission including LUCF represented a small fraction of approximately 0.016% of global emissions in 2010. The two most significant GHG emitted in Brunei Darussalam were CO_2 and CH_4, accounting respectively 62.0% and 36.8% of total CO_2 equivalent emission. Emission levels for nitrous oxide and hydrofluorocarbons were relatively small. A total of 8,858.2 Gg CO_2e of emissions originated from the energy sector. IPPU emitted 106.7 Gg CO_2e. Meanwhile, 27.1 Gg CO_2e of emissions came from the agriculture sector and waste sector emitted 496.6 Gg CO_2e. LUCF had been the carbon sink with net removal of 2,625 Gg CO_2e.

Civen Brunei Darussalam's vulnerability to climate change impacts, the government has developed and implemented plans and actions to build and enhance resilience and adaptation to the adverse impacts of unusual and extreme weather and climate events. Flood mitigation and coastline protection projects in flood prone areas and erosion susceptible areas were implemented under the National Development Plan 2007 -2012. Climate change adaptation is most advanced in the biodiversity and forestry sectors. In addition to the unique biodiversity, forest like peat provides flood protection, slope stability and support fresh water supply. The country's ground level is below sea level and the peat that accumulates in forest floors raises the ground level

As a country endowed with a relatively small resource base, the government has to ensure that the country's natural resources are utilised in the most efficient and sustainable manner to meet long term development needs. In addition to promoting energy efficient behaviour and energy efficient measures among the public, private and government sectors, the government initiated the deployment of renewable energy by commissioning the Tenaga Suria Brunei (TSB) solar photovoltaic (PV) power plant in 2010 as an alternative source of energy.

Information

Brunei Darussalam's Initial National Communications, August 2016

Philippine Second National Communication (SNC) on Climate Change

Ms. Maria Delia Cristina M. Valdez
Environmental Management Bureau – Department of Environment and Natural Resources

Abstract

The Philippines is one of the countries in the world that are most vulnerable to climate change. This means that the country is not only more exposed by virtue of its geographical setting and environmental situation. It is also less able to cope with the extreme events and natural calamities brought about by climate change. The Second National Communication (SNC) to the United Nations Framework Convention on Climate Change (UNFCCC) explored the conditions in the country that may have been affected by climate change, and the factors that may have contributed to the country's high vulnerability. The report also looked into the mechanisms that have been employed to adapt to and mitigate the effects of climate change, as well as policies and actions that have been taken to promote and improve the country's ability to cope with climate change. It also identified the gaps and needs that need to be addressed to enhance adaptation and reduce vulnerability, which is evident in the current plans and programs in climate change from the submission of the SNC.

Cambodia's Second National Communication

Leang Sophal,
General Secretariat of National Council for Sustainable Development,
Department of Climate Change, Cambodia

Abstract

The Kingdom of Cambodia ratified, as a Non-Annex I Party, the United Nations Framework Convention on Climate Change (UNFCCC) in 1995 and acceded to the Kyoto Protocol in 2002. The Initial National Communication (INC) was officially submitted after the ratification in 2002. Preparing a comprehensive Second National Communication (SNC) in Cambodia is still a challenging task. Many functions and data are not available yet and had to be developed in the process.

For the second national communication, the greenhouse gas inventory (GHG inventory) has been prepared using the IPCC guidelines, default emission factors and activity data from various sources. UNFCCC software was used to harmonize data, calculate emissions and compile tabular information. Many governmental and non-governmental organizations, as well as individual experts, took part in the GHG inventory process. Exactly, Cambodia's GHG emissions were estimated at 47,709 $GgCO_2$-eq in 2000 from Energy, agriculture, land use change and forestry and waste sector, and removal at 48,383 $GgCO_2$-eq. The net removal was estimated at 674 $GgCO_2$-eq. Hence, Cambodia remained a net sink in the year 2000. In 1994, Cambodia was a net sink country able to offset approximately 5,142 $GgCO_2$-eq.

Each sector and fuel type a list of mitigation options was formulated based on previously successful projects, pilot projects, feasibility studies, literature reviews and expert opinion. These mitigation options were screened based on UNFCCC documentation (UNFCCC 2004) to determine the most viable options for Cambodia. Related to strategies and policy, we used four short to long term strategies, namely: short-term win-win strategy; extended short-term win-win finance strategy includes carbon finance; medium-term green growth support strategy; and long-term green growth planning strategy.

In the context of adaptation, in the short term it is the intention of the RGC to focus on increasing its capacity to cope with current climate risks through improving climate risk management and community livelihood. Using climate information, increasing water use efficiency and creating additional sources of income for farmers are among the measures identified.

Long-term efforts will be directed at increasing the resilience of the agriculture system to future climate risks through the revitalization of long-term policies and planning that take into account climate change. Measures include information use, infrastructural interventions, expanding to other areas with lower risks, insurance, better varieties of crops and long-term research.

Introduction of 1st Biennial Update Report on Climate Change of China

Qingxian Gao
Chinese Research Academy of Environmental Sciences, China

Abstract

In this presentation, the Chinese first Biennial Update Report on climate change (1st BUR) is introduced briefly. The relevant decision of UNFCCC on BUR was recalled and the implementation from China was summarized. The main contents of the 1st BUR were outlined in this presentation.

Recalling Articles 4 and 12 of the UNFCCC, each Party shall submit its national communication. As a non-Annex I party to the Convention, the People's Republic of China has attached great importance to its international obligations. China submitted its *Initial* and *Second National Communications on Climate Change* in 2004 and 2012 respectively, in which policies and actions in response to climate change were comprehensively elaborated, and the 1994 and 2005 National GHG Inventories were reported.

Upon receiving the grants from the Global Environment Facility (GEF) in 2015, the Chinese government launched the preparation of its 1st BUR by organizing the departments and research institutions concerned and by the guidelines for the preparation of biennial update reports from non-Annex I Parties provided by the COP decisions. *The 1st BUR,* approved by the Chinese government, is divided into eight Parts: National Circumstances and Institutional Arrangements for Addressing Climate Change, National Greenhouse Gas Inventory, Mitigation Actions and Their Effects, Finance, Technology and Capacity-Building Needs and Support Received, Information on Domestic Measurement, Reporting and Verification (MRV) and Other Information, Basic Information of the Hong Kong and the Macao SAR on Climate Change were included in 1st BUR, presenting a full picture of China's national efforts on climate change. The National GHG Inventory as presented herein is of 2012.

Addressing climate change is a shared mission of mankind. Considering its basic national circumstances and the characteristics of its development stage, China is vigorously promoting eco-civilization, and green, circular and low-carbon development by integrating climate change into its medium-and long-term national economic and social development planning and by attaching equal importance to mitigation and adaption, and try to make progress on all fronts by resorting to legal and administrative means, technologies and market forces. The Chinese government will continue to fulfill its own obligations under UNFCCC and to implement its Nationally Appropriate Mitigation Actions (NAMAs) and Nationally Determined Contributions (NDC) for the enhancement sake etc.

3.3 Session II

Indonesia Experience of the International Consultation and Analysis Process

Joko Prihatno
Director of GHG Inventory and MRV, Directorate General of Climate Change
Ministry of Environment and Forestry, Republic of Indonesia

Abstract

According to decision 2/CP.17, paragraph 41(a), Indonesia as Parties not included in Annex I to the Convention (non-Annex I Parties), submitted its first biennial update report (BUR) on 18 March 2016. Further, according to paragraph 58(a) of the same decision, the international consultation and analysis (ICA) conducted for first Indonesia BUR. The process of ICA consists of two steps: (1) the technical analysis of the submitted BUR, and (2) followed by a workshop for the facilitative sharing of views.

The technical analysis of the BUR took place from 13 to 17 June 2016 in Bonn, Germany, and was undertaken by the following a team of technical experts (TTE). During the technical analysis, in addition to the written exchange, through the secretariat, to provide technical clarifications. Following the technical analysis of the BUR, the TTE prepared and shared a draft summary report with Indonesia on 13 September 2016 for its review and comment. Indonesia, in turn, provided its feedback on the draft summary report on 13 December 2016. The TTE responded to and incorporated the Party's comments and finalized the summary report in consultation with Indonesia on 21 February 2017. Finally, Indonesia was presented BURs at workshop for the facilitative sharing of views under the forty-sixth sessions of the Subsidiary Body for Implementation (SBI-46) on 15 May 2017.

The TTE concludes that most of the elements of information listed of the ICA guidelines have been included in the first BUR of Indonesia, in particular on GHG inventories. Indonesia reported the summary tables for the GHG estimates for the years 2000 and 2012 and, at the sectoral level, emission estimates for the entire time series 2000–2012, using tier 1 and tier 2 methodologies of the 2006 IPCC Guidelines. The TTE commends Indonesia for its efforts to report a high-quality inventory, and its use of the 2006 IPCC Guidelines.

With regard to capacity-building needs, Indonesia reported information appropriate to national circumstances. The TTE, in consultation with Indonesia, identified capacity-building needs to support for preparing national GHG inventories, in particular in the area of uncertainties. ICA has identified areas that need improvement and identified areas that need for capacity building.

Information

First biennial update report of Indonesia. Available at <http://unfccc.int/8722.php>.

Preparing for ICA and FSV the Malaysia Way

Azimuddin Bahari[1], E. Philip, [2] and Nur Zawani Ibrahim[1]
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Abstract

Malaysia's Biennial Updated Report (BUR) was produced by the national experts. Working groups (WGs) for greenhouse gas inventory, mitigation and Measuring, Reporting and Verification (MRV) were established for the BUR and National Communication. Each WG was responsible for the respective report with supervision by the Project Management Committee and the National Steering Committee for BUR/NC.

Preliminary questions were received three weeks prior to the centralised ICA session. These questions were organised in the following manner: General, GHG Inventory, Agriculture, Forestry and Other Land Use (AFOLU) and non-AFOLU session; mitigation, needs and support. Malaysia had two skype sessions with the Team of Technical Experts (TTE).

In preparing for the International Consultation and Analysis (ICA), Malaysia established a team consisting primarily the WGs Head and the sub WG heads. Upon receipt of questions, the core team prepared the answers and the ICA team vetted the answers before they were submitted to UNFCCC. The organisation of work helped Malaysia to reply to the TTE on timely manner. Malaysia completed the FSV in the 46th SBI session on the 15th May 2017. Due to budget constraints, a smaller team attended the FSV session in Bonn.

The ICA process helped enhance Malaysia's understanding of reporting requirements to increase transparency of reporting. In addition, sufficient funds, competent and dedicated team of experts would be the key to a timely delivery of the BURs and NCs. Hence, areas of improvement identified by the TTE can only be addressed with continuous capacity building and awareness.

