The 2nd Workshop on Greenhouse Gas Inventories in Asia Region

7-8 February 2005, Shanghai, China

Proceedings

Ministry of the Environment, Japan
National Institute for Environmental Studies (NIES), Japan

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PREFACE

This month of February 2005 marks one important milestone as the Kyoto Protocol enters into force. To help guide policies and strategies of countries around the world in their efforts to reduce emissions and enhance sinks of atmospheric greenhouse gases, accurate GHG inventories will continue to be critically important.

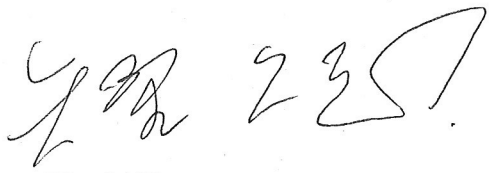
Over a year has passed since the First Workshop on GHG Inventories in the Asia Region was held in Phuket, Thailand, in November 2003. During this time, many countries in Asia have made progress with their GHG inventories. Some non-Annex countries have submitted their first National Communications under the UN Framework Convention on Climate Change and gained valuable experience in the process. Many have improved the accuracy of their inventories through work on locally relevant emission factors.

It is clear that neighboring countries and the entire region can benefit by cooperating and sharing information and experience. In this context, this Second Workshop on Greenhouse Gas (GHG) Inventories in Asia Region (WGIA) was held in Shanghai, China, on 7 and 8 February 2005, with participation by scientific experts and governmental representatives responsible for GHG inventories in their countries. The workshop was held back-to-back with the Contact Group of Experts, Hands-on Training Workshop on National Greenhouse Gas Inventories for the Asian Region. The aims of this workshop were to (1) to hear updates on GHG inventories of countries in Asia, (2) to share useful information and experiences in GHG inventory preparation, and (3) to discuss future activities of this Asian network.

Through discussions at the workshop, participants gained an up-to-date understanding of common issues and challenges, and developed some ideas on how cooperation can help countries in Asia produce more accurate GHG inventories in the most efficient way in the future. We hope that the momentum will continue to build in this direction.

Lastly, we would like to extend our sincere thanks to our host country China for its generous support. We would also like to thank the UNFCCC Secretariat, Asia-Pacific Network for Global Change Research CAPaBLE Programme and IPCC Technical Support Unit for the National GHG Inventories Programme for their great contributions to the workshop.

Dr. Shuzo Nishioka
Executive Director
National Institute for Environmental
Studies (NIES), Japan



Mr. Hisashi Yano
Senior Policy Coordinator
Climate Change Policy Division
Global Environment Bureau
Ministry of the Environment, Japan


The 2nd Workshop on GHG Inventories in Asia Region
7–8 February 2005, Shanghai, China

Opening Remarks

Dr. Shuzo Nishioka (Japan)

Mr. Aimin Ma (China)

Prof. Zhang Yutian (China)

Chair & Co-Chairs

Ms. Mimi Nameki (Japan)

Dr. Rizaldi Boer (Indonesia)

Mr. Syamphone Sengchandala (Lao P.D.R)

Dr. Shuzo Nishioka (Japan)

Dr. Damasa Macandog (Philippines)

Mr. Dominique Revet (UNFCCC)

Dr. Sirintornthep Towprayoon (Thailand)

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Proceedings

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Executive Summary

The 2nd Workshop on GHG Inventories in Asia Region

7 – 8 February 2005, Shanghai, China

EXECUTIVE SUMMARY

The Second Workshop on Greenhouse Gas (GHG) Inventories in Asia Region (WGIA) was attended by governmental officials and scientists from 10 countries and representatives of three international organizations.[1] It was organized by the Ministry of the Environment, Japan and the National Institute for Environmental Studies (Japan) and hosted by the Chinese Research Academy of Environmental Science. Objectives of the meeting were to (1) update each other on the most up-to-date situation of GHG inventories in Asia, (2) share useful information and experiences in GHG inventory preparation, and (3) discuss future activities of the Asian network.

During updates on the status of GHG inventories, participants received information on the Intergovernmental Panel on Climate Change (IPCC) work for GHG inventory guidelines and resources available for UNFCCC National Communications from non-Annex I Parties. Some resources that were mentioned include the (1) UNFCCC User Manual for the guidelines on national communications from non-Annex I Parties,[2] (2) various documents of the IPCC National Greenhouse Gas Inventory Programme (NGGIP),[3] and (3) the IPCC's Emission Factor Database.[4] Work is under way to produce 2006 IPCC GHG inventory guidelines. Also, the UNFCCC website provides some useful materials, particularly a plain-language description ("User Manual") of the latest UNFCCC guidelines for national communications (decision 17/CP.8), as well as the "NAI Update,"[5] a brief newsletter on issues relevant for non-Annex I Parties which is released shortly after each Subsidiary Body (SB) meeting.

China, India and Viet Nam reported on their submission of Initial National Communications to the UNFCCC Secretariat (in Nov. 2004, June 2004, and Nov. 2003, respectively). Of the participating countries in the WGIA, all countries have now submitted their Initial National Communications, while Korea has submitted its Second, and Japan has submitted its Third.

A presentation was made on the GHG Inventory Project (Capacity Building for GHG Inventory Development in Asia-Pacific Developing Countries) supported by the APN CAPaBLE Programme.[6] It includes pilot studies in Cambodia and Thailand aiming to improve GHG

[1] Countries that participated in the 1st and/or 2nd WGIA meetings include Cambodia, China, India, Indonesia, Japan, Korea, Lao PDR, Mongolia, Philippines, Thailand, Viet Nam (Mongolia was unable to attend this time).

[2] http://unfccc.int/files/essential_background/application/pdf/userman_nc.pdf

[3] www.ipcc-nggip.iges.or.jp

[4] www.ipcc-nggip.iges.or.jp/EFDB/main.php

[5] http://unfccc.int/national_reports/non-annex_i_natcom/nai_update/items/347txt.php

[6] APN="Asia-Pacific Network for Global Change Research (APN)," CAPaBLE="Scientific Capacity Building and

inventories, establish sustainable systems for GHG inventories, provide more realistic emission factors reflecting country and regional conditions, and exchange information with other developing countries for better GHG inventories.

Participants in the WGIA summarized constraints and problems that countries have experienced in GHG inventory compilation in the following four categories: (1) activity data for all five sectors[7] (data is not being collected in some sectors; data has been collected but may not be readily accessible; data is accessible but there are problems with format and conversion; and data is available but there are problems with reliability), (2) emission factors (local EFs are needed that specifically reflect local conditions; more research is needed to improve EF quality); (3) capacity building (needed for experts responsible for GHG inventories) and (4) institutional arrangements (need to be improved, particularly at the national level, in order to facilitate greater efficiency and sustainability in preparing GHG inventories).

The meeting discussed approaches to address these difficulties. The discussion concluded with a recommendation that countries encourage the following actions in the Asian region: (1) promote more sharing of experience among Asian countries regarding collection of activity data, updating of emission estimation methods, and refinement of emission factors; (2) put more effort into emission factors for the Asian region (compile relevant information on EFs that could be useful for other countries in the region that have similar environmental conditions; and submit locally-developed EFs to the IPCC's Emission Factor Database to share with others); (3) share successful practices in each country regarding activity data and EFs, (4) strengthen the WGIA network, promote active use of the network's mailing list, and participate in ongoing discussions on GHG inventories in Asia, and (5) compile reports; publish findings (e.g., related to research for GHG inventories, methodologies, local EFs, source/sink category analysis, etc.); and enhance the visibility of the activities of the WGIA.

Participants welcomed a kind offer from the Philippines to host a third workshop in early 2006. In preparation for the workshop, participants will strive to have active communications between now and then.

Enhancement for Sustainable Development in Developing Countries." See www.apn.gr.jp

[7] Energy; industrial processes; agriculture; land use, land-use change and forestry (LULUCF); and waste.

Chairpersons' Summary

Attachment　I：Agenda
Attachment II：List of Participants

The 2nd Workshop on GHG Inventories in Asia Region
7-8 February, 2005, Shanghai, China

Chairpersons' Summary

Background

1. The Second Workshop on Greenhouse Gas (GHG) Inventories in Asia Region (WGIA) was held in Shanghai, China on 7–8 February 2005 (one and a half days). It was organized by the Ministry of the Environment, Japan and the National Institute for Environmental Studies (Japan) and hosted by the Chinese Research Academy of Environmental Science. The workshop was held back-to-back with the Consultative Group of Experts (CGE) Hands-on Training Workshop on National GHG Inventories for the Asia-Pacific Region organized by the Secretariat of the UN Framework Convention on Climate Change (UNFCCC) from 8 to 12 February.

2. The workshop was attended by participants from 10 countries (Cambodia, China, India, Indonesia, Japan, Korea, Lao PDR, Philippines, Thailand, Viet Nam), and representatives of three international organizations (the UNFCCC Secretariat, the Technical Support Unit of the IPCC National Greenhouse Gas Inventories Programme, and the Asia-Pacific Network for Global Change Research).

Opening Session

3. The opening session was chaired by Ms. Mimi Nameki of the Ministry of the Environment, Japan who opened by pointing out that as the Kyoto Protocol will enter into force this month, the role of GHG inventories will become even more important as a basis of climate change policies. Dr. Shuzo Nishioka of the National Institute for Environmental Studies welcomed participants to the workshop and invited participants to consider future activities of this group as a network in Asia to improve GHG inventories. Mr. Aimin Ma of the Office to the National Coordination Committee on Climate Change (China) on behalf of the host country, welcomed participants to China and expressed his view that it is important for neighboring countries to learn from each other and share experiences relating to GHG inventories. Prof. Zhang Yutian of the Chinese Research Academy of Environmental Science also welcomed participants to China and expressed his hope for a fruitful workshop. He said that China had recently submitted its Initial National Communication (INC) to the UNFCCC Secretariat and he hoped that regional cooperation would benefit all countries in future GHG inventory work. Dr. Hideaki Nakane of the Greenhouse Gas Inventory Office of

Japan (GIO) described the objectives of the meeting as being (1) to update each other on the most up-to-date situation of GHG inventories in Asia, (2) to share useful information and experiences in GHG inventory preparation, and (3) to discuss future activities of the Asian network.