Thailand's experience of FSV in ICA process

Patthra Pengthamkeerati
Office of Natural Resources and Environmental Policy and Planning (ONEP)
Ministry of Natural Resources and Environment (MoNRE), Thailand

Abstract

Thailand has submitted the First Biennial Update Report (BUR) since December 2015. Through the International Consultation and Analysis (ICA), this report was reviewed in two steps of (1) technical analysis by team of technical experts (TTE) and (2) facilitative sharing of views (FSV). All Parties were allowed to submit the questions, and TTE prepared a draft summary report. Then, TTE and Thailand reviewed and responded to the Party questions and comments, finalized summary report, and presented to SBI. In the FSV, questions from all Parties were welcomed by submitting the written questions in advance. In the third workshop of FSV under the Subsidiary Body for Implementation (SBI) in May 2017, Thailand gave a brief presentation on the First BUR with answering the submitted written questions, and then question and answer session was opened among the Parties. After this step, the FSV record will be publicly available on the UNFCCC website. Questions received during the first step of ICA process on Thailand's First BUR were mostly on (1) the descriptions on methodology, activity data and emission factor, (2) institutional arrangement and capacity building needs, and (3) area of improvement. In the FSV, questions were in techniques on emission estimations, what are gaps and needs, and how to improve accuracy for GHG inventory and mitigation (e.g., higher tiers and IPCC methodologies). Due to the ICA process and the awareness on more routine submission of GHG reports, the structure of reporting systems in Thailand has been established and the systems have strengthened the engagement of all the related agencies. In addition, domestic MRV in Thailand has been set up for both GHG inventory and mitigation actions to improve the transparency and accuracy of the report according to the TACCC principles.

UNFCCC Secretariat's Support for Strengthening Transparency in Reporting from non-Annex I Parties, and Status of Negotiations on the Transparency Framework under the Paris Agreement

Dominique Revet,
UNFCCC Secretariat

Abstract

At the forty-second session of the Subsidiary Body for Implementation (SBI)[1], Parties gave the UNFCCC Secretariat a mandate to make every effort to ensure that training is made available to all non-Annex I Parties on the use of the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas (GHG) Inventories, and building sustainable national GHG inventory management systems.

In 2017, the UNFCCC conducted 2 *Regional* W*orkshops on the Building of Sustainable National Greenhouse Gas Inventory Management Systems, and the Use of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories*. The first was conducted in collaboration with the IPCC and the CGE, and the second with the UNDP, FAO and the CGE.

The workshops consist of **five** sessions. The **first** session is for sharing of country experiences. The **second** session focuses on the key role of the national GHG inventory management system, including presentations and hands on materials to support the development of a national GHG inventory management system. For this, the Secretariat adapted training materials developed by the US EPA, including the National GHG Inventory System Template Workbook[2]. Sessions **three through five** provide training on the 2006 IPCC Guidelines, including general guidance, reporting, and sectoral guidance. Participants also learn how to utilize the IPCC inventory software for compiling various components of a national GHG inventory.

The UNFCCC Secretariat has developed a multiyear project and **is currently raising funds** to support the implementation of these regional training workshops on an annual basis **until 2021**, as well as the subsequent enrollment of country experts onto **on-line training and certification** on the use of the 2006 IPCC guidelines.

On agenda item on **transparency framework**, the **APA 1.3** invited Parties to make submissions, by 30 September 2017, requested the Secretariat to organize a pre-sessional roundtable focusing on issues covered in Parties' submissions, also including technical discussions on how cross-cutting issues listed in Paris Agreement Article 13, including, *inter alia*, its paragraphs 2-4, were considered in Parties' submissions.

Information

FCCC/CP/2015/10/Add.1
FCCC/SBI/2015/10, paragraph 29.
UNFCCC/SBI/2017/INF.9

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[1]FCCC/SBI/2015/10, paragraph 29.
[2]https://www3.epa.gov/climatechange/EPAactivities/internationalpartnerships/capacity-building.html

3.4 Session III

The Status of Reporting of Fluorinated Gases

Elsa Hatanaka
Greenhouse Gas Inventory Office of Japan (GIO), National Institute for Environmental Studies (NIES), Japan

Abstract

Although the reporting of F-gases such as HFCs, PFCs, and SF_6 are not mandatory for Non-Annex I countries, some WGIA countries are reporting such gases. There is a wider attempt to do so for HFCs, and to a lesser extent so for PFCs and SF_6. Of those, some at least partially cover a time-series of data - more so for PFCs, followed by HFCs and then SF_6.

Regarding estimation methodology, where available, reports indicated HFC methodology to be mainly *Revised 1996 IPCC Guidelines/GPG* Tier 1-based, with some exceptions. This was similar for SF_6, but PFC methodology split between the *Revised 1996 IPCC Guidelines/GPG* Tier 1 and the *2006 IPCC Guidelines* Tier 1/2. However, we would need to be mindful that the sample size of WGIA countries reporting F-gases is very small.

F-gases occur from various sources. For reference, on the last year when Japan was applying the *Revised 1996 IPCC Guidelines/GPG*, the main source for HFCs were refrigeration and air conditioning. The electronics industry was the main source for PFCs and electrical equipment was the main source for SF_6. HFC emissions were over and above the largest of the three F-gases, and PFC emissions and SF_6 emissions followed behind.

Here, the emissions for HFCs, PFCs, and SF_6 for WGIA countries were compiled, and several observations were made. It was noted that there were obvious peaks in emissions for certain years when reporting took place, following reporting requirements. It was also noted that the size of emissions were quite different between the gases, with HFCs being over and above the largest, with PFC emissions and SF_6 emissions following behind. It was also noted that it was difficult to evaluate consistency across years within one country's reporting when there was no time-series data.

However, it was observed that comparison between HFC/PFC/SF_6 emissions within one country, during one reporting, and comparison across countries for the same inventory year might be useful.

In summary, it is difficult to grasp the general picture of F-gas emissions because it is often unclear: 1) whether it is a true zero-emission situation (NO) or whether it is just a lack of data (NE), 2) whether it is a conscious choice not to report (intentional NE), or 3) whether the reported data are true (not under-estimated or overestimated). However, with the HFC phase down planned under the Montreal Protocol and other efforts under UNFCCC, it will surely be more important to further develop each country's F-gas inventory.

The Kigali amendment and Policy for fluorocarbons in Japan

Masahiko Suzuki
Ministry of the Environment, Japan

Abstract

Fluorocarbons are used in our life, such as Refrigerator, Air conditioning, Automobile air conditioner, spray can. Typical gases are chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs). These are known as Ozone Depleting Substances (ODS).

The ozone layer is a protective shield up in the air that absorbs harmful ultraviolet rays which can cause various negative impacts on human health and ecosystems. However, it has been destroyed by man-made chemicals (ODS). Therefore there is a "hole" in the ozone layer which is known as ozone hole.

In order to protect the ozone layer, in 1985, the global community has agreed to phase out ozone-depleting substances under the Vienna Convention for the Protection of the Ozone Layer. In 1987, the Montreal Protocol on Substances that Deplete the Ozone Layer was adopted.

CFCs and HCFCs are also greenhouse gases. Therefore, the phase-out of ODS under the Montreal Protocol has contributed and will continue to contribute to the mitigation of climate change. In addition, hydrofluorocarbons (HFCs) that are ozone friendly and therefore used as alternatives to CFCs and HCFCs are also greenhouse gases.

In Oct. 2016, at the 28th Meeting of the Parties (MOP 28) to the Montreal Protocol, the Parties adopted the amendment (called the Kigali Amendment) to phase down HFCs in order to reduce the use of HFCs, high global warming potential gases.

Taking into account the current situation, Japan established the "Act on Rational Use and Proper Management of Fluorocarbons" to carry out comprehensive measures throughout the life cycle of fluorocarbons. Japan will enhance the policies and measures through the act while continuously reviewing the prospect of fluorocarbons use.

Information

"Let's protect the ozone layer 2016 edition"
<http://www.env.go.jp/en/earth/ozone/leaf2016/Full.pdf>
"Act on Rational Use and Proper Management of Fluorocarbons"
<http://www.env.go.jp/en/earth/ozone/laws/ozone4.pdf>
METI, WG on measures to deal with Fluorocarbons (2017.3.1)
<http://www.meti.go.jp/committee/sankoushin/seizou/kagaku/freon_wg2/010_haifu.htmlt>(*Japanes only)
MOE and METI, WG on measures to deal with Fluorocarbons (2017.4.11)
<http://www.meti.go.jp/committee/sankoushin/seizou/kagaku/freon_wg/005_haifu.html>(*Japanese only)

Access

Ozone Depletion: Introduction (leaflet) <http://www.env.go.jp/en/earth/ozone/intro.html>
Ozone Depletion: Laws (*in Japan) <http://www.env.go.jp/en/earth/ozone/laws.html>
Ministry of the Environment, Japan <http://www.env.go.jp/en/earth/index.html>

Estimation Methodology for Fluorinated Gases

Kiyoto Tanabe
Co-Chair, IPCC Task Force on National Greenhouse Gas Inventories

Abstract

Under the United Nations Framework Convention on Climate Change (UNFCCC), Annex I Parties are required, as a minimum requirement, to contain in their national GHG inventories the information on CO_2, CH_4, N_2O PFCs, HFCs, SF_6 and NF_3 (Decision 24/CP.19). On the other hand, non-Annex I Parties are not obliged to report their emissions of fluorinated gases, although they are encouraged to report HFCs, PFCs and SF_6 (Decision 17/CP.8).

Nevertheless, inclusion of fluorinated gases in the national GHG inventories is recommendable to non-Annex I Parties because it is important in the light of:

- their high global warming potential (GWP);
- substantial use in industrial processes and in households; and
- significant opportunities for GHG abatement.

The *2006 IPCC Guidelines for National Greenhouse Gas Inventories* provide methodological guidance to estimate emissions of fluorinated gases from the following sources in the Industrial Processes and Product Use Sector (Volume 3).

- Fluorochemical Production (Category 2B9, Chapter 3.10 in Vol.3)
- Aluminium Production (Category 2C3, Chapter 4.4 in Vol.3)
- Magnesium Production (Category 2C4, Chapter 4.5 in Vol.3)
- Electronics Industry (Category 2E, Chapter 6 in Vol.3)
- Emissions of Fluorinated Substitutes for Ozone Depleting Substances (ODS) (Category 2F, Chapter 7 in Vol.3)
- Other Product Manufacture and Use (Category 2G, Chapter 8 in Vol.3)

For most of these source categories, simple Tier 1 methods with default emission factors are available. For the category 2F (Emissions of Fluorinated Substitutes for ODS), estimation of actual emissions may be a challenge for non-Annex I Parties because it requires complex calculation as well as data for many years in the past on production, exports, imports, etc of chemicals. The IPCC Inventory Software may help non-Annex I Parties overcome such difficulties.

Information

IPCC 2006, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). Published: IGES, Japan.

Access

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http://www.ipcc-nggip.iges.or.jp/software/index.html

Assessing F Gases- India Context

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Abstract

As a party operating under Article-5 of the Montreal Protocol, India is committed to phase-out Ozone Depleting Substances (ODSs) including Hydro-chloro-fluoro-carbons (HCFCs) in 2030 in accordance with the accelerated phase out schedule of the Montreal Protocol.

While phasing out the ODSs, there has been an increase in use of HFCs. Along with HFCs, consumption of other gases such as CFCs and SF_6 is also taking place in various manufacturing industries such as the air conditioning, refrigeration, fires extinguishers, Heat pumps, Circuit breakers, Foams, Aluminium, semiconductors, glass etc. The Table below indicates the estimates produced in India's National Communications and BUR1.

	Base Year	HFC-134a (Gg)	HFC-23 (Gg)	CF4 (Gg)	C2 F6 (Gg)	SF6 (Gg)	CO_2 eq (Gg)	% of Total Country Emissions
NATCOM 1	1994	NR	NR	NR	NR	NR	NR	-
NATCOM 2	2000	0.220	0.420	0.870	0.087	0.013	11966.1	0.92
BUR 1	2010	-	1.43	2.13	0.58	0.0042	36012.4	1.19

While the emissions of HFCs, PFCs and SF_6 are increasing, but awareness within the industry is being generated for replacing these with natural substitutes. It is envisaged that while acceding to the Kigali amendment, India will be able to reduce its HFC consumption in 2047 by 15% of the average consumption between 2024-26. There lies a potential of replacing HFCs used in the non-mobile cooling devices for domestic and commercial refrigeration and commercial and domestic air conditioners by iso-butane, propane, ammonia, and CO_2 amongst others that have lower GWP. It is estimated that about 77 percent of HFC needs in India's Refrigeration and Air conditioning sector can be replaced by naturals using currently available technologies. Prioritizing naturals is likely to result in direct emissions saving of 50 million tonnes of CO_2 equivalent by 2030 wrt to 2015.

It is proposed that a proper stock taking of the production, export and import is required from individual industrial units to reduce gaps associated with the present estimations. Further, to reduce the HFCs with high global warming potential, the way ahead includes steps for revising the standards for use of natural substitutes of HFCs in non-mobile refrigeration and air-conditioning sector, use of natural substitutes along with R&D to replace PFCs and SF_6.

Information

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NATCOM2, 2012. India's 2nd National Communication to UNFCCC. Published by MoEFCC, Government of India

BUR1, 2015. India's 1st Biennial Report to UNFCCC. Published by MoEFCC, Government of India

HCFC-Phase II, 2017. India's HCFC Phase out management Plan, Phase-II. Published by the Ozone Cell, Government of India.

3. Abstracts

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Hydrofluorocarbons (HFCs) emissions in China: an inventory for 2005–2013 and projections to 2050

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Abstract

Hydrofluorocarbons (HFCs) are widely used as substitutes for ozone-depleting substances are very potent greenhouse gases (GHGs). China's past and future HFC emissions are of great interest since China has emerged as a major producer and consumer of HFCs. Here, we present for the first time, a comprehensive inventory estimate of China's HFC emissions during 2005−2013. Results show a rapid increase in HFC consumption, and emissions in China during the period, and that the emissions of HFC with a relatively high global warming potential (GWP) grew faster than those with a relatively low GWP. The proportions of China's historical HFC CO_2-equivalent emissions to China's CO_2 emissions or global HFC CO_2-equivalent emissions increased rapidly during 2005−2013. Under the Business-as-usual Scenario that HFCs are used to replace a significant fraction of hydrochlorofluorocarbons (HCFCs) in China (to date, there are no regulations on HFC uses in China), emissions of HFCs are projected to be significant components of China's and global future GHG emissions. However, potentials do exist for minimizing China's HFC emissions, for example, if regulations on HFC uses are established in China. Our findings on China's historical and projected HFC emission trajectories could also apply to other developing countries, with important implications for mitigating global GHG emissions.

Fluorinated Gas Emission Trends in the Republic of Korea

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Abstract

The Republic of Korea estimated the fluorinated greenhouse gases (F gases) such as hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6) for the national greenhouse gas (GHG) inventory according to UNFCCC reporting guidelines (FCCC/SBSTA/2006/9).

Compared by gas, the share of the F gas emissions in the total GHG emissions have increased from 0.4% in 1990 to 2.9% in 2014. Although the F gases remains small amount compared to the other gases (CO_2 91.1%; CH_4 3.9%; N_2O 2.2% in 2014), the F gas emissions have extremely increased follow as growth of the electronics industry. In 2014, the F gas emissions reached 20.3 million tons of CO_2eq., and it has increased approximately 18 times when compare to the 1.2 million tons of CO_2eq. in 1990, and about 7.5%, 18.9 million tons of CO_2eq., compared to 2013.

In 2014, the large share of the F gas emissions were SF_6 and HFCs emissions as 46% and 42% respectively. HFC emissions were 8.5 million tons of CO_2eq. in 2014 representing 1.2% of the total GHG emissions. This increased by 768.7% since 1990 level and by 5.5% since 2013 level as a result of increased in high HFCs consumption for refrigerants.

PFC emissions in 2014 were 2.4 million tons of CO_2eq., accounting for 12% of the total F gas emissions and 0.4% of the total GHG emissions. This represented 8,793 times increase from the 1992 (when data were first collected) level and 4.6% increase from the previous year. The main sources of the PFC emissions are semiconductor and display manufacture processes.

SF_6 emissions in 2014 were 9.4 million tons of CO_2eq. representing 1.4% of the total GHG emissions. The SF_6 emissions increased by 54 times more than the 1990 level and by 10.3% compared to the previous year, due to increasing use of SF_6 in semiconductor, display manufactures, and electricity transmission facilities.

Comparing to the UNFCCC Annex I Parties' F gas emissions in 2012, The Republic of Korea has ranked the fourth place after the United States, Japan and Russian Federation, and also ranked the same with PFC emissions. The Republic of Korea has placed in the second only after the United States for SF_6, and in the eighth for HFC emissions.

Information

2016 National Greenhouse Gas Inventory Report of Korea
UNFCCC Old GHG Data (1990~2012)

Access

http://www.gir.go.kr/eng

3.5 Session IV

Importance of Developing Fluorocarbon Emissions Inventory and Emissions Mitigation Analysis

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Abstract

Climate change and its impacts have been the focus of international attention for decades, and mitigation and adaptation policies have been discussed among international negotiators and scientists. After the publication of the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC) in 2014[1)], the international negotiation process under the United Nations Framework Convention on Climate Change (UNFCCC) focused on and evaluated mid-term targets for reducing greenhouse gases (GHG) emissions, so called "Intended Nationally Determined Contributions (INDCs)"[2)], and all UNFCCC parties agreed "to keep a global temperature rise this century well below 2℃ and to drive efforts to limit the temperature increase even further to 1.5℃ above pre-industrial levels" at the 21st Conference of the Parties (COP21) to the UNFCCC in 2015, so called the "2℃ target".

In order to achieve the 2℃ target, it is required to mitigate GHGs largely at the global scale, not only energy-related CO_2 both in the demand side and the supply side but also non-energy related GHGs. The ratio of emissions of fluorinated gases such as hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF_6) regulated under the Kyoto Protocol was not high historically, but it was estimated that HFC emissions especially would increase largely in the future as alternative gases of chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs). In addition, fluorinated gases are considered as GHGs with high global warming potentials (GWPs), so that an impact of a mitigation action is also large and effective. However, due to lack of mitigation institutions and incentives for reducing fluorinated gases emissions, most of fluorinated gases have been released to atmosphere without any measures, especially in developing countries. Thus, it is important to develop fluorocarbon emissions inventory in Asian developing countries and utilize its inventory for future emissions mitigation analysis.

This presentation will introduce the following topics; 1) how important to reduce fluorocarbons emissions to achieve the 2℃ target, 2) impacts of offsetting CO_2 reduction efforts due to fluorocarbons emissions without any measures, 3) methodologies how to develop emissions inventory and emissions scenarios in the future, 4) cost competitiveness of fluorocarbon mitigation costs compared to CO_2 mitigation costs for achieving the 2℃ target[3)].

Information

1) IPCC AR5 WG3 (2014) Figure SPM4
2) UNEP (2015) The Emission Gap Report, Figure ES1, Figure ES2.
3) Carbon Pricing Leadership Coalition (2017) Report of the High-Level Commissions on Carbon Pricing.

Australia's National Inventory System for GHG inventory reporting

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Abstract

The Australian Government has invested for nearly 30 years been in institutional arrangements to that support the development of a comprehensive and efficient inventory system that effectively supports evolving Government climate policy and our international reporting obligations. By understanding that effective domestic emissions policies rely on emissions estimates clearly linked to an efficient inventory system (aligned with IPCC and UNFCCC reporting rules and emission estimation guidance), Australia has shown that centralising institutional arrangements as much as possible will help ensure estimates are robust and transparent. Australia's National Inventory System (NIS) is at the heart of the Australian Government's response to climate change. It allows us to;

- fulfil our international reporting obligations under the Paris Agreement, the UNFCCC and Kyoto Protocol,
- support the design and implementation and independent monitoring of domestic emission reduction policies,
- track Australia's progress towards its international emission reduction commitments; and
- provide a key input into emissions projections that inform decisions on future emission reduction commitments.

The NIS's success is in large part due to key investments in data collection and centralised data management systems. Australia centralises its inventory preparation in the Department of the Environment and Energy. Data collection is underpinned by legislation. The key legislative tool is Australia's mandatory National Greenhouse and Energy Reporting Scheme – NGERS. All major companies that emit emissions or produce or consume energy over a certain threshold must report annually - in accordance with methods based in national inventory methods. This underlying principle of NGERS has been crucial to ensuring data collected supports complete and accurate national inventory reporting. Prior to NGERs, the Department relied on voluntary collections utilizing existing datasets such as taxation and commercial systems. Investment in data management is ongoing. In particular the Australian Greenhouse Emissions Information System (AGEIS) which supports a high quality and transparent inventory consistent with requirements of the IPCC inventory guidelines. Design of the NIS provides for independent monitoring of government emission reduction measures. These measures include the Emissions Reduction Fund and its safeguard mechanism, the Renewable Energy Target and the Carbon Neutral Program. Inclusion of the effects of these measures in the national inventory is crucial for the Government's mitigation strategy. Building on inventory estimates, the Australian Government produces robust emissions projections to inform domestic policy debate and national emission targets. The Department of the Environment and Energy has also sought to share its experience in the development of inventory systems in the region. For example, in partnership with Thailand's Office of Natural Resources and Environmental Policy and Planning (ONEP), the Department of the Environment and Energy is supporting the design and development of the Thailand Greenhouse Gas Emissions Information System (TGEIS). Australia's NIS and its supporting institutional arrangements will always be a work in progress. With the resources available, the Department strives over time to improve the inventory system's efficiency, and its ability to deliver transparent, accurate, time series consistent and international comparable emission data, capable of supporting effective domestic abatement measures to achieve Australia's international emission reduction commitments.