Session I: Update on the Status of Asian Inventories

4. Session 1 was co-chaired by Dr. Rizaldi Boer of Bogor Agricultural University in Indonesia and Mr. Syamphone Sengchandala of Prime Minister's Office of Lao PDR. In this session, presenters provided updates on activities since the first workshop, held in Phuket in 2003.

5. Mr. Taka Hiraishi of the Institute for Global Environmental Strategies (IGES) in Japan presented information on the Intergovernmental Panel on Climate Change (IPCC) work for GHG inventory guidelines and resources available for UNFCCC National Communications from non-Annex I Parties. He referred participants to the UNFCCC User Manual for the guidelines on national communications from non-Annex I Parties,[1] various documents of the IPCC National Greenhouse Gas Inventory Programme (NGGIP),[2] and the IPCC's Emission Factor Database.[3] He pointed out that work is now under way to produce 2006 IPCC GHG inventory guidelines. In a comment, Mr. Dominique Revet of the UNFCCC Secretariat pointed out that the UNFCCC website[4] provides some useful materials, particularly a plain-language description ("User Manual") of the latest UNFCCC guidelines for national communications (decision 17/CP.8), as well as the "NAI Update,"[5] a brief newsletter on issues relevant for non-Annex I Parties which is released shortly after each Subsidiary Body (SB) meeting.

6. Next, three countries reported on their submission of Initial National Communications (INC) to the UNFCCC Secretariat (see workshop proceedings for greater detail). First, Mr. Hoang Manh Hoa of the Ministry of Natural Resources and Environment of Viet Nam reported that his country had submitted its INC in November 2003 and gave a detailed description of its contents, including adaptation and mitigation efforts. Next steps are developing climate change scenarios in Viet Nam for 2010 to 2070, collecting data for the Second National Communication, continuing to study adaptation measures, and developing climate change project portfolio including potential Clean Development Mechanism

[1] http://unfccc.int/files/essential_background/application/pdf/userman_nc.pdf
[2] www.ipcc-nggip.iges.or.jp
[3] www.ipcc-nggip.iges.or.jp/EFDB/main.php
[4] www.unfccc.int
[5] http://unfccc.int/national_reports/non-annex_i_natcom/nai_update/items/347txt.php

projects.

7. Next, Dr. Subodh Sharma of India's Ministry of Environment and Forests reported that India had submitted its INC in June 2004. He gave a detailed presentation of the main contents of the INC and explained the national institutional arrangements and the extensive work that had gone into the report. India had found that most of the IPCC default emission coefficients were not representative of India's specific coefficients, and had to use a combination of indigenously-developed and the IPCC's default emission factors. The shares of levels of inventory estimations in the INC were 23%, 70% and 7% for Tier 1, Tier 2, and Tier 3, respectively, and India desired to move to a higher tier in the future in many emission categories. Sectors requiring improvement in GHG emission estimates included energy, industrial processes, agriculture, LULUCF,[6] and waste management.

8. Third, Dr. Qingxian Gao of the Chinese Research Academy of Environmental Science reported that China had submitted its INC in November 2004. He described the development process and main contents of the INC. China's experiences in preparing the INC including the following: some obstacles arose due to a lack of activity data; there were challenges in dealing with reliability and quality of data; much of the IPCC's default data could not be applied directly to China; many models used for assessing the impacts of climate change were still introduced from abroad; the assessments of impacts were preliminary; and many uncertainties still existed. Dr. Gao reported that capacity building had been an important part of the entire INC exercise.

9. Then, Ms. Nameki of the Ministry of the Environment, Japan reported on the current status of Japan's GHG inventory at the national and local levels. At the national level, Japan started annual submission of its GHG inventory in 1996 and had now established the infrastructure and a routine for annual submissions, which allowed it to accurately track trends in overall emissions in each sector. At the local level, Japan had introduced the "Area Promotion Plan" which encourages local governments to plan local projects to tackle climate change. Japan's National Policy Programme on Climate Change includes a step-by-step process (in three phases, 2002-04, 2005-07, 2008-12) and fiscal 2004 marked the end of the first phase of implementation.

10. Finally, Prof. Seungdo Kim of Korea's Hallym University made a presentation on his country's progress with procedures for estimating CH_4 emissions from landfills using Tier

[6] Land Use, Land-Use Change and Forestry

2 methodology. A comparison of this more rigorous Tier 2 (applying a specially developed Fortran code) with the IPCC's Tier 1 methodology resulted in significantly different estimates for year-by-year emissions from a landfill. Some participants indicated their desire to obtain more details of the methodology in English.

11. The Co-Chairs summarized the session, saying that it was clear non-Annex I countries face a number of challenges in preparing National Communications, and that capacity-building is still required. They said that GHG inventories could be enhanced by (1) improving institutional arrangements to make GHG inventory preparation a continuous process, (2) improving emission factors and sharing these with other countries that have similar characteristics, and (3) improving the methodologies for GHG emission estimates. Above all, it is clear that countries could benefit by sharing the information and experience that they gain through their respective work with GHG inventories and National Communications.

Session II: Sharing Useful Information and Experiences in GHG Inventory Preparation

12. Session II was co-chaired by Mr. Dominique Revet of the UNFCCC Secretariat and Dr. Sirintornthep Towprayoon of King Mongkut's University of Technology Thonburi in Thailand.

13. Mr. Leandro Buendia of the IPCC-Technical Support Unit for the National Greenhouse Gas Inventories Programme made a presentation on the IPCC's Good Practice Guidance for Land Use, Land-Use Change and Forestry (GPG-LULUCF), an extensive guide published in 2003 to support the development of good inventories. It also helps countries produce reliable estimates of the magnitude of uncertainties in GHG inventories, and describes how these uncertainties may be best managed to be acceptable for the UNFCCC. Default emission factors in the GPG-LULUCF are now accessible from the Emission Factor Database[7] and many other materials are available from the main website.

14. Dr. Linda Stevenson of the Asia-Pacific Network for Global Change Research (APN)[8] presented the APN CAPaBLE Program (Scientific Capacity Building and Enhancement for Sustainable Development in Developing Countries). One project the APN is currently funding (approximately US$120,000 over three years) is the APN CAPaBLE GHG

[7] www.ipcc-nggip.iges.or.jp/EFDB/main.php
[8] www.apn.gr.jp

Inventory Project (Capacity Building for GHG Inventory Development in Asia-Pacific Developing Countries). Dr. Hideaki Nakane of the Greenhouse Gas Inventory Office of Japan, as the APN Project Leader for this project, introduced the project which includes pilot studies in Cambodia and Thailand. Among the project's top aims are (1) to improve GHG inventories, (2) to establish sustainable systems for GHG inventories, (3) to provide more realistic emission factors reflecting country and regional conditions, and (4) to exchange information with other developing countries for better GHG inventories.

For Cambodia, Mr. Thy Sum of the Ministry of the Environment presented its work under the APN CAPaBLE GHG Inventory Project to improve GHG inventories for LULUCF, through trainings in Japan and field work in Cambodia to measure aboveground biomass and biomass growth rates of deciduous, evergreen and secondary forests.

For Thailand, Dr. Amnat Chidthaisong of King Mongkut's University of Technology Thonburi made a presentation on a new instrument, developed by NIES and assembled under the APN CAPaBLE GHG Inventory Project, a semiconductor-based sensor that can measure methane flux in various situations, including rice paddies. The new sensor can replace the gas chromatographic measurement of sampling air from a chamber which is commonly used for this purpose, as the sensor is mobile (fits in a suitcase), makes quick measurements, is reliable and accurate, offers lower cost per measurement, and is relatively easy to operate. Under the APN CAPaBLE GHG Inventory Project, he has received training in Japan to use this instrument, plans to put it to use soon in methane emission measurements in various rice cultivation schemes in order to develop an emission factor database for methane emissions in Thailand, and hopes to share his experiences in the future with other countries in the region.

15. Ms. Chisa Umemiya of the Greenhouse Gas Inventory Office of Japan identified the regionally-significant source/sink categories in Asia by applying the key category analysis method by nation and found that the characteristics of those categories differ across regions. She suggested one of the future activities of the region would be improving the accuracy of emission factors and activity data of those identified categories. Dr. Qingxian Gao said that differences in regional characteristics of key categories in the waste sector in her analysis might originate from different waste management practices used in different regions. Mr. Hiraishi mentioned that the methodology of her analysis should be discussed further in order to identify the regionally-significant categories where participating countries need real improvement in quality of GHG emissions estimations.

16. The Co-Chairs summarized the discussions of this session, saying that participants had gained useful information. The discussion on the regionally-significant source/sink categories had stimulated thinking on these topics and deserves further discussion in the future. Also, there is an obvious link between the technical work being done, for example, at the IPCC level with regard to methodologies, on one hand, and the need for in-country capacity building, on the other.

Session III: Future Activities of the WGIA Community

17. Session 3 was co-chaired by Dr. Shuzo Nishioka and Dr. Damasa Macandog of the University of the Philippines Los Banos. To begin with, Dr. Gao, as rapporteur, presented a summary of the previous day of discussions.