Access

Australia’s National Greenhouse Accounts track national emissions from 1990 onwards as a nation, by state and by industry. This data is used to:

- meet Australia's reporting commitments under the United Nations Framework Convention on Climate Change (UNFCCC)
- track progress against Australia's emission reduction commitments; and

inform policy makers and the public.

http://www.environment.gov.au/climate-change/greenhouse-gas-measurement/tracking-emissions

The AGEIS is an online database that provides detailed greenhouse gas emissions data from the National Greenhouse Accounts. Data is available at the national and state level and can be queried through a dynamic interface and search function – See

http://ageis.climatechange.gov.au/

The *National Greenhouse and Energy Reporting Act 2007* (NGER Act) introduced a single national framework for reporting and disseminating company information about greenhouse gas emissions, energy production and energy consumption - See

http://www.cleanenergyregulator.gov.au/NGER

IPCC TFI: Recent Activities

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Abstract

Following the decision (IPCC/XLIV-5) taken at 44th Session of the IPCC (held in October 2016, Bangkok, Thailand), the IPCC Task Force on National Greenhouse Gas Inventories (TFI) has started its work on production of the Methodology Report titled the *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (2019 Refinement)* to be completed in May 2019.

The overall aim of the *2019 Refinement* is to provide an updated and sound scientific basis for supporting the preparation and continuous improvement of national greenhouse gas (GHG) inventories. It will have the same structure as the *2006 IPCC Guidelines* and will be used in conjunction with the *2006 IPCC Guidelines*. The refinement work will not revise the *2006 IPCC Guidelines*, but will update, supplement and/or elaborate the *2006 IPCC Guidelines* where gaps or out-of-date science have been identified. The *2019 Refinement* will not replace the *2006 IPCC Guidelines*, but will be used in conjunction with the *2006 IPCC Guidelines*.

The activities to maintain and improve the IPCC Emission Factor Database (EFDB) and IPCC Inventory Software have been progressing. More than 300 data were accepted by the EFDB Editorial Board in 2016 for inclusion into the database. The work to incorporate Tier 2 methods in the software is completed for Energy, Industrial Processes and Product Use, and Waste sectors.

The IPCC TFI continues its other activities supporting users of the IPCC Guidelines (e.g. organizing expert meetings, producing supporting materials) and collaboration with other organizations contributing to inventory-related capacity building programmes/activities (e.g. regional workshops organized by UNFCCC).

Access

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

National GHG Inventories for Development of Mitigation or NDC Actions

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UNEP/UNDP Global Support Programme (GSP)

Abstract

It is a common assumption that the national greenhouse gas (GHG) inventory and associate emission projections are the prerequisites to developing mitigation actions and Nationally Determined Contributions (NDCs). This presentation intends to contextualize the national GHG inventories of developing countries (Non-Annex 1 countries) with mitigation or NDC actions. It begins by providing the link between GHG inventories and mitigation/NDC actions, and goes on to bring out keys issues for Non-Annex I countries to consider in developing appropriate mitigation/NDC actions. Toward the conclusion, the presentation highlights typical technical mistakes most inventory teams make, including mistakes relating to preparation of mitigation/NDC actions. As a way forward, practical recommendations on national inventories/NC/BUR management have been suggested by the author.

3.6 Poster Session

Research on the Methane Estimation and Its Emission Factor from Landfill in China

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Abstract

Municipal solid waste (MSW) landfills have been identified as one of the major anthropogenic sources of greenhouse gas (GHG) emissions. In order to better understand the uncontrolled GHG emissions, a quantitative in-situ measurement and evaluation of methane (CH_4) and carbon dioxide (CO_2) emissions were conducted at experimental landfill site in Beijing, China.

The landfill is currently the largest sanitary landfill for non-hazardous waste in Beijing and covers an area of about 684,000 m^2. It is divided into 2 main layers. The top layer is divided into six cells and temporarily covered with the geomembrane (HDPE) over worked-out landfill cells before the final capping. A landfill gas (LFG) recovery system for electricity generation had been equipped in 2007.

CH_4 oxidation Factor was analyzed based on in-situ measurement and method of IPCC. CH_4 fluxes were measured by Light Shield Static Chambers; CH_4 concentration was measured by Agilent 7890A gas chromatography with FID detector.

CH_4 and CO_2 emission fluxes from soil covers surface have a large variation range, but the fluxes follow a seasonal variance obviously. Based on the results of strengthening monitoring by IDW analysis, The hot spot area of CH4 emission on November is the same as that on June, but the methane emission flux value was significantly higher than that in June. CH_4 and CO_2 emission fluxes maintain a high degree of synchrony. The correlation analysis showed that CH_4 and CO_2 emission fluxes had significant positive correlation（$r=0.861$, $P<0.01$）. The annual CH_4 oxidation factor is in the range of 0.01 to 0.82 and the average is 0.42, which is higher than the default value of IPCC (0.1).

Building Up a Low-Carbon Society: -Low-Carbon Community Development in China

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Abstract

Since announced carbon reduction target in 2009, China has promptly formed a three-pillar policy framework for responding to climate change. Among the framework lies one of the most dynamic climate policy "Low carbon Pilots". The pilots are designed to incorporate any form and any level of policy instruments so that great ideas could arise from the bottom. Low-Carbon Community is one of them.

In order to promote low carbon community, the NDRC has issued guidelines to standardized low carbon community and promote low carbon behavior thereof. Dozens of communities have been approved as National Low-carbon Communities. They have also demonstrated various low carbon technology and fostered low carbon behaviors.

Two important elements underlying the low carbon community establishment are the low carbon standards/guidelines and the low carbon technologies/products. Together they eliminate barriers that have been preventing application of low carbon technologies and products.

Furthermore, the New-Type Urbanization and Smart City initiatives are bring synergies into the development of Low-Carbon Community by setting requirements and providing essential technology and resources support.

Efficiency of Nitrification Inhibitors from Plants on Reducing Nitrous Oxide Emissions under Soil Incubation and Enhancing Maize (*Zea mays* L.) Growth, Yield and N Uptake in Pot Experiment

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Abstract

This study investigated the effects of nitrification inhibitors (NIs) from plants for retarding soil nitrogen (N) transformation to reduce greenhouse gas emissions and, subsequently, promote N fertilizer use by plant. Selected plants for this study included commercial neem [*Azadirachta indica*] oil, peppermint [*Mentha cordifolia*], sweet basil [*Ocimum basilicum*] and hoary basil [*Ocimum africanum*]. NIs from these plants were applied at a rate of 10% of fertilizer. Result from the incubation showed that application of N fertilizer with hoary basil tended to have the best efficiency in retarding nitrification process, compared with the application of N fertilizer only ($p<0.05$). This was due to retarding soil N_2O emission up to 21 days, and significantly reducing cumulative soil N_2O emission ($P = 0.0084$) by 29.33% when compared to the treatment with only N fertilizer. Pot experiment was also conducted to study the NI efficiency on maize (Suwan 4452) growth and N use efficiency. The result showed that NIs tended to enhance maize growth, and seemed to increase maize yields (biomass and grain). N content and N uptake by maize in the treatment of urea fertilizer and hoary basil were significantly higher when compared to the urea treatment ($P<0.0001$), but no NI effect was found in maize yield. These findings support that NIs from plants can retard N transformation of fertilizer, which subsequently may reduce fertilizer losses and greenhouse gas emission, and increase plant N use efficiency and crop productivity.

Estimating forest carbon stock at project-level REDD activity: a case study in the Paung Laung Reserve Forest, Myanmar

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Abstract

REDD+ ("Reducing Emissions from Deforestation and Forest Degradation and the Role of Conservation, Sustainable Management of Forests and Enhancement of Forest Carbon Stocks in Developing Countries") is of central importance in mitigating climate change. Since 2015, FD/FRI (Myanmar) and FFPRI (Japan) have conducted a collaborative research project in Myanmar entitled "Nesting a REDD+ project carbon accounting and monitoring system under the (sub-) national system". Carbon accounting of a REDD+ project should be properly nested under the (sub-) national carbon accounting system so that the project activities are consistent with the national policy and the project performance is legally registered in the national account. This study aims the following outputs;

i. Developing potential methods of refining activity data, emission factors and/or reference levels of the (sub-) national level for a REDD+ project in the study site
ii. Proposing a set of the project-level carbon accounting and monitoring systems composed by the developed methods

We selected Paung Laung Reserved Forest (ca. 160,500 ha) in Shan State as the project area. We have conducted ground-based inventory of emission factors in the project area, and been conducting an econometrics analysis in order to identify major causes and processes of deforestation in Myanmar. Our results imply that carbon stock estimation of bamboo would be important to evaluate emission factors in semi-evergreen forest type. We are developing an efficient method to measure forest biomass including bamboo to reduce the effort and labor in the field. We also plan to examine species composition changes relating to disturbance intensities. Data of species composition changes will be useful information on assessment for biodiversity and forest degradation.

To demonstrate development of FREL in the project area, we will estimate historical carbon stocks by our developing method. Our socio-economic studies (e.g. the approach of panel data analysis adopted by using statistical data such as population, GDP, etc.) will contribute to the adjustment for FREL levels under national circumstances.

Data Collecting Activity and Verification for Generating Credible GHG Inventory

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Abstract

Malaysia has been building a sustainable greenhouse gas inventory system since 2008. Continuous capacity building includes improving the activity data and emission factors data. Understanding the national data and then translating into an activity data was a challenge during the Second National Communication period. However, this has improved over the years.

Activity data is obtained from national statistic, national reports National Energy Balance, directly from private sectors and international databases. The collection, verification and quality control (QC) check of activity data was done through series of workshops with relevant data providers. In addition, focus discussion was also organized to obtain better activity data and in some cases emission factors.

Activity data for LULUCF sector is generated from a combination of data from national registry and verified through the geospatial images, levy or licenses issued. Additionally, these activity data are compared against international databases.

Two -track approach for quality assurance (QA) process is undertaken where the Project manager would verify the activity data against national data. Secondly, international experts are also appointed to verify the sectoral reports.

Activity Data Flows of Viet Nam during Estimation of the BUR1 and Recommendations After Having National GHG Inventory System

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Abstract

The first Biennial Updated Report (BUR1) of Viet Nam was submitted timely to UNFCCC in the December 9th, 2014. That submission has been reviewed by international consultation and analysis (ICA) process in the 4th November 2015 with many positively feedbacks from Team of Experts (TTE) during Technical Analysis. Even though, some challenges were found by working group during the estimating which mainly came from the collecting of activity data (AD). As the nature of a developing country, Vietnam has a limit of statistical data in the National Statistic Book. With the reason, may AD was collected by local experts and/or by expert adjustments with the best understanding of the domestic context.

The Primer Minister (PM) of Vietnam has been approved the National Greenhouse Gas Inventory System (NIS) by a PM Decision on 22nd December 2015. With the updating institutional arrangement of the NIS of Vietnam, the AD seems to be collected officially by General Statistics Office (GSO) from line Ministries. Some recommendations for the AD flows has been suggested for the AD collection. Consequently, Vietnam expects to provide the BUR2 in the end of 2017 with some improvements following recommendations of TTE and a facilitative sharing of views (FSV) for BUR1.