18. The meeting then discussed the constraints and problems that participants' countries have experienced in GHG inventory compilation. Common issues included the following:
    (a) Activity Data (for all five sectors)[9]
        - Data is not being collected in some sectors.
        - Data has been collected but may not be readily accessible.
        - Data is accessible but there are problems with format and conversion.
        - Data is available but there are problems with its reliability.
    (b) Emission Factors
        - Local emission factors that specifically reflect local conditions need to be developed.
        - More research studies are needed to improve quality of emission factors.
    (c) Capacity Building
        - Capabilities of experts responsible for GHG inventories need to be enhanced.
    (d) Institutional Arrangements
        - Institutional arrangements need to be improved, particularly at the national level, in order to facilitate greater efficiency and sustainability in preparing GHG inventories.

19. The meeting then discussed approaches to address these difficulties. The discussion concluded with a recommendation for countries to encourage the following actions in the Asian region:

[9] Energy; industrial processes; agriculture; land use, land-use change and forestry (LULUCF); and waste.

(a) Promote greater sharing of experience among Asian countries regarding collection of activity data, updating of emission estimation methods, and refinement of emission factors.

(b) Emission factors for the Asian region
- Compile relevant information on emission factors that could be useful for other countries in the region that have similar environmental conditions.
- Submit locally-developed emission factors to the IPCC's Emission Factor Database to share with others.

(c) Share experience of successful practices in each country regarding activity data and emission factors.

(d) Strengthen the WGIA network, promote active use of the network's mailing list, and participate in ongoing discussions on GHG inventories in Asia.

(e) Compile reports (including proceedings of this workshop); publish findings (e.g., related to research for GHG inventories, methodologies, local emission factors, source/sink category analysis, etc.); and enhance the visibility of the activities of the WGIA in the IPCC, CDM and CGE communities, for the benefit of all in their GHG inventory work.

20. Finally, the meeting discussed plans for a third WGIA workshop. Participants welcomed a kind offer from the Philippines (University of the Philippines Los Banos, Department of Environment and Natural Resources, and the Manila Observatory) to host the meeting in early 2006. In preparation for the workshop, participants will strive to have active communications between now and then.

Closing Session

21. Dr. Nishioka wrapped up the workshop, thanking everyone for their contributions. Dr. Gao thanked participants for coming to Shanghai and expressed his hopes that everyone had enjoyed their time here. Ms. Nameki reviewed the main topics of discussions and mentioned that many issues still remain to be discussed and addressed. Limited time and resources mean that countries need to find the most efficient way to enhance the accuracy of GHG inventories so that they reflect the local conditions of the Asian region. She urged everyone to keep working together and was confident that the network established through this workshop would be of great help for that purpose. The participants thanked the Japanese organizers for organizing the workshop, and expressed special appreciation to the host organization in China for the warm hospitality and fine venue.

Attachment I

The 2nd Workshop on GHG Inventories in Asia Region (WGIA)

7-8 February 2005, Shanghai, China

Agenda

Day 1, Monday 7th February

9:00~9:30		**Participant Registration**
9:30~10:30		**Opening Session (60 min.)** *Chair: Ms. Mimi Nameki, Japan*
9:30~ 9:35	Dr. Shuzo Nishioka, Japan	Welcome address (5 min.)
9:35~ 9:40	Mr. Aimin Ma, China	Welcome speech from host country (5 min.)
9:40~9:45	Prof. Zhang Yutian, China	Welcome speech from host country (5 min.)
9:45~ 10:05	All	Introduction of participants (20 min.)
10:05~10:20	Dr. Hideaki Nakane, Japan	Overview of workshop and explanation of schedule (13 min. + 2 min.)
10:20~10:30	All	Questions (10 min.)
10:30~10:45		***Tea Break (15 min.)***
10:45~12:55		**Session Ⅰ: Update on the status of the Asian inventories (130 min.)** *Co-chairs: Dr. Rizaldi Boer, Indonesia & Mr. Syamphone Sengchandala, LAO P.D.R*
10:45~11:05	Mr. Taka Hiraishi, Japan	IPCC's work for GHG inventory guidelines and national communications from non-Annex I Parties (15 min. + 5 min.)
11:05~11:20	Mr. Hoang Manh Hoa, Viet Nam	Submission of Viet Nam's Initial National Communication (10 min. + 5 min.)

11:20~11:40	Dr. Subodh Kumar Sharma, India	Submission of India's Initial National Communication (15 min. + 5 min.)
11:40~12:00	Dr. Qingxian Gao, China	Submission of China's Initial National Communication (15 min. + 5 min.)
12:00~12:20	Ms. Mimi Nameki, Japan	Current status of the GHG inventory in Japan (15 min. + 5 min.)
12:20~12:40	Prof. Seungdo Kim, Republic of Korea	Development of application procedures of the Tier 2 methodology for CH_4 emission from Korean landfills (15 min. + 5 min.)
12:40~12:55	All	Questions and discussion (15 min.)
12:55~14:25		***Lunch Time (90 min.)***
14:25~15:30		**Session Ⅱ: Sharing useful information and experiences in GHG inventory preparation (65 min.)** *Co-chairs: Mr. Dominique Revet, UNFCCC & Dr. Sirintornthep Towprayoon, Thailand*
14:25~14:50	Mr. Leandro Buendia, IPCC-NGGIP/TSU	IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry (18 min. + 7 min.)
14:50~15:00	Dr. Linda Anne Stevenson, APN	Overview of the APN CAPaBLE Programme (8 min. + 2 min.)
15:00~15:10	Dr. Hideaki Nakane, Japan	Introduction of the APN CAPaBLE Project "Capacity Building for GHG Inventory Development in Asia-Pacific Developing Countries (APN CAPaBLE GHG Inventory Project)" (8 min. + 2 min.)
15:10~15:30	Mr. Thy Sum, Cambodia	Cambodia's LULUCF inventory improvement under the APN CAPaBLE GHG Inventory Project (15 min. + 5 min.)
15:30~15:45		***Tea Break (15 min.)***
15:45~17:00		**Session Ⅱ: Sharing useful information and experiences in GHG inventory preparation (75 min.)**

15:45~16:10	Dr. Amnat Chidthaisong, Thailand	Rapid and accurate measurements of methane emissions from rice paddies under the APN CAPaBLE GHG Inventory Project (18 min. + 7 min.)
16:10~16:30	Ms. Chisa Umemiya, Japan	Identification of regionally-significant source/sink categories in Asia (15 min. + 5 min.)
16:30~17:00	All	Questions, discussion, and wrap-up of Day 1 (30 min.)

Day 2, Tuesday 8th February

9:00~10:30		**SessionⅢ: Discussion for the future activities of the WGIA community (90 min.)** *Co-chairs: Dr. Shuzo Nishioka, Japan & Dr. Damasa Macandog, Philippines*
9:00~9:20	Rapporteur: Dr. Qingxian Gao, China	Report on Day 1 (20 min.)
9:20~10:15	All	- Enhancement of use of WGIA as an effective network - Common features of GHG inventory preparation - How to determine short term strategies - Roles of each country and work plans (55 min.)
10:15~10:30	All	Wrap-up of the discussion (15 min.)
10:30~11:30		***Tea Break (60 min.)***
11:30~12:00		**Closing Session (30 min.)**
11:30~11:50	Dr. Shuzo Nishioka, Japan	Wrap-up (20 min.)
11:50~11:55	Dr. Qingxian Gao, China	Closing remarks (5 min.)
11:55~12:00	Ms. Mimi Nameki, Japan	Closing remarks (5 min.)

Attachment II

LIST OF PARTICIPANTS
THE 2nd WORKSHOP ON GHG INVENTORIES IN ASIA REGION
7-8 February 2005, Shanghai, China

CAMBODIA

Mr. Thy SUM
Chief, Climate Change Office,
Ministry of Environment
48, Samdech Preah Sihanouk Blvd.,
Chamkarmon, Phnom Penh,
CAMBODIA

Mr. Chan Thou CHEA
Chief of Office,
Ministry of Environment,
Department of Planning and Legal Affairs
48, Room 303, Preah Sihanouk Blvd.,
Phnom Penh, CAMBODIA

CHINA

Dr. Qingxian GAO
Center for Climate Impact Research, SEPA
Chinese Research Academy of Environmental Science
8 Da Yangfang, An Wai, Beijing 100012,
CHINA

Prof. Zhang YUTIAN
Director, International Cooperation Center
Chinese Research Academy of Environmental Science
8, Da Yangfang, An Wai, Beijing100012,
CHINA

Mr. Aimin MA
Deputy Division Director
Office to the National Coordination Committee on Climate Change
National Development and Reform Commission
38, Yuetan Nanjie, Beijing 100824
CHINA

Dr. Xinyou HUANG
Department of Electronic Engineering
Nanjing University of Information Science and Technology
Nanjing, Jiangsu 210044
CHINA

Mr. Huaqing XU
National Project Coordinator of Initial National Communication
Director, Professor, Center for Energy, Environment and Climate Change
Energy Research Institute,
National Development and Reform Commission, CHINA
B-1405, Guohong Building, Muxidibeili,
Beijing 100038, CHINA

Dr. Xiaosu DAI
Director of Climate Change Division

Department of Scientific and Technological Development
China Meteorological Administration, CHINA

INDIA

Dr. Subodh Kumar SHARMA
Adviser
Ministry of Environment and Forests
Government of India
Paryavaran Bhawan, CGO Complex
Lodi Road, New Delhi, INDIA

Dr. Sumana BHATTACHARYA
Expert Consultant, Natcom, India
Project Management Cell
Winrock International India
1, Navjeevan Vihar, New Delhi 110017
INDIA

INDONESIA

Mr. Mochamad NATSIR
Head of Sub Division for Climate Change Adaptation, Ministry of Environment
Jl. D.I. Panjaitan Kav. 24 Kebon Nanas,
Jakarta Timur, INDONESIA 13410