Information

http://unfccc.int/national_reports/non-annex_i_parties/ica/items/8621.php

First biennial update report of Viet Nam. Available at http://unfccc.int/8722.php

Second national communication of Viet Nam. Available at http://unfccc.int/national_reports/non-annex_i_natcom/items/2979.php

Summary report on the technical analysis of the first biennial update report of Viet Nam submitted on 8 December 2014 Viet Nam. Available at http://unfccc.int/resource/docs/2015/tasr/vnm.pdf

Access

Facilitative sharing of views. Available at http://unfccc6.meta-fusion.com/bonn_may_2016/events/2016-05-21-09-05/viet-nam

Effect of Rice Cultivation Practices on N_2O Emission Factor of managed agricultural soil

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Abstract

Rice cultivation is an important anthropogenic source of not only atmospheric methane (CH_4) but also nitrous oxide (N_2O). N_2O is one of the most important greenhouse gases, representing global warming potential 298 times higher than carbon dioxide (CO_2). Rice cultivation practices are related with application of N-fertilizer, animal manure, compost, crop residues and other organic N additions to the soil, and intermittent flooding have effects on N_2O emission. In this study, our measurement results of direct N_2O emission and amount of N applied to the soil from Thai rice fields published in peer-reviewed journals were compiled. The initial data set included five field measurements of N_2O collected during the rice-growing season from three sites. Amounts of total N applied to rice soil varied by order of magnitude from 18 to 261 kg N ha^{-1} $season^{-1}$. The emission factor from N input to flooded rice (EF_{1FR}) were also varied according to cultivation practice particular with water management scheme. In continuous flood field during wet season, estimation of EF_{1FR} from field measurement was 0.004±0.002 kg N_2O-N (kg N input)$^{-1}$ which is close to IPCC default value of EF_{1FR} 0.003 kg N_2O-N (kg N input)$^{-1}$ (range 0.00-0.006 kg N_2O-N (kg N input)$^{-1}$). However, during dry season where less water was introduced to rice field, estimation of EF_{1FR} was higher to 0.013± 0.010 kg N_2O-N (kg N input)$^{-1}$. Where as water management scheme of single and multiple drainage induced higher EF_{1FR} to 0.028±0.020 kg N_2O-N (kg N input)$^{-1}$. We also observed N_2O measurement from Alternative Wet and Dry (AWD) system where several shifts of aerobic and anaerobic condition were conducted, high emission factor was found to be 0.111±0.065 kg N_2O-N (kg N input)$^{-1}$.

It is noted that water management in rice cultivation is the important factor influent to direct N_2O emission from rice field which can be varied by order of magnitude. Therefore high uncertainty of N_2O emission from managed rice soil need to be concerned.

Information

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Sampanpanish P. (2013). The effects of the rice variety and type of fertilizer on the emission of greenhouse gases from rice paddy fields. Research Journal of Chemistry and Environment. 17(4). 42-48.

Towprayoon S., Smakgahn K., and Poonkaew S. (2005). Mitigation of methane and nitrous oxide emissions from drained irrigated rice fields. Chemosphere, 59(11), 1547-1556.

Capacity Building on Greenhouse Gas Inventory and Training Needs for ASEAN Countries

Nareerat Thanakasem, Chanyaphak Wathanachinda
Climate Change International Technical and Training Center, Thailand Greenhouse Gas Management Organization (Public Organization), Thailand

Abstract

Thailand Greenhouse Gas Management Organization (Public Organization) or TGO, which is the responsible agency in Thailand for GHG mitigation activities, recognized the crucial issue on climate change and initiated the establishment of Climate Change International Technical and Training Center or CITC which is aimed to be a "one-stop technical training center" and networking platform on mitigation and adaptation for ASEAN countries and other developing countries.

In 2016, CITC together with **Sirindhorn International Institute of Technology**, **Thammasat University** developed curriculum and manual on "Greenhouse Gas Inventory for ASEAN countries" This inventory manual is developed in regard to the preliminary analysis of "Need Assessment" results of all ASEAN countries; Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam, from the previous study, which was presented by the Thailand Greenhouse Gas Management Organization (TGO) in 2014, along with the feedback of a questionnaire from ASEAN members, collected by SIIT.

Regarding the results of the survey, more than 85 percent of ASEAN members know and understand the circumstances of their own national GHG inventory. In addition, more than 75 percent of them comprehend the concept of GHG inventory development in relation to the *Revised 1996 IPCC GL* as well as the *2006 IPCC GL*; however, they are still unclear about understand the differences between the two guidelines.

Additionally, this questionnaire assesses knowledge and comprehension about the basic concept to develop a national GHG inventory as well as methodology to estimate the quantity of GHG emissions from the experts in individual sector. This result includes 64 percent from the waste sector, 57 percent from the energy sector and 29 percent from IPPU and AFOLU sectors.

The results indicate that ASEAN members understand the basic concept of GHG inventory development as well as the methodology to estimate GHG emission, resulting in a high fraction of understanding about the meaning of activity data and emission factors as well as processes of uncertainty and Quality assurance/Quality control, Parenthetically, explanation of the verification process is an important issue for improvement of the GHG inventory.

In 2017, CITC together with Ministry of Natural Resource and Environment co-organized the "Training on Greenhouse Gas Inventory Management and Application of the 2006 IPCC Guidelines for ASEAN Countries" during 21-23 June 2017 at Thailand. There were 40 representatives from 8 ASEAN countries include Cambodia, Indonesia, Philippines, Lao PDR, Malaysia, Singapore, Thailand and Vietnam joined the training.

Information

Thailand Greenhouse Gas Management Organization (Public Organization), Executive summary,

3. Abstracts

Greenhouse Gas Inventory Curriculum Development Project, 2006.

Low carbon society and mitigation measures in Myanmar

Myint Soe, Hnin Hnin Aye
Myanmar

Abstract

National electrification is a top priority of Myanmar for sustainable economic development, and for poverty reduction. The Myanmar National Electrification Plan (NEP) aims to achieve 100 percent electrification by 2030.

1) Combined Cycle Power Plant Project

This is a well-known electricity generation option where much higher efficiencies than the usual simple cycle electricity generation are obtained. Developing country will not opt for this mitigation option because of its high initial cost and its technical complexity, compared to the trouble-free simple cycle. However, power system improvements in the energy efficiency and conservation programs in the existing facility (Thaton Gas Turbine Old Power Plant) considered promising solutions for alleviating some of the power shortages in the country and also in reducing GHG emissions.

2) Grit Extension Project

Power generation based on renewable energy sources (RES) will also reduce greenhouse gas emissions that would otherwise be produced from diesel-based generator use. The burning of fossil fuels emits greenhouse gases (GHG) that cause climate change and impose substantial environmental and economic costs. The increased use of renewable-resources-based electric power will produce local environmental and health benefits. Grit extension project is therefore considered for rural electrification to reduce emissions of greenhouse gases, ease growth in fossil fuel energy demand, curb the upward pressure on energy prices.

Information

Myanmar National Electrification Plan (NEP)
New Thaton Combined Cycle Power Plant Project

Access

MOEE, NCDDP Myanmar
http://cdd.drdmyanmar.org/en

Preparation of Japan's National Greenhouse Gas Inventory and Trends in GHG Emissions

Greenhouse Gas Inventory Office of Japan (GIO), National Institute for Environmental Studies (NIES), Japan

Abstract

Under Article 4 and 12 of the United Nations Framework Convention on Climate Change (hereinafter, Convention) and relevant decisions adopted by the Conference of the Parties, the Annex I parties including Japan (i.e. developed countries) are required to prepare national greenhouse gas (GHG) inventories and submit them to the Secretariat of the Convention. Moreover, Article 7 of the Act on Promotion of Global Warming Countermeasures, which provides for domestic measures under the Convention, requires the Government of Japan to annually estimate and make public Japan's GHG emissions and removals.

In accordance with these Articles, the Greenhouse Gas Inventory Office of Japan (GIO) develops GHG inventories in cooperation with private consultant companies on request by the Ministry of the Environment. Before preparing GHG inventories, GIO collects data from relevant ministries, agencies and organizations to estimate emissions and removals. Based on these data together with other data from different publications, GIO then compiles a GHG inventory.

Japan's total GHG emissions in FY2015 were 1,325 million tonnes of carbon dioxide (CO_2) equivalents (Mt CO_2 eq.; the same shall apply hereafter).

This is a decrease of 2.9% (39 Mt CO_2 eq.) and 6.0% (84 Mt CO_2 eq.) when compared to the FY2014 and FY2013 emissions (1,364 Mt CO_2 eq. and 1,409 Mt CO_2 eq.), respectively, mainly because of the decreased energy-related CO_2 emissions owing to lowered CO_2 emissions from power generation, as a result of decreased electricity consumption (due to energy conservation, cool summer and mild winter, etc.) and the improvement of carbon intensity in power generation (due to greater adoption of renewable energy, resuming nuclear power operation, etc.).

This is also a decrease of 5.3% (74 Mt CO_2 eq.) when compared to the FY2005 emissions (1,399 Mt CO_2 eq.), mainly due to the decreased energy-related CO_2 emissions in the industrial and transport sectors, despite the increase in hydrofluorocarbon (HFC) emissions from refrigerants following their substitution in place of ozone-depleting substances.

Access

http://www-gio.nies.go.jp/index-j.html

4. Report on Mutual Learning Session

4 Report on Mutual Learning Session

4.1 Overview of the Mutual Learning

Mutual Learning (ML) is an activity to improve the individual countries' inventories through the following series of processes: 1) exchanging inventories between two countries; 2) learning from a partner's inventory; and 3) exchanging comments on each other's inventories. The primary purpose of the ML is to improve GHG inventories by providing details of methods and data for GHG emission/removal estimation between two countries and exchanging comments on the methods and data. The ML is also expected to foster and strengthen a cooperative relationship among GHG inventory experts. Since the aim of the ML is not criticism or audit, participants can conduct a two-way communication, not a one-way communication like an examiner versus an examinee.

The first Mutual Learning was held on the Waste sector between GIO and Korea Environment Corporation (KECO) in the annual workshop in 2008. The Secretariat of WGIA introduced this activity in WGIA8 in 2010. With the participants' agreement, ML has been held in the following WGIAs as one of the sessions.

Table 4.1.1 History of Mutual Learning

		General	Energy	IP	Agriculture	LULUCF	Waste
2008-2010		Trial implementation Japan- Korea					
2010	**WGIA8**	Introduction to ML (with hands on training)					
2011	**WGIA9**	-	Indonesia-Mongolia	-	-	Japan-Lao PDR	Indonesia-Cambodia-Korea
2012	**WGIA10**	-	Cambodia-Thailand	Indonesia-Japan	Indonesia-Vietnam	-	China-Korea
2013	**WGIA11**	-	Lao PDR-Thailand	-	China-Myanmar	-	Malaysia-Vietnam
2014	**WGIA12**	-	Indonesia-Myanmar	-	China-Mongolia	Vietnam*	-
2015	**WGIA13**	Japan-Vietnam	-	-	Indonesia-Lao PDR	Cambodia-Mongolia	Korea-Myanmar
2016	**WGIA14**	-	Brunei-Korea	Myanmar-Malaysia	-	Indonesia-Lao PDR	Mongolia-Thailand
2017	**WGIA15**	-	Mongolia-Vietnam	-	-	Lao PDR - Myanmar	China-Philippines

*Reporting from Vietnam with comments from experts

Participants

In December 2016, the WGIA Secretariat advertised the ML to the participants of WGIA, and received applications from 15 groups from 7 parties. Considering the requirements of the applicants and an appropriate balance among sectors and the feasibility of implementation, the WGIA Secretariat set up three pairs (Mongolia and Vietnam on Energy sector, Lao PDR and Myanmar on LULUCF sector, and China and the Philippines on Waste sector) in March 2017.