Dr. Rizaldi BOER
Head of Laboratory of Climatology
Department of Geophysics and Meteorology
Faculty of Mathematics and Natural Sciences,
Bogor Agricultural University
Kampus IPB Darmaga, Darmaga Bogor,
INDONESIA

JAPAN

Ms. Mimi NAMEKI
Deputy Director
Climate Change Policy Division,
Global Environment Bureau
Ministry of the Environment
1-2-2, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8975 JAPAN

Dr. Shuzo NISHIOKA
Executive Director
National Institute for Environment Studies
16-2, Onogawa, Tsukuba, Ibaraki 305-8506
JAPAN

Dr. Hideaki NAKANE
Manager
Greenhouse Gas Inventory Office of Japan
Center for Global Environmental Research
National Institute for Environment Studies
16-2, Onogawa, Tsukuba, Ibaraki 305-8506
JAPAN

Mr. Tomoyuki AIZAWA
Researcher
Greenhouse Gas Inventory Office of Japan
Center for Global Environmental Research
National Institute for Environment Studies
16-2, Onogawa, Tsukuba, Ibaraki 305-8506
JAPAN

Ms. Chisa UMEMIYA
Assistant Fellow
Greenhouse Gas Inventory Office of Japan
Center for Global Environmental Research
National Institute for Environment Studies

16-2, Onogawa, Tsukuba, Ibaraki 305-8506
JAPAN

Mr. Takashi MORIMOTO
Cooperation Researcher, Greenhouse Gas Inventory Office of Japan
(Analyst, Climate Change Mitigation Policy Group, Environmental Policy Consulting Department, UFJ Institute Ltd.)
UFJ Institute Ltd.
1-11-7, Shinbashi, Minato-ku,
Tokyo 100-8631 JAPAN

Mr. Taka HIRAISHI
Senior Consultant, Institute for Global Environmental Strategies
(Co-chair, IPCC National Greenhouse Gas Inventories Programme)
Institute for Global Environmental Strategies
2108-11 Kamiyamaguchi, Hayama, Miura,
Kanagawa, 240-0115, JAPAN

KOREA (ROK)

Prof. Seungdo KIM
Associate Professor
Department of Environmental System Engineering
Hallym University
39 Hallymdaehak-gil Chuncheon
Gangwon-do 200-702,
REPUBLIC OF KOREA

Ms. Sanghee UM
Staff, Pyrolysis Research Laboratory
Department of Environmental System Engineering
Hallym University
39 Hallymdaehak-gil Chuncheon
Gangwon 200-702,
REPUBLIC OF KOREA

LAO P.D.R.

Mr. Syamphone SENGCHANDALA
Deputy Director of Environment Impact Assessment Division
Science Technology and Environmental Agency, Prime Minister's Office
Ban Sisavad, Nahaydoi Road, P.O. Box 2279, Vientiane, LAO P.D.R.

PHILIPPINES

Ms. Raquel Ferraz VILLANUEVA
Supervising Environmental Management Specialist
Environmental Management Bureau
Department of Environment and Natural Resources
Felbet's Bldg., Lanang, Davao City
PHILIPPINES

Dr. Damasa MACANDOG
Institute of Biological Science, University of the Philippines at Los Banos
College, Launa 4031 PHILIPPINES

THAILAND

Ms. Aree Wattana TUMMAKIRD
Chief of Measures Analysis Section
Office of Natural Resources and Environmental Policy and Planning (ONEP)

61/1 Soi Phibun Wattana 7, Rama VI Road,
Bangkok 10400, THAILAND

Dr. Sirintornthep TOWPRAYOON
Associate Professor
The Joint Graduate School of Energy
and Environment
King Mongkut's University of
Technology Thonburi
91 Pracha-Uthit Road, Bangmod, Tungkru
Bangkok 10140, THAILAND

Dr. Amnat CHIDTHAISONG
Lecturer
The Joint Graduate School of Energy and Environment
King Mongkut's University of Technology Thonburi
91 Pracha-Uthit Road, Bangmod, Tungkru
Bangkok 10140, THAILAND

VIET NAM

Mr. Hoang Manh HOA
Senior Expert and Researcher on Climate Change
National Office for Climate Change and Ozone Protection,
International Cooperation Department,
Ministry of Natural Resources and
Environment of Viet Nam
51, Quang Trung Street, Ha Noi, VIET NAM

INTERNATIONAL ORGANIZATIONS

UNFCCC

Mr. Dominique REVET
Programme Officer
United Nations - Climate Change Secretariat (UNFCCC)
Implementation Programme,
Non-Annex I Sub-Programme
OBS - KennedyAllee 105 - 107
P.O. Box 260 124, D-53153 Bonn,
GERMANY

IPCC-NGGIP/TSU

Mr. Leandro Valmonte BUENDIA
Programme Officer
Intergovernmental Panel on Climate Change
Technical Support Unit for the National Greenhouse Gas Inventories Programme
2108-11 Kamiyamaguchi, Hayama, Miura,
Kanagawa, 240-0115, JAPAN

Asia-Pacific Network for Global Change Research (APN)

Dr. Linda Anne STEVENSON
Programme Manager for Scientific Affairs
APN Secretariat
IHD Centre Building, 5th Floor
1-5-1 Wakinohama Kaigan Dori
Chuo-ku, Kobe 651-0073 JAPAN

Dr. Chhemendra SHARMA
APN Liaison Office for South Asia
SASCOM
c/o National Physical Laboratory
Dr K. S. Krishnan Marg, New Delhi 110 012,
INDIA

SECRETARIAT

Mr. Randal HELTEN
408-1388 Nelson Street, Vancouver BC
CANADA V6E 1J9

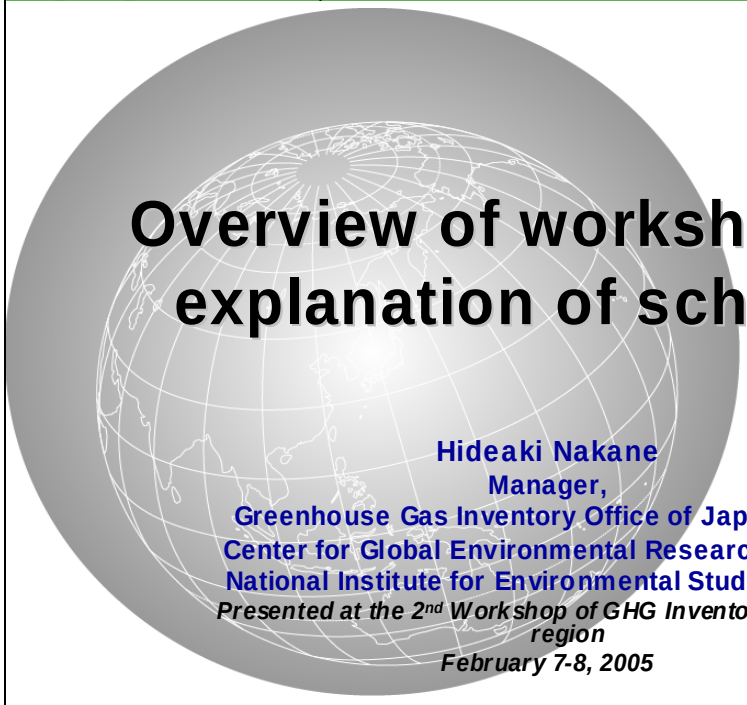
Ms. Kazuko WATANABE
Workshop on GHG Inventories in Asia Region
Secretariat
2-30-11, Shinkawa, Chuo-ku, Tokyo 104-0033
JAPAN

Ms. Fumiko HIRASAWA
Workshop on GHG Inventories in Asia Region
Secretariat
2-30-11, Shinkawa, Chuo-ku, Tokyo 104-0033
JAPAN

DOCUMENTS

i) Presentations
ii) Other documents
iii) Appendix

i) Presentations



Overview of workshop and explanation of schedule

Hideaki Nakane
Manager,
Greenhouse Gas Inventory Office of Japan (GIO),
Center for Global Environmental Research (CGER),
National Institute for Environmental Studies (NIES)

Presented at the 2nd Workshop of GHG Inventories in Asia region
February 7-8, 2005

Joint Hosting Organizations

- Ministry of the Environment of Japan
  Ms. Mimi Nameki
- National Institute for Environmental Studies, Japan
  Dr. Shuzo Nishioka
- Chinese Research Academy of Environmental Science (Local Host)
  Dr. Gao Qingxian

Participants

- 29 participants (governmental officials and researchers) from 11 countries
- 4 representatives from 3 international organizations
  - UNFCCC Secretariat, Dr. Revet
  - IPCC-NGGIP/TSU, Dr. Leandro
  - Asia-Pacific Network for Global Change Research (APN), Dr. Stevenson
- Mr. Taka Hiraishi (IGES); Japan; IPCC's work

Workshop objectives

1. Update the most up-to-date situation of GHG inventories in Asia
2. Share useful information and experiences in GHG inventory preparation and related research activities
3. Discuss on the future activities of the Asian network

Day 1 - Session 1

Co-chaired by: Dr. R. Boer & Mr. S. Sengchandala

Objective 1: To update the most up-to-date situation of GHG inventories in Asia

- Recent trend in IPCC/NGGIP and non-Annex-I NCs
- Submission of new NCs by participating countries
- Examples of some efforts of participating countries

Day 1 - Session 2

Co-chaired by: Mr. D. Revet (UNFCCC) & Dr. S. Towprayoon

Objective 2: To share useful information and experiences in GHG inventory preparation

- Use of IPCC GPG-LULUCF
- The APN CAPaBLE Programme; A Project "Capacity Building for GHG Inventory Development in Asia-Pacific Developing Countries"
- Lessons learned from other projects, eg. the UNDP-GEF Regional Capacity Building Project
- Ms. Chisa Umemiya (GIO) ; an example of analysis of the GHG inventories in Asia countries

Day 2 - Session 3

Co-chaired by Dr. S. Nishioka & Dr. D. Macandog and Dr. G. Qingxian as Rapporteur

Objective 3: To discuss the future activities of the Asian network

- Enhancement of effective use of the Asian network ⟹ **eg. concrete outcomes; more visible**
- How to determine short term strategies for the region ⟹ **???**
- Roles of each country and work plans ⟹ **???**

Various ways, leaderships, roles, funding possibilities…:
Let's discuss together!!!

Expected outputs

- Clear ideas of the latest circumstances in Asia and global of the GHG inventories and related activities
- Enhanced capacity to prepare GHG inventories and related research
- Motivation and plans for the future activities of the Asian network

Roles of Co-chairs

- To introduce yourself
- To remind the subject of the sessions at the beginning of the session
- To make sure the session proceeds on time *(Mr. Aizawa as the time-keeper)*
- Very brief closing address may be helpful

IPCC's Work for GHG Inventory Guidelines and National Communications from non-Annex I Parties

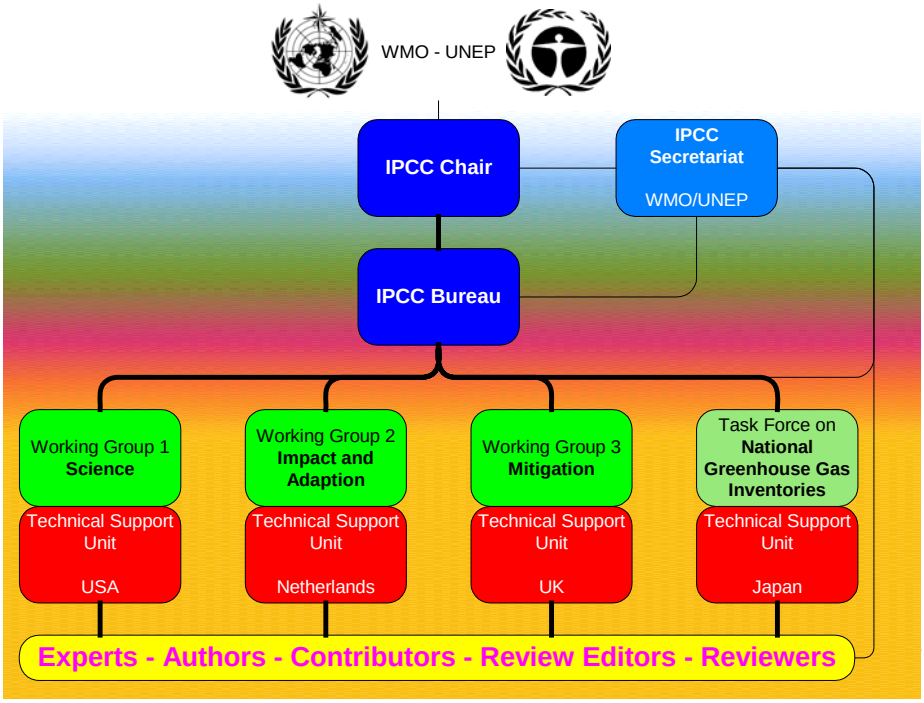
7 February 2005
Taka Hiraishi <hiraishi@iges.or.jp>
Senior Consultant
Institute for Global Environmental Strategies (IGES)

Contents

- IPCC National Greenhouse Gas Inventory Programme (NGGIP) and UNFCCC Reporting
- Non-Annex I National Communications

2

IPCC – Organisation



IPCC NGGIP

- IPCC/OECD/IEA GHG Inventories programme started 1991 (within IPCC Working Group-I)
- Since 1999 IPCC NGGIP (Technical Support Unit at IGES/Japan)
- Objectives and activities
  - to develop and refine an internationally-agreed methodology and software for the calculation and reporting of national GHG emissions and removals; and
  - to encourage the widespread use of this methodology by countries participating in the IPCC and by Parties of the United Nations Framework Convention on Climate Change (UNFCCC).

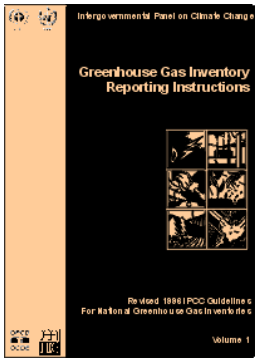
4

IPCC - NGGIP Products

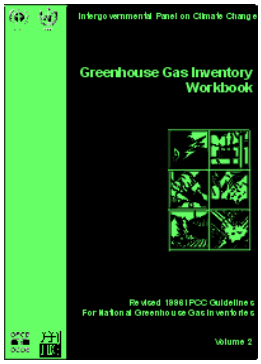
"1995" and "Revised 1996" IPCC Guidelines for National Greenhouse Gas Inventories

<http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>

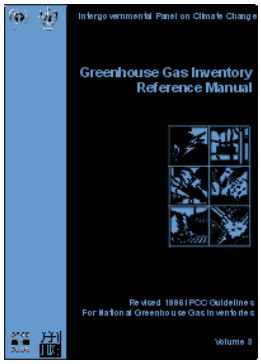
(cf. COP Decisions 4/CP.1, 9/CP.2, 2/CP.3 & *17/CP.8*)



Volume 1
Reporting
Instructions



Volume 2
Workbook
+
IPCC Software



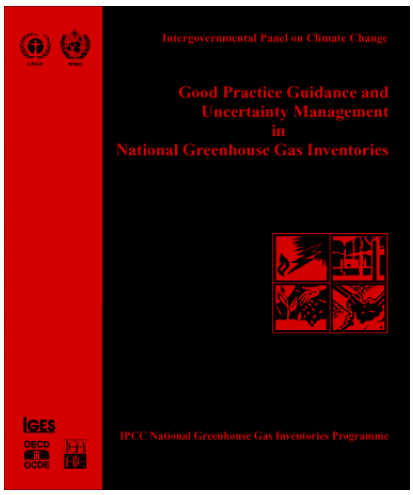
Volume 3
Reference
Manual

5

IPCC NGGIP Products

IPPC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories

<http://www.ipcc-nggip.iges.or.jp/public/gp/english/> (All UN language versions)



Complements the Revised 1996 IPCC Guidelines

Published in 2000

- Endorsed by SBSTA12 -

Background Papers: IPCC Expert Meeting on Good Practice Guidance and Uncertainty Management in National GHG Inventories

Published in late 2002

<http://www.ipcc-nggip.iges.or.jp/public/gp/gpg-bgp.htm>

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IPCC NGGIP Products

IPCC Good Practice Guidance for Land use, Land-Use Change and Forestry, 2003

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

- **Actions by SBSTA at 19th, 20th & 21st(COP10) sessions -**

Complements the Revised 1996 IPCC Guidelines.

GPG-LULUCF provides supplementary methods and good practice guidance for estimating, measuring, monitoring and reporting on carbon stock changes and greenhouse gas emissions from LULUCF activities under Article 3, paragraphs 3 and 4, and Articles 6 and 12 of the Kyoto Protocol. 7

Ongoing projects of the NGGIP

2006 IPCC Inventory Guidelines

- Revision of the Revised 1996GLs;
  - First authors meeting in May 2004, five meetings held.
  - Expert Review of First Order Draft to begin on 28 Feb. 2004;
  - Final Report to be ready in early 2006
- Invitation by SBSTA 17.

Database for emission factors and other parameters (EFDB project)

- Objective: to provide information on emission factors and other parameters needed in inventory calculations (robust; applicable; and documented)

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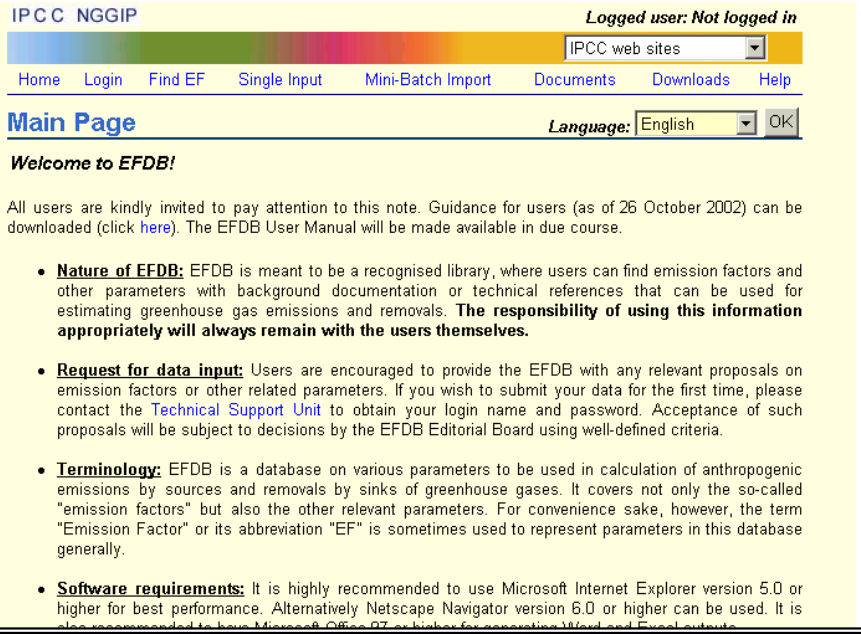
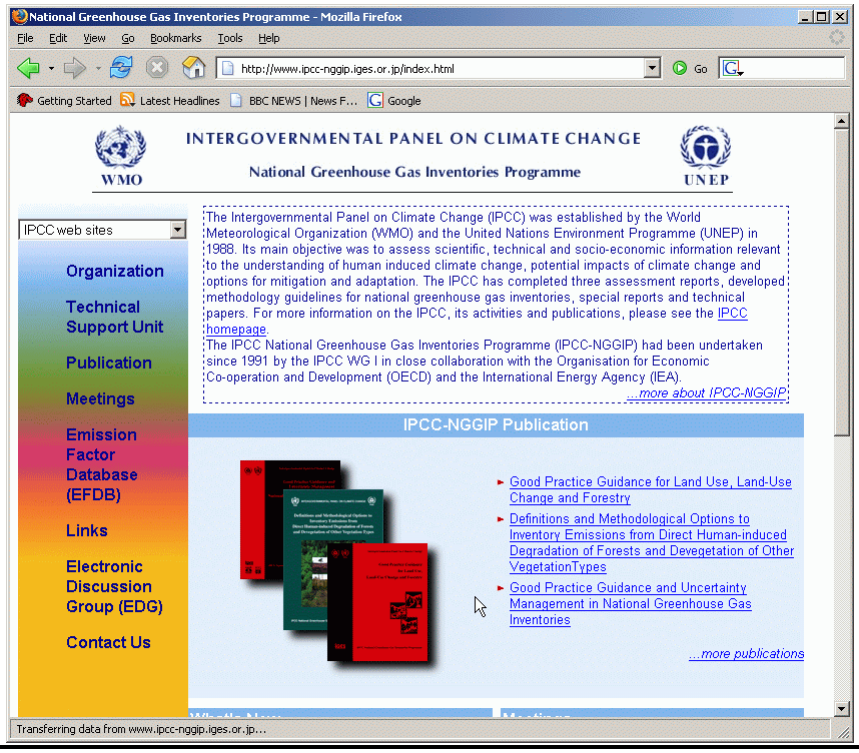
EFDB Web application