Preparation

A few months before WGIA15, the chosen participants in the ML submitted the materials of their inventories to the WGIA Secretariat, including worksheets used for estimating emissions and reports describing details of methodologies, and exchanged the materials with their partner countries through the Secretariat. Through studying the materials provided by the partner country, the participants found good points as well as issues to improve in the partner's inventory. They also found issues to clarify by questions. Thus, participants wrote such comments and questions to their partner countries onto

"Question and Answer Sheets". After that, the "Question and Answer Sheets" were shared with the partner countries through the Secretariat. The partner countries responded to these comments and questions before WGIA15 took place.

Table 4.1.2 Preparation Process of Mutual Learning

Process	Schedule
Material submission	April 2017
Material exchange	Late April 2017
Studying the materials	During May 2017
Comment exchange	Early June 2017
Answers to comments	Mid-June 2017
Sessions	11th July 2017

Table 4.1.3 Submitted Materials for the MLs

Sector	Country	Inventory
Energy	Mongolia	First BUR in 2017 (Draft)
	Vietnam	First BUR in 2014
LULUCF	Lao PDR	TNC (Draft)
	Myanmar	INC in 2012
Waste	China	First BUR in 2016
	the Philippines	Study for INDC in 2015

Discussions

In the WGIA15, the ML participants were divided into three sessions (Energy, LULUCF and Waste) to discuss sector-specific issues based on preliminary comment exchanges. In order to encourage a frank discussion and to ensure confidence, these sessions were held as closed-door discussion.

In these sessions, participants discussed their counterpart's inventory and national system, sharing their own technical issues (e.g. data collection, adoption of emission factors, national system, etc.) with the partner to overcome the obstacles, and clarifying matters in their own inventory which should be improved. Due to the adequate preliminary preparation of comment exchange over two months, the participants could deeply learn about actual issues in each other's inventory.

Since the ML provides a good opportunity to study on both the counterparts' and the participants' own inventories, participants have shown their interests to continuous to take part in this programme in future WGIAs. The points of discussions and outcomes of each individual ML session are summarized in the following sections (4.2 - 4.5).

4.2 Energy

Sector Overview

Mongolia and Vietnam participated in an ML session on the Energy sector. General information of the two countries is shown in Table 4.2.1 below.

Table 4.2.1 Sector Overview for the ML on Energy Sector

	Mongolia	Vietnam
National total GHG emissions (kt-CO_2 eq., with LULUCF)	10,031 (in 2014, BUR2017)	246,801 (in 2010, BUR2014)
GHG emissions in the Energy sector (kt-CO_2 eq.)	17,268 (in 2014, BUR2017)	141,171 (in 2010, BUR2014)
Responsible agency for the inventory	Ministry of Environment, Green Development and Tourism	Ministry of Natural Resources and Environment
Estimation methodology	2006 IPCC Guidelines	Revised 1996 IPCC Guidelines and partially 2006 IPCC Guidelines
Source of emission factors	Basically, IPCC default values and partially country-specific values	Basically, IPCC default values and partially country-specific values
Source of activity data	National Statistics	Energy Balance Table in Vietnam and National Statistics

Materials Used

In order to prepare for the ML session in WGIA15, both countries exchanged their documents relevant to the Energy sector two and a half months before the workshop. The exchanged documents were as follows:

Mongolia
- Excel files with estimation worksheets from 1990 to 2014, in the folders titled “energyBackground” and “energySectoral”
- Common Reporting Format Tables from 1990 to 2014

Vietnam
- National GHG Inventory Report 2010 of Vietnam, Final Draft
- Energy Balance Tables in Vietnam for 2005 and 2010
- Excel file with estimation worksheets titled “L3,4 Energy 2010 estimation”

Questions and Answers

After receiving the materials described above, both countries studied them and provided questions and comments to their partner country approximately 40 days before the workshop. The classification and the number of questions are summarized in Table 4.2.2.

Table 4.2.2 Classification of Questions and Comments in the ML on Energy Sector

Classification of questions	Number of questions	
	from Vietnam to Mongolia	from Mongolia to Vietnam
Acquisition of activity data	1	5
Adoption of emission factors or parameters	1	2
Estimation methods	3	0
Institutional arrangement	0	2
Others	1	7

Outcomes of the Mutual Learning Session

Through the ML session, several issues and good practices in the participating countries' preparation of GHG inventory were identified.

➢Issues and Solutions

Some issues were pointed out through the ML as follows:

1) Fuel consumption of civil aviation should be disaggregated between domestic and international flights.
2) Fuel consumption of road transportation types (car, motorcycle, etc.) should be disaggregated.
3) When comparing country-specific emission factors (CSEF) with default values, the reason of the difference should be explained if CSEF was much lower or much higher than the default values.
4) Fuel consumption of the energy and IPPU sectors (e.g. non-energy use) should be disaggregated.
5) The activity data (AD) from different sources should be matched each other.
6) Transition of national institutional arrangement from project-based to stable is necessary.
7) Duty and responsibility among line ministries, especially finance mechanisms, were not identified.

➢Good Practices

Some good practices were pointed out through the ML as follows:

Mongolia

1) The emissions were estimated from 1990.
2) The 2006 IPCC Guidelines were applied.
3) Country-specific emission factors for four types of coal were developed.
4) Common Reporting Format tables were produced for full time-series.

Vietnam

1) Energy balance tables for 2 inventory years (2005 & 2010) were provided.
2) The institutional arrangement was already set up at the highest level.
3) First BUR was submitted.
4) Documentation of BUR1 was well done (The NIR 2010 was provided).

➢Possible Follow-up Activities

The following were pointed out as possible follow-up activities:

1) To estimate time-series;
2) To establish and maintain a sustainable national institutional arrangement;
3) To develop and maintain national energy balance tables.

➢Suggestions for Future MLs

The participants' suggestions for future ML were as follows:

1) To provide Japan's experience, especially for the transport category;
2) To discuss the manner for AD collection (not limited to energy sector).

Table 4.2.3 Participants in the ML on Energy Sector

Parties	Name	Organization	Title
Mongolia	Ms. Tegshjargal Bumtsend	Climate Change Project Implementing Unit of the Environment and Climate Fund under the Ministry of Environment and Tourism of Mongolia	GHG Inventory Specialist (energy and IPPU)
	Dr. Gerelmaa Shaariibuu		GHG Inventory Specialist (waste)
	Ms. Sanaa Enkhtaivan		GHG Inventory Specialist (AFOLU)
Vietnam	Ms. Trong Nghia Nguyen	Institute of Industrial Policy and Strategy, Ministry of Industry and Trade, Viet Nam	Lead Researcher on Climate Change Mitigation
	Mr. Ngan Ngoc Vy	Institute of Strategy and Policy on Natural Resources & Environment	Deputy Head in Charge of Division
	Dr. Phuong Nam Nguyen	Vietnam Center for Technology Responding to Climate Change (CliTech), Department of Climate Change (DCC)	Head of Division, Climate Change Mitigation Technology
Facilitators and Resource persons	Mr. Akira Osako (Facilitator)	Greenhouse Gas Inventory Office of Japan (GIO), National Institute for Environmental Studies	GHG Inventory Expert
	Mr. Naofumi Kosaka (Co-facilitator)		GHG Inventory Expert
	Mr. Takashi Morimoto (Resource person)	Environment and Energy Dept., Mitsubishi UFJ Research and Consulting Co., Ltd.	Chief Analyst
	Mr. Masaaki Nakamura (Resource person)		Analyst
Observers	Mr. Takumi Ichikawa (Workshop organizer)	Ministry of the Environment, Government of Japan	Chief Official
	Ms. Akiko Tanaka (WGIA secretariat)	Greenhouse Gas Inventory Office of Japan (GIO) National Institute for Environmental Studies	GHG Inventory Expert
	Mr. Hiromi Yoshinaga (WGIA secretariat)		GHG Inventory Expert

4.3 Land Use, Land-Use Change and Forestry Sector

Sector Overview

Lao PDR and Myanmar participated in ML session for the Land Use, Land-Use Change and Forestry sector. The general information of the two countries is shown in Table 4.3.1 below.

Table 4.3.1 Sector Overview for the ML on LULUCF Sector

	Lao PRD	Myanmar
National total GHG emissions (kt-CO_2 eq., with LULUCF)	50,742 (in 2000, SNC2013)	-67,821 (in 2000, INC 2012)
GHG emissions/removals in the LULUCF sector (kt-CO_2 eq.)	41,916 (in 2000, SNC2013)	-101,817 (in 2000, INC 2012)
Responsible agency for the inventory	The Ministry of Natural Resources and Environment	The Ministry of Natural Resources and Environmental Conservation (MoNREC)
Estimation methodology	2006 IPCC Guidelines, Tier 1 and Tier 2	2006 IPCC Guidelines , Tier 1
Source of emission factors	Country-specific parameters and IPCC default values	IPCC default values
Source of activity data	Mainly from national forest inventory report/system	Mainly from national statistics and national forest inventory

Materials Used

In order to prepare for ML session in WGIA15, both countries exchanged their documents relevant to GHG emission/removal estimation for the sector to the Secretariat two months before the workshop. The exchanged documents were as follows:

Lao PDR:
- 3B1a_FL Remaining FL.xls
- 3B1b_Land Converted to FL.xls
- 3B2b_Land Converted to CL.xls
- 3B3b_Land Converted to GL.xls
- 3B4a_WL Remaining WL.xls
- 3B4b_Land Converted to WL.xls
- 3B5b_Land Converted to SL.xls
- 3B6b_Land Converted to OL.xls
- 3C1a_Biomass Burning FL.xls
- 3C1d_Biomass Burning WL.xls
- 3C2_Liming.xls

Myanmar:
- Myanmar's first national communication under the UNFCCC in 2012 (PDF) (Chapter 3)
- LULUCF database.doc
- compile report GHG inventory chapter 3.doc
- forestry summary report with worksheets.doc

Questions and Answers

After receiving the estimation documents, both countries studied them and submitted questions and comments to the partner country approximately one month before the workshop through the Secretariat. The classification and the number of the questions are listed in Table 4.3.2.

Table 4.3.3 Classification of Questions and Comments in the ML on LULUCF Sector

Classification of question	Number of questions	
	from Lao PDR to Myanmar	from Myanmar to Lao PDR
Acquisition of activity data	6	5
Adoption of emission factors or parameters	6	6
Estimation methods	1	2
Institutional arrangement	0	5
Others	2	4

Outcomes of the ML Session

Through the ML, several issues and good practices in the participating countries' preparation of GHG inventory have been identified.

➢Issues and solutions

The issues were:

1) Some categories were not estimated.
2) Key category analysis was not conducted, but it will be done in the future.
3) Preparation of land-use change matrix was not completed, but it will be done in the future;
4) Country-specific parameters were not used for some categories, but they would be taken into account in the future.
5) Construction of time series GHG estimations was not implemented, but it would be done in the future.