Http://www.ipcc-nggip.iges.or.jp/EFDB/main.php

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



10

National Communications: Guidelines for Non-Annex-I Parties

Legal Basis: UNFCCC Article 4.1 COMMITMENTS

All Parties, taking into account their common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances, shall:

(a) Develop, periodically update, publish and make available to the Conference of the Parties, in accordance with Article 12, national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, using comparable methodologies to be agreed upon by the Conference of the Parties;

(j) Communicate to the Conference of the Parties information related to implementation, in accordance with Article 12.

12

Legal Basis: UNFCCC Article 12.1 Communication of Information Related to Implementation

In accordance with Article 4, paragraph 1, each Party shall communicate to the Conference of the Parties, through the secretariat, the following elements of information:

(a) A national inventory of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, to the extent its capacities permit, using comparable methodologies to be promoted and agreed upon by the Conference of the Parties;

(b) A general description of steps taken or envisaged by the Party to implement the Convention; and

(c) Any other information that the Party considers relevant to the achievement of the objective of the Convention and suitable for inclusion in its communication, including, if feasible, material relevant for calculations of global emission trends.

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Legal Basis: UNFCCC Article 12 (cont.)

- 5. <Annex I countries> shall make its initial communication within six months of the entry into force of the Convention for that Party. ... Each Party not so listed shall make its initial communication within three years of the entry into force of the Convention for that Party, or of the availability of financial resources in accordance with Article 4, paragraph 3. Parties that are least developed countries may make their initial communication at their discretion.

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Non-Annex I Communication Guidelines

[Decision 10/CP.2]

- National and regional development priorities, objectives and circumstances should, in accordance with Article 4.1, and the provisions of Article 3 and Article 4.3, 4.4, 4.5, 4.7, 4.8, 4.9 and 4.10, be taken into account by COPs in considering matters related to their initial communications; and
- Non-Annex I Parties which wish to submit voluntarily additional information may use elements from the guidelines approved for Annex-I Parties when preparing their initial communications.

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COP 8 Decisions related to NAI NCs

- Improved NAI NC Guidelines (Dec.17/CP.8)
- Continuation of CGE with the revised Terms of Reference (Dec.3/CP.8)
- Overall decision on NAI NCs (Dec.2/CP.8)

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Non-Annex I Communication Guidelines
[Dec.17/CP.8]

- Scope of NC:
  - **A national inventory** of anthropogenic emissions by sources and removal by sinks of all greenhouse gases not controlled by the Montreal Protocol, to the extent its capacities permit, using comparable methodologies to be promoted and agreed upon by the Conference of the Parties;
  - **A general description of steps taken or envisaged** by the non-Annex I Party to implement the Convention;
  - **Any other information** that the non-Annex I Party considers relevant to the achievement of the objective of the Convention and suitable for inclusion in its communication, including, if feasible, material relevant for calculations of global emission trends

17

Non-Annex I Communication Guidelines
[Dec.17/CP.8]

Principal Objectives of the Guidelines

- To assist non-Annex I Parties in meeting their reporting requirements under the Convention;
- To encourage the presentation of information in a consistent, transparent and comparable, as well as flexible manner, taking into account specific national circumstances;
- To facilitate the presentation of information on support required for the preparation and improvement of national communications from non-Annex I Parties;
- To serve as policy guidance to the operating entity of the financial mechanism for the timely provision of financial support needed by developing country Parties in order to meet the agreed full costs of complying with their obligations…

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Non-Annex I Communication Guidelines
[Dec.17/CP.8]

National circumstances

- Non-Annex I Parties should provide a description of their national and regional development priorities, objectives and circumstances, on the basis of which they will address climate change and its adverse impacts. …..
- Non-Annex I Parties are encouraged to provide a summary of relevant information regarding their national circumstances, as appropriate, in tabular form.
- Non-Annex I Parties may provide a description of existing institutional arrangements relevant to the preparation of their national communications on a continuous basis.

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Non-Annex I Communication Guidelines
[Dec.17/CP.8]

Inventory

- Each Non-Annex I Party shall, in accordance with Article 4, paragraph 1(a) and Article 12, paragraph 1(a), communicate to the Conference of the Parties a national inventory of anthropogenic emissions by sources and removals by sinks of all greenhouse gases (GHGs) not controlled by the Montreal Protocol, to the extent its capacities permits, following the provisions in these guidelines.
- Non-Annex I Parties shall estimate national GHG inventories for the year 1994 for the initial national communication or alternatively may provide data for the year 1990. For the second national communication, non-Annex I Parties shall estimate national GHG inventories for the year 2000. The least developed country Parties could estimate their national GHG inventories for years at their discretion
- Non-Annex I Parties should use the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories.
- Non-Annex I Parties are encouraged to apply the IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories …, taking into account the need to improve transparency, consistency, comparability, completeness and accuracy in inventories.

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Non-Annex I Communication Guidelines
[Dec.17/CP.8]

Other information

- General Description of steps taken or envisaged to implement the Convention.
- Other information considered relevant to the achievement of the objective of the Convention.
- Constraints and gaps, and related financial, technical and capacity needs.

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Non-Annex I Communication Guidelines
[Dec.17/CP.8]

- Submission:
  - The information provided in accordance with these guidelines shall be communicated by each non-Annex I Party to the COP in a single document, with an executive summary outlining the information contained in the full document, in both hard copy and electronic format.
  - Each non-Annex I Party shall submit its national communication in one of the official languages of the United Nations. The executive summary, which is to be of no more than 10 pages, shall be translated into English and made publicly available. Parties are also encouraged to submit, to the extent possible and where relevant, English translations of their communications.
  - Additional or supporting information may be supplied through other documents such as a technical annex.

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Consultative Group of Experts on national communications from Parties not included in Annex I to the Convention (CGE) Terms of Reference (Decision8/CP5)

- Exchange experience and information on the preparation of national communications;
- Consider, as appropriate, the needs for and availability of financial resources and technical support, and the identification of barriers to and gaps in this support;
- Consider, as appropriate, information in national communications from non-Annex I Parties in accordance with the guidelines for the preparation of initial national communications;
- Review existing activities and programmes to facilitate and support the preparation of national communications by non-Annex I Parties;
- Identify the difficulties encountered by non-Annex I Parties in the use of the guidelines;
- Identify the analytical and methodological issues, including technical problems in the preparation and reporting of greenhouse gas inventories;
- Examine national communications, in particular greenhouse gas inventories, submitted by non-Annex I Parties, with a view to arriving at recommendations on ways of overcoming difficulties in the use of the IPCC methodologies and the UNFCCC guidelines;
- Encourage interaction among experts from all Parties.

23

CGE Mandate Revised

(Decision3/CP8)

COP8 adopted the revised mandate of the Consultative Group of Experts, comprising 24 experts:

- Five members from each of the regions of non-Annex I Parties, namely, Africa, Asia and the Pacific, and Latin America and the Caribbean;
- Six members from Parties included in Annex I to the Convention (Annex I Parties), including one from countries with economies in transition;
- One member from each of three international organizations with relevant experience in providing technical assistance to non-Annex I Parties in the preparation of national communications.

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Consultative Group of Experts (CGE)

(Decision3/CP.8) (2002) **Mandate**

- Identify and assess technical problems and constraints
- Identify and assess the difficulties encountered;
- Examine national communications submitted to the secretariat;
- Provide technical advice and support, by organizing and conducting workshops, including hands-on training workshops at the regional or sub-regional level;
- Provide technical advice to the SBI. . .

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CGE: Current Members

A. African Region

- Ms. Emily Ojoo-Massawa (Kenya), Mr. Mohamed Etayari (Libya), Ms. Marília Manjate (Mozambique) , Mr. Samuel Adejuwon (Nigeria), Ms. Madeleine Diouf (Senegal) (also LEG member)

B. Asian Region

- Mr. M. Asaduzzaman (Bangladesh) , Mr. Subodh Kumar Sharma (India), Mr. Jaekyu Lim (Republic of Korea), Mr. Jose Villarin (Philippines) , Mr. Muhammad Mundicar (Kuwait)

C. Latin America and the Caribbean Region

- Mr. Carlos Fuller (Belize), Mr. Arthur Rolle (Bahamas), Mr. Luis Paz Castro (Cuba), Ms. Lilian Portillo (Paraguay), Mr. Luis Santos (Uruguay)

D. Annex I

- Mr. Satender Singh (Canada), Ms. Riitta Pipatti (Finland), Ms. Renate Vandeputte (Belgium) (also LEG member), Mr. Othmar Schwank (Switzerland), Mr. Alexander Pisarenko (Ukraine), Mr. Jack Fitzgerald (United States of America)

E. Organizations

- Ms. Bo Lim (NCSU/UNDP), Mr. Taka Hiraishi (IPCC/GHG Inventory Task Force), Mr. Mahendra Kumar (Climate Change Enabling Activities/UNEP)

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Work of CGE

- Regional workshop for the Latin America and the Caribbean region in Mexico City, Mexico, from 8 to 12 May 2000
- Regional workshop for the Africa region in Nairobi, Kenya, from 15 to 18 August 2000
- Regional workshop for the Asia and the Pacific region in Bangkok, Thailand from 16 to 20 October 2000
- Three interregional workshops of the CGE were held in 2001 and 2002
- CGE Workshops have been held; in Mauritius in April 2003, in Mexico in Sept. 2003, and in Malaysia in April 2004
- CGE hands-on training workshop on national greenhouse gas inventories for the Latin America and the Caribbean region was held in Panama on 25 - 29 October 2004
- Similar training workshop will be held in Shanghai on 8-10 February 2005.

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CGE Findings - Inventories

- Insufficient resources to collect the necessary activity data for the estimation of the GHG emissions (land use change and forestry, energy, etc.).
- Need for appropriate emission factors (forests, transport, agriculture, waste disposal).
- No technical coordinators or secretariat or technical focal points for performing the technical work.
- A lack of adequate capacities in the existing institutions to carry out research and training on climate change issues.
- Need for exchange of information related to national inventories among the countries of the regions.
- Need to improve UNFCCC Guidelines.
- Provision of further financial and technical support.

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CGE National Communication Guidelines User Manual

(November 2003)

- The user manual is available electronically in PDF-format in three UN languages: English, Français, Español.

<http://unfccc.int/files/essential_background/application/pdf/userman_nc.pdf>

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Discussions: Issues re. NAI NCs

- NC is a commitment by all Parties, under the "common but differentiated responsibility" principle. 121 NAIs have done NCs
- NC preparation requires human, technological, institutional and financial capability.
- Continuation of NC activities and maintenance of NC institutional setup is difficult in many developing countries.
- Provision of agreed full cost funding is not a straightforward question.
- Unsuccessful negotiations at COP9, SBI 20 and COP10 (Dec. 2004).

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NAI National Communications (As of January 2005)

(Red: 2nd communications)

ALBANIA, ALGERIA, ANTIGUA AND BARBUDA, ARGENTINA, ARMENIA, ZERBAIJAN, BAHAMAS, BANGLADESH, BARBADOS, BELIZE, BENIN, BHUTAN, BOLIVIA, BOTSWANA, BRAZIL, BURKINA FASO, BURUNDI, CAMBODIA, CAPE VERDE, CENTRAL AFRICAN REPUBLIC, CHAD, CHILE, CHINA, COLOMBIA, COMOROS, CONGO, COOK ISLANDS, COSTA RICA, COTE D'IVOIRE, CUBA, DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA, DEMOCRATIC REPUBLIC OF THE CONGO, DJIBOUTI, DOMINICA, DOMINICAN REPUBLIC, ECUADOR, EGYPT, EL SALVADOR, ERITREA, ETHIOPIA, GABON, GAMBIA, GEORGIA, GHANA, GRENADA, GUATEMALA, GUINEA, GUYANA, HAITI, HONDURAS, INDIA, INDONESIA, IRAN, (Islamic Republic of), ISRAEL, JAMAICA, JORDAN, JORDAN, KAZAKHSTAN, KENYA, KIRIBATI, KYRGYZSTAN, LAO PEOPLE'S DEMOCRATIC REPUBLIC, LEBANON, LESOTHO, MACEDONIA (The former Yugoslav Republic of), MADAGASCAR, MALAWI, MALAYSIA, MALDIVES, MALI, MALTA, MARSHALL ISLANDS, MAURITANIA, MAURITIUS, MEXICO, MICRONESIA, MONGOLIA, MOROCCO, NAMIBIA, NAURU, NEPAL, NICARAGUA, NIGER, NIGERIA, NIUE, PAKISTAN, PALAU, PANAMA, PAPUA NEW GUINEA, PARAGUAY, PERU, PHILIPPINES, REPUBLIC OF KOREA, REPUBLIC OF MOLDOVA, SAINT KITTS AND NEVIS, SAINT LUCIA, SAINT VINCENT AND GRENADINES, SAMOA, SENEGAL, SEYCHELLES, SINGAPORE, SOLOMON ISLANDS, SOUTH AFRICA, SRI LANKA, SUDAN, SWAZILAND, TAJIKISTAN, THAILAND, TOGO, TRINIDAD AND TOBAGO, TUNISIA, TURKMENISTAN, TUVALU, UGANDA, UNITED REPUBLIC OF TANZANIA, URUGUAY, UZBEKISTAN, VANUATU, VIET NAM, YEMEN, ZAMBIA, ZIMBABWE [31]

The Second Workshop on GHG Inventories in Asia Region
Shanghai, China, 7-8 February 2005

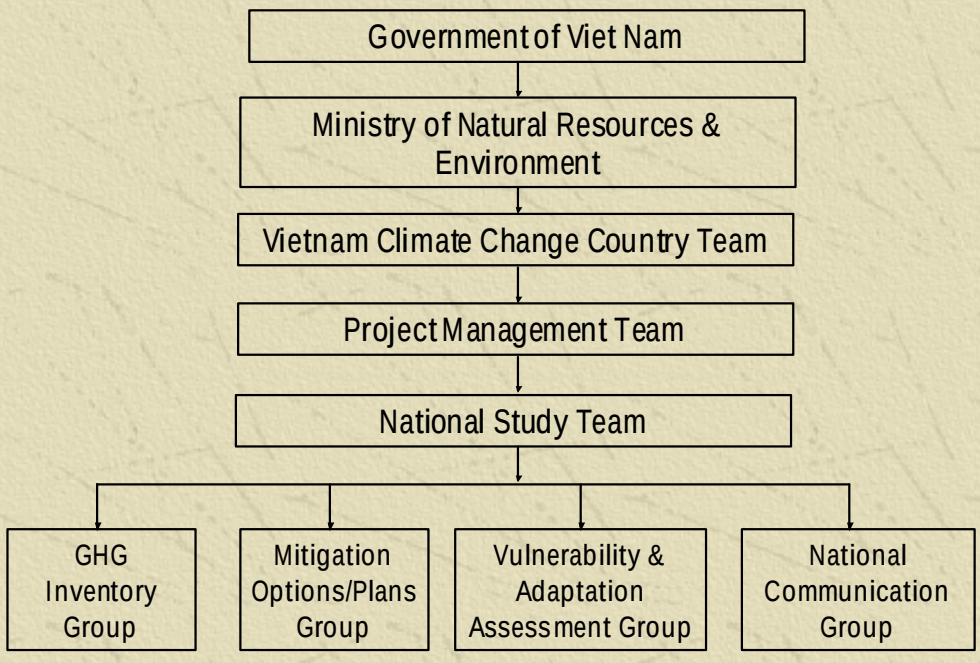
Submission of the Viet Nam Initial National Communication

Hoang Manh Hoa
Senior Expert on Climate Change
International Cooperation Department
Ministry of Natural Resources and Environment of Viet Nam

Background

- Viet Nam signed the UNFCCC in 1992 and ratified it on 16 November 1994.
- In order to fulfill the commitment described in the articles 12.1, 12.5 of UNFCCC and following the guidelines "Preparation of the Initial National Communication" for Non-Annex I Parties, the Government of Viet Nam assigned the Ministry of Natural Resources and Environment as a National Authority to implement the project "Viet Nam: Preparation of the Initial National Communication to the UNFCCC – GF/2200-97-54" with financial and technical support from the GEF and UNEP.
- There were many workshops and seminars held to prepare and complete the Initial National Communication.
- The Initial National Communication of Viet Nam was submitted to the UNFCCC Secretariat in November 2003.

Institutional arrangements for Preparing National Communication



Institutional arrangements for preparing National Communication

The climate change enabling activity to prepare the Initial National Communication to the UNFCCC led to the establishment of a National Study Team composed of the following institutions:

- Ministry of Natural Resources and Environment (MONRE)
- Ministry of Industry (MOI)
- Ministry of Planning and Investment (MPI)
- Ministry of Science and Technology (MOST)
- Ministry of Agriculture and Rural Development (MARD)
- Ministry of Finance (MOF)
- Ministry of Foreign Affairs (MOFA)
- Ministry of Transportation (MOT)
- Viet Nam Union of Science and Technology Associations (VUSTA).