➢Good Practices

The good practices identified for both countries were:

1) The institutional arrangement for GHG inventory was established and worked well.
2) 2006 IPCC Guidelines were applied for calculation of GHG emissions and removals based on a good understanding of methodologies.
3) Coordination between the GHG inventory agency and other organizations was done.

➢Possible Follow-up Activities

Both countries agreed that applying good practices and/or good parameters used in the GHG inventories of similar countries was important. Possible follow-up activities are:

1) Methodologies and data, including land representation, should be improved.
2) Moving to higher tier for key categories with the use of country-specific parameters is necessary.
3) Quality Assurance and Quality Control (QA/QC) procedure should be implemented.
4) Consistency on the time series data is required.
5) Parameters made from research could not be used as country-specific parameters. Before using them as country-specific parameters, quantitative assessment is needed.

Table 4.3.4 Participants in the ML on LULUCF Sector

Country	Name	Organization	Position
Lao PDR	Mr. Mone Nouansyvong	Ministry of Natural Resources and Environment (MONRE)	Consultant (TNC Project)
	Mr. Bounthee Saythongvanh	Ministry of Natural Resources and Environment (MONRE)	Deputy Director
	Mr. Boun Eua Khamphilavanh	Ministry of Natural Resources and Environment (MONRE)	Head of Unit
Myanmar	Mr. Kyaw Moe Aung	Second National Communication Project, Myanmar	Project Coordinator
	Mr. Aung Thu Han	Environmental Conservation Department Ministry of Natural Resources and Environmental Conservation, Myanmar	Assistant Director
	Dr. Myat Su Mon	Forest Department, Co-Leader of GHG Inventory Working Group for Second National Communication Project, Myanmar	Assistant Director
	Dr. Khin Lay Swe	Leader of GHG Inventory Working Group for Second National Communication Project, Myanmar	External Environmental Expert, Agriculture Sector
	Dr. Aaron J. M. Russell	Myanmar Country Representative, GGGI	MRV on GHG Emissions, Mitigation Action and Support
	Dr. Nyo Mar Htwe	Yezin Agricultural University	Lecturer
	Dr.Ei Ei Theint	Department of Agriculture	Deputy Staff Officer
Facilitators and Resource persons	Dr. Midori Yanagawa (Facilitator)	Greenhouse Gas Inventory Office of Japan (GIO), National Institute for Environmental Studies	GHG inventory expert
	Ms. Atsuko Hayashi (Co-facilitator)		
	Mr. Atsushi Sato (Resource person)	Environment and Energy Dept., Mitsubishi UFJ Research and Consulting Co., Ltd.	Senior researcher

4.4 Waste Sector

Sector Overview

China and the Philippines participated in an ML session for the Waste sector. The general information of the two countries is shown in Table 4.4.1 .

Table 4.4.1 Sector Overview for the ML on Waste Sector

	China	Philippines
National total GHG emissions (kt-CO_2 eq., with LULUCF)	11,320,000 (in 2012, BUR2016)	21,767 (in 2000, SNC2014)
GHG emissions in the Waste sector (kt-CO_2 eq.)	158,000 (in 2012, BUR2016)	11,599 (in 2000, SNC2014)
Responsible agency for the inventory	National Development and Reform Commission (NDRC)	Climate Change Commission
Organization in charge of Waste sector	Chinese Research Academy of Environmental Sciences (CRAES)	Environmental Management Bureau (EMB), Department of Environment and Natural Resources (DENR)
Estimation methodology	Tier 2 and Tier 1 of the Revised 1996 IPCC Guidelines and the IPCC Good Practice Guidance (referencing the 2006 IPCC Guidelines)	Tier 1 of the 2006 IPCC Guidelines
Source of emission factors	Country-specific parameters and IPCC default values	IPCC default values
Source of activity data	National statistics	National statistics and Estimations from population statistics

Materials Used

In order to prepare for the ML session in WGIA15, both countries exchanged their documents relevant to GHG emission estimation of the sector with each other two months before the workshop. The exchanged documents were as follows:

China:
- Second National Communication on Climate Change of The People's Republic of China (Excerpt - Waste Treatment)
- First Biennial Update Report on Climate Change of The People's Republic of China (Excerpt - Waste Treatment)
- Overview of provincial greenhouse gas inventory guidelines
- 4_Waste(1)--GPG2000.xls

the Philippines:
- Second National Communication to the United Nations Framework Convention on Climate Change, 2014
- Intended Nationally Determined Contributions, Communicated to the UNFCCC on October 2015
- B-LEADERS, Philippines Mitigation Cost-Benefit Analysis, Waste Sector Result, 2015
- B-LEADERS, Enhanced Cost-Benefit Analysis (CBA) of Mitigation Options for the Philippines, 2016

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- LECB PHL Project, Climate Change Mitigation Options for the Solid Waste Sector (Assessment of Implementation Requirements of Mitigation Options and Promotion of the Use of Eco-efficient Soil Cover), Minutes of the Focus Group Discussion, 2015
- The president of the Philippines, Executive Order No.174, 2014
- EMB-DENR, Memorandum Circular No. 009, 2016
- EMB-DENR, Special Order No. 297, 2016
- Solid Waste Calculations as of 042716
- Waste Sector Calculations as of 042716
- Wastewater Calculations as of 042716
- Domestic-WW-pop-alloc-shift-w-sludge-remove-2014-04-26.xlsx
- Industrial-WW-treatadjusts-2016-04-2725.xlsx

Questions and Answers

After receiving the materials described above, both countries studied them and provided questions and comments to their partner country approximately one month before the workshop. The classification and the number of the questions were shown in Table 4.4.2.

Table 4.4.3 Classification of Questions and Comments in the ML on Waste Sector

Classification of question	Number of questions	
	from the Philippines to China	from China to the Philippines
Acquisition of activity data	7	7
Adoption of emission factors or parameters	1	0
Estimation methods	1	0
Uncertainty analysis	1	1
Mitigation measures	0	2
Others	2	2

Outcomes of the Mutual Learning Session

Through the ML, several issues and good practices in the participating countries' preparation of GHG inventory were identified.

➢Issues

Main issues discussed in the session were as follows.

1) Activity data (AD) acquisition issues persisting for solid waste treatment activities in rural areas;
2) Lack of separate monitoring on the amount of open-burned waste and possible double-counting with the Agriculture sector;
3) Lack of centralized data compilation system which collects data from enterprises through municipalities;
4) Necessity to develop regional emission factors (EFs) for wastewater treatment and parameters for solid waste disposal.

➢Good Practices

Good practices of participant countries' inventories were pointed out as follows.

<u>China:</u>

1) Bottom-up data collection procedures have been in place.
2) The inventory system supports the domestic carbon trading.

3) Industry-based reporting system has been in place.

Philippines:
1. AD estimation is based on internal assumptions using extrapolation with income class and size of city.
2. Institutionalized inventory management and reporting system is in place.
3. By regulation, biodegradable waste must be treated at the village level and this practice contributes to reducing GHG emissions.

➢Suggestions for future ML and WGIA

Suggestions for future ML and WGIA from participants were as follows.
1. Focus on special topics, such as AD collection, QA/QC, key parameters (degradable organic carbon (DOC), methane correction factor (MCF), Compositions etc.).
2. Have brief presentations on topics during ML.

Table 4.4.4 Participants in the ML on Waste Sector

Parties	Name	Organization	Title
China	Prof. Qingxian Gao	Chinese Research Academy of Environmental Sciences (CRAES), Center for Climate Change Impact Research (CCIR)	Professor
	Dr. Zhanyun Ma		Professor
	Mr. Siyang Yu	Sino-carbon Innovation and Investment Ltd., Co.	Senior Consultant
	Prof. Jianxin Hu	Peking Univ., College of Environmental Sciences & Engineering	Professor
Philippines	Mr. Crispian N. Lao	National Solid Waste Management Commission	Commissioner and Vice Chairman
	Ms. Maria Delia Cristina M. Valdez	Environmental Management Bureau (EMB), Department of Environment and Natural Resources (DENR)	Senior Environmental Management Specialist
Facilitators and Resource persons	Dr. Takefumi Oda (Facilitator)	Greenhouse Gas Inventory Office of Japan (GIO), National Institute for Environmental Studies	GHG Inventory Expert
	Ms. Elsa Hatanaka (Co-facilitator)		Senior Researcher
	Mr. Hiroyuki Ueda (Resource person)	Environment and Energy Dept., MURC	Senior Analyst
Observer	Mr. Masahiko Suzuki (Workshop organizer)	Ministry of the Environment, Government of Japan	Official

Annex I: Agenda

Annex I: Agenda

The 15th Workshop on GHG Inventories in Asia (WGIA15)
- Capacity Building for Measurement, Reporting and Verification -
Period: 11th – 14th July, 2017,
Venue: Hilton Nay Pyi Taw, Myanmar

Study Tour – Visiting Natural "Teak" Forest and "Teak" Hardwood Plantation Area in Bago Yoma Mountain Range, Bago Region

Day 1: Morning, 11th July 2017		
8:00 - 9:00	**Participant Registration**	
8:30-12:00	**Mutual Learning (Closed session: open only for countries participating in the session, facilitators, resource persons, and the WGIA Secretariat)**	
Sector	LULUCF	
Combination of Participating Countries	**Lao PDR – Myanmar**	
Room	Gandamar	
Facilitator	Dr. Midori Yanagawa (GIO)	
Rapporteur	Dr. Takefumi Oda (GIO)	
Note: Mutual learning sessions are closed sessions in order to secure confidentiality of information so that countries participating in the mutual learning session can provide unpublished information. Therefore, only participating countries in the sessions, facilitators, resource persons and the WGIA Secretariat can enter the rooms. In addition, facilitators and resource persons will be registered in advance and receive confirmation of participation from the countries engaging in mutual learning and the WGIA Secretariat.		
9:00 – 12:30	**UNFCCC Meeting**	
	Room: Grand Ballroom	
	Building sustainable national greenhouse gas inventory management systems Mr. Dominique Revet (UNFCCC)	
12:00-14:00	***Lunch***	
Day 1: Afternoon, 11th July		
14:00-17:30	**Mutual Learning (Closed sessions: open only for countries participating in the session, facilitators, resource persons, and the WGIA Secretariat)**	
Sector	Energy	Waste
Combination of Participating Countries	**Mongolia – Vietnam**	**China – Philippines**
Room	Gandmar	Kumudra
Facilitator	Mr. Akira Osako (GIO)	Dr. Takefumi Oda (GIO)
Rapporteur	Dr. Takefumi Oda (GIO)	

Annex I

Day 2: Morning, 12th July, 2017			
8:00 - 8:30	**Participant Registration**		
8:30 – 9:55	**Opening Session**		
	Room: Grand Ballroom	**Chair: Mr. Hla Maung Thein (Myanmar)**	**Rapporteur: Mr. Naofumi Kosaka (GIO)**
8:30 – 8:40	Welcome Address		Union Minister, Minister of the Ministry of Natural Resources and Environmental Conservation (MONREC, Myanmar)
8:40 – 8:50	Welcome Address		Mr. Yoshio Nakura (MOEJ)
8:50 – 9:00	Overview of WGIA15		Mr. Hiroshi Ito (GIO)
9:00 – 9:30	*Group Photo & Tea Break*		
9:30 – 9:50	Latest Japanese Climate Change Policies		Mr. Takumi Ichikawa (MOEJ)
9:50 – 10:10	Myanmar National Climate Change Policy		Mr. Than Aye, Deputy Director General Environmental Conservation Department (Myanmar)
10:10 – 10:30	**Questions and Answers**		**All**
10:30 – 12:00	**Session I: Updates on the National Communications (NCs) and Biennial Update Reports (BURs) from Non-Annex I Parties**		
	Room: Grand Ballroom	**Chair: Mr. Takahiko Hiraishi (IGES)**	**Rapporteur: Mr. Naofumi Kosaka (GIO)**
10:30 – 10:35	Introduction to the Session		Dr. Takefumi Oda (GIO)
10:35 – 10:50	Brunei Darussalam's Initial National Communication		Mr. Muhammad Nabih Fakhri Matussin (Brunei)
10:50 – 11:05	Philippine Second National Communication (SNC) on Climate Change		Ms. Maria Delia Cristina M. Valdez (Philippines)
11:05 – 11:20	Cambodia's Second National Communication		Mr. Leang Sophal (Cambodia)
11:20 – 11:35	Introduction of 1st Biennial Update Report on Climate Change of China		Prof. Gao Qingxian (China)
11:35 – 12:00	**Questions and Answers**		**All**
12:00 – 13:30	*Lunch*		

Day 2 Afternoon, 12th July			
13:30 – 15:00	**Session II: Countries' Experience with the ICA Process and the Support for Strengthening Transparency in Reporting from Non-Annex I Parties**		
	Room: Grand Ballroom	**Chair: Prof. Rizaldi Boer (AB/ Bogor Agricultural University)**	**Rapporteur: Mr. Naofumi Kosaka (GIO)**
13:30 – 13:35	Introduction to the Session		Ms. Atsuko Hayashi (GIO)
13:35 – 13:50	Indonesia Experience of International Consultation and Analysis (ICA) Process		Dr. Joko Prihatno (Indonesia)
13:50 – 14:05	Preparing for ICA and FSV the Malaysia Way		Dr. Elizabeth Philip (Malaysia)
14:05 – 14:20	Thailand's Experience of FSV in ICA Process		Dr. Patthra Pengthamkeerati (Thailand)
14:20 – 14:35	UNFCCC Secretariat's Support for Strengthening Transparency in Reporting from non-Annex I Parties, and Status of Negotiations on the Transparency Framework under the Paris Agreement		Mr. Dominique Revet (UNFCCC)
14:35 – 15:00	**Questions and Answers, Discussion**		**All**
15:00 – 15:30	*Tea Break*		
15:30 – 17:35	**Session III: Fluorinated Gas Emissions from Non-Annex I Parties**		
	Room: Grand Ballroom	**Chair: Dr. Sumana Bhattacharya (AB/ Iora Ecological Solutions Pvt ltd.)**	**Rapporteur: Mr. Naofumi Kosaka (GIO)**
15:30 – 15:50	Introduction and the Status of Reporting of Fluorinated Gases		Ms. Elsa Hatanaka (GIO)
15:50 – 16:05	The Kigali Amendment and Policy for Fluorocarbons in Japan		Mr. Masahiko Suzuki (MOEJ)
16:05 – 16:20	Estimation Methodology for Fluorinated Gases		Mr. Kiyoto Tanabe (IPCC/TFI)
16:20 – 16:35	**Questions and Answers, Discussion**		**All**
16:35 – 16:50	Fluorinated Gas Emissions in India (Tentative)		Dr. Sumana Bhattacharya (India)
16:50 – 17:05	Hydrofluorocarbon Emissions in China: An Inventory for 2005− 2013 and Projections to 2050		Prof. Jianxin Hu (China)
17:05 – 17:20	Fluorinated Gas Emission Trends in the Republic of Korea		Ms. Min-Sun Kim (Korea)
17:20 – 17:35	**Questions and Answers, Discussion**		**All**
18:30 – 20:30	*Welcome Reception hosted by Japan & Myanmar*		

Annex I

Day 3 Morning, 13th July 2017			
9:00 – 12:00	**Session IV: GHG Inventories, Projections and Mitigation Actions**		
	Room: Grand Ballroom	**Chair: Dr. Sirintornthep Towprayoon (AB/ King Mongkut's University of Technology Thonburi)**	**Rapporteur: Mr. Naofumi Kosaka (GIO)**
9:00 – 9:05	Introduction to the Session		Dr. Midori Yanagawa (GIO)
9:05 – 9:30	Importance of Developing Fluorocarbons Emissions Inventory and Emissions Mitigation Analysis		Dr. Tatsuya Hanaoka (NIES/AIM)
(Cancelled)	GHGs Emission and Mitigation Actions in Iran in 2020-2030 Horizon		Mr. Mohammad Sadegh Ahadi (Iran)
9:30 – 9:45	Australia's National Inventory System for GHG Inventory Reporting		Mr. Haakon Marold (Australia)
9:45 – 10:15	**Questions and Answers, Discussion**		**All**
10:15– 11:00	*Tea Break*		
11:00 – 11:15	IPCC TFI: Recent Activities		Dr. Baasansuren Jamsranjav (IPCC/TFI/TSU)
11:15 – 11:30	National GHG Inventories for Development of Mitigation or NDC Actions		Mr. Stanford Mwakasonda (UN Environment, Global Support Programme (GSP))
11:30 – 12:00	**Questions and Answers, Discussion**		**All**
12:00 – 13:30	*Lunch*		
13:30 – 15:00	**Poster Session**		
	Room: Foyer		
15:00 – 16:30	**Wrap-up Session**		
	Room: Grand Ballroom	**Chair: Prof. Yukihiro Nojiri (GIO)**	
15:00 – 15:15	Summary of the Mutual Learning Sessions		Dr. Takefumi Oda (GIO)
15:15 – 15:30	**Discussion**		**All**
15:30– 15:45	*Tea Break*		
15:45 – 16:00	Summary of the Plenary Sessions		Mr. Naofumi Kosaka (GIO)
16:00 – 16:10	**Discussion**		**All**
Closing Remarks			
16:10 – 16:20	Closing Remarks		TBD (Myanmar)
16:20 – 16:30	Closing Remarks		Dr. Yukihiro Nojiri (GIO)

Day 3 Evening, 13th July			
17:00 – 18:00	**Joint Meeting of the WGIA Organizing Committee and Advisory Board (Members of the OC and AB, and the WGIA Secretariat are required to attend)**		
	Room: Gandamar	**Chair: Mr. Hiroshi Ito (GIO)**	
17:00 – 17:30	Review of Activities in WGIA15		All
17:30 – 18:00	Discussion on Topics for WGIA16		All

Study Tour, 14th July 2017	
6:30 – 16:00	**Study Tour – Visiting Natural "Teak" Forest and "Teak" Hardwood Plantation Area in Bago Yoma Mountain Range, Bago Region**

Poster Sessions			
13:30 – 15:00	**Room: Foyer**		
Number	**Topic**	**Title**	**Name, Organization**
P-1	1	Research on the Methane Estimation and Its Emission Factor from Landfill in China	Zhanyun Ma, Qingxian Gao, Wei Huang, Sijia Qu *Chinese Research Academy of Environmental Sciences*
P-2	6	Building Up a Low-Carbon Society: Low-Carbon Community Development in China	Siyang Yu, Chunyan Dai, Guoqiang Qian *SinoCarbon Innovation & Investment Co., Ltd*
P-3	6	Efficiency of Nitrification Inhibitors from Plants on Reducing Nitrous Oxide Emissions under Soil Incubation and Enhancing Maize *(Zea mays L.*) Growth, Yield and N Uptake in Pot Experiment	Phatchariya Welutung and Patthra Pengthamkeerati *Department of Environmental Technology and management, Faculty of Environment Kasetsart University, Bangkok*
P-4	7	Estimating Forest Carbon Stock at Project-level REDD Activity: a case study in the Paung Laung Reserve Forest, Myanmar	Tamotsu Sato[1], Billy Ne Win[2], Fumiaki Kitahara[3], Myat Su Mon[4], Tetsuya Michinaka[1], Takuya Furukawa[1], Ei Ei Swe Hlaing[2], Thaung Naing Oo[2], [1]*Forestry and Forest Products Research institute (FFPRI), Japan*, [2]*Forest Research Institute*, *Ministry of Natural Resources and Conservation*, *Myanmar* [3]*Shikoku Research Center*, *Forestry and Forest Products Research institute (FFPRI)*, *Japan* [4]*Forest Department*, *Ministry of Natural Resources and Conservation*, *Myanmar*
P-5	3	Data Collecting Activity and Verification for Generating Credible GHG Inventory	Philip, E[1], K.S. Yap, I[2]. Nur Zawani[2] and Azimuddin Bahari[2], [1] *Forest Research Institute Malaysia*, [2]*Ministry of Natural Resources and Environment Malaysia*
P-6	3	Activity Data Flows of Viet Nam during Estimation of the BUR1 and Recommendations After Having National GHG Inventory System	Nguyen Phuong Nam *Center for Technology Responding to Climate Change*, *Department of Climate Change, Ministry of Natural Resources and Environment*, *Vietnam*
P-7	1	Effect of Rice Cultivation Practices on N_2O Emission Factor of Managed Agricultural Soil	Sirintornthep Towprayoon[1], Nittaya Cha-un[1], Amnat Chidthaisong[1], Patikorn Sriphirom[1] [1]*The joint graduate school of energy and environment (JGSEE)*, *Centre of Excellence on Energy Technology and Environment (CEE)*, *King Mongkut's University of Technology Thonburi (KMUTT)*

Annex I

P-8	4	Capacity Building on Greenhouse Gas Inventory and Training Needs for ASEAN Countries	Nareerat Thanakasem, Chanyaphak Wathanachinda *Climate Change International Technical and Training Center*, *Thailand Greenhouse Gas Management Organization (Public Organization)*
P-9	6	Deep Decarbonizing Land Use and Forest Sector in Indonesia	Rizaldi Boer, Gito Sugih Immanuel *Center for Climate Risk and Opportunity Management* *Bogor Agricultural University*
P-10	6	Low-carbon Society and Mitigation Measures in Myanmar	Myint Soe[1], Hnin Hnin Aye[2] [1]*Industrial Planning Control Department, Ministry of Industry* [2]*Myanmar Electric Power Enterprise, Ministry of Electric Power Industry & Energy*
P-11	7	Preparation of Japan's National Greenhouse Gas Inventory and Trends in GHG Emissions	GIO of Japan

Topics:
1. Emission factor development (Sector)
2. Remote-sensing and GIS
3. Data collection and statistics
4. International support programme
5. International framework
6. Low-carbon society and mitigation measures
7. Others

Annex II: List of Participants

Annex II: List of Participants

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