Implemented activities

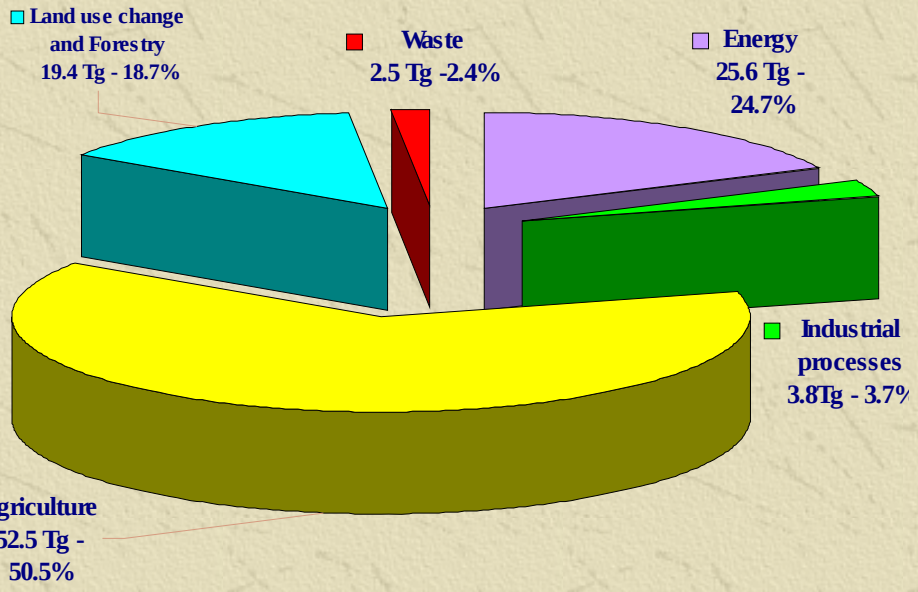
- 1994 National GHG Inventory was carried out for the main sectors:
  - Energy
  - Industry Processes
  - Forestry and Land Use Change
  - Agriculture
  - Waste

  The methodology:
  - the guidance of IPCC version 1996
  - The guideline for preparation of National Communication for Non-Annex I Parties
- The data sources were collected and processed from the General Statistical Office and other related Agencies of Viet Nam

GHGs Inventory Results in 1994

Emission sector	CO_2 equivalent (million tons)	(%)
Energy	25.6	24.7
Industrial Processes	3.8	3.7
Agriculture	52.5	50.5
Forestry and Land Use Change	19.4	18.7
Waste	2.5	2.4
Total emission	103.8	100

GHGs Inventory Results in 1994



GHG National & Sectoral Projection

Unit: Tg CO_2 equivalent

Year	*1994*	*2010*	*2020*
Energy	25.64	105.17	196.98
Land use change and Forestry	19.38	-21.70	-28.40
Agriculture	52.45	57.20	64.70
Total	97.47	140.67	233.28

GHG Mitigation Options

- Based on the results of GHG Inventory, GHG mitigation options in Viet Nam were developed for 3 major sectors:
  - Energy (9 options)
  - Forestry and Land Use Change (6 options)
  - Agriculture (3 options)

GHG mitigation options in Viet Nam
Energy sector (Period 2000-2020)

Options	Period 2000-2020	
	GHG mitigation potential ($Tg\ CO_2$)	Abatement Cost ($/t$CO_2$)
E1: Replacement of low-efficiency coal fired boilers by higher efficiency one	10.2	3.65
E2: Replacement of low-efficiency oil fired boilers by higher efficiency one	3.5	-3.65
E3: Fuel efficiency improvements with lean burn engine in transportation	21.9	-6.78
E4: Development of geo-thermal power	29.2	5.15
E5: Development of solar power	26.1	6.01

GHG mitigation options in Viet Nam (Cont.)
Energy sector (Period 2000-2020)

Options	Period 2000-2020	
	GHG mitigation potential (Tg CO_2)	Abatement Cost ($/t$CO_2$)
E6: Development of wind power stations	34	4.64
E7: Efficiency improvement in coal-cooking stoves	73	-4.15
E8: Replace incandescent light bulbs by compact fluorescent lamps	16	-8.31
E9: More efficient industrial motors	70	-7.19
Total	283.8	

GHG mitigation options in Viet Nam (Cont.)
Forestry and Land Use Change sector (Period 2000- 2020)

Options	*Carbon Sink (Tg CO_2)*	*Reduced Cost ($/t$CO_2$)*
F1: Protection of forest	1,320.6	0.21
F2: Combination of forest nursing and delineation for regeneration	372.6	0.11
F3: Planting of protective, specialized forest	325.8	0.26
F4: Short rotation reforestation	445.8	-0.15
F5: Long rotation reforestation	496.1	0.20
F6: Scattered trees planting	278.7	2.56
Total	3,221.6	

GHG mitigation options in Viet Nam (Cont.)
Agriculture sector (Period 2000- 2020)

Options	*Reduced methane ($Tg\ CO_2\ eq.$)*	*Mitigation Cost ($\$/tCO_2$)*
A1: Water management in rice field	105.0	13.12
A2: Food processing for animal	8.0	5.19
A3: Utilization of biogas	27.3	3.41
Total	140.3	

Implemented activities

- Adaptation measures for water resources:

1. Building reservoirs for containing flood water to mitigate losses caused by flood, meanwhile regulate water during low-flow season.
2. Upgrading and raising the scale of drainage system
3. Upgrading existing sea and river-mouth dykes
4. Actively limiting the population growth rate and organizing new resettlement areas to avoid the effects of sea level rise
5. Reclaiming areas for agricultural production
6. Using water scientifically and effectively with special attention paid to increasing run-off during low-flow season
7. Exploiting while protecting water sources
8. Conducting studies for planning rational and safe use of surface water sources.

Implemented activities

- Adaptation measures for agriculture sector:

1. Development of crop patterns suitable to climate change
2. Effective use with of irrigation water
3. Upgrading of irrigation system for agriculture
4. Development of new varieties that could stand against severe environmental conditions
5. Reserve and storage of local crop varieties, establishing crop seed banks
6. Development of farming techniques appropriate to climate change

Implemented activities

- Adaptation measures for forestry and land use change sector:

1. Enhancing reforestation, regreening bare lands and hills, protecting and developing of mangrove forest
2. Protecting natural forest and going forward to closing natural forest exploitation. Preventing forest fire
3. Establishing bank of seeds of natural forest trees in order to protect some valuable varieties.
4. Enhancing timber processing and limiting use wood as material.
5. Selecting and developing plant varieties suitable to natural conditions taking into account climate change

Implemented activities

- Adaptation measures for aquaculture:

1. Researching on prediction of movement of fishes and providing fishermen with fish monitoring equipment.
2. Importing and developing valuable aquaculture varieties that could adapt to high temperature.
3. Changing farming structure in some wet areas from rice monoculture to fish-rice rotation system.
4. Taking into account sea level rise and increase of temperature while building infrastructures, quays, ports, store house, etc.
5. Developing plan on brackish water aquaculture for Central Viet Nam with 2000 km of coast and sandy land
6. Building back-up dyke behind sea dyke to create transitional belts between agricultural land and sea.
7. Building storm shelter port systems along the coast as well as in islands.
8. Establishing natural ecological reserves.

Implemented activities

- Adaptation measures for coastal zone:

Three strategic options:

1. Full protection:

   Make all dykes higher and strengthen coastal management

2. Adaptation: reform infrastructures and habits of the people living in the coastal zone to adapt sea level rise.

3. Withdrawal (or avoidance): resettlement, moving house and infrastructures from threatened areas.

Implemented activities

- Adaptation measures for energy, transportation sector:

1. Taking into account climate change factors in planning of energy and transport development
2. Upgrading and reconstructing transport infrastructure in areas often threatened by sea level rise and flood
3. Ensuring demand side management of energy based on high efficiency of energy use, economical and rational use of energy, ensuring energy security and safety
4. Developing strategies to response and adapt to the vagary of weather.

Implemented activities

- Adaptation measures for human health

1. Accelerating the implementation of the programme "Eliminating hunger and reducing poverty", improving living standards of the people, especially of those in remote areas.
2. Developing national plan and programme for medical control and monitoring in areas that have high danger of infections in order to take timely response measures and prevent the spreading of diseases.
3. Establishing green, clean and beautiful areas in the dense populated areas.
4. Promoting public awareness on climate change so that every person could take adaptation measures for himself
5. Implementing strict quarantine at the borders, airports to prevent infection and disease transmission from outside.

Portfolio of some projects on climate change

No	Name of Project	Location	Total Budget (million USD)	Time
1	Development of renewable energy	All country	50	2005-2009
2	Energy saving in industry	All country	3.3	2005-2007
3	Encouraging utilization of renewable energy in rural areas	North of Vietnam	0.46	2005-2007
4	Forest plantation on sandy soil in the coast of the Southern Central Viet Nam	Southern Central Vietnam	11.5	2005-2010

Portfolio of some projects on climate change (cont.)

No	Name of Project	Location	Total Budge (million USD	Time
5	Improving cooking stoves of the rural-mountainous community	North of Viet Nam	0.35	2005-2009
6	Using biogas as fuel to mitigate GHG in rural areas	All country	1.5	2004-2008
7	Research on-generation technology from biomass fuel in Vietnam	All country	0.135	2004-2006
8	Energy conservation and saving in small and medium-sized enterprises	All country	1.5	2003-2006

Portfolio of some projects on climate change (cont.)

No	Name of Project	Location	Total Budge (million USD	Time
9	Wind power stations for the people in remote island	Quang Ninh Province	0.2	2004-2011
10	Planting protective forest in the watershed of Ngan Sau, Ngan Pho Rivers	Ha Tinh Province	7.01	2004-2012
11	Irrigation management of wetland rice field to reduce methane emission	Red River Delta and Mekong River Delta	5.025	2004-2007
12	Exploitation of geo-thermal energy in Vietnam	Central Viet Nam	0.3	2004-2005

Next steps

1. Carrying out the Project "Expedited financing for (interim) measures for capacity building in priority areas" (Phase II). This project is a following-up to the Initial National Communication.

- The main objective of the project is to enhance capacity building at national level and maintain efforts to access and disseminate information related to climate change technologies.
- The specific objectives are:
  - To help meet the added requirement of enhancing capacity in order to identify and analyse technologies needs
  - To access information on technology transfer and sensitise the public awareness on climate change
  - To build the capacity to prepare climate change programmes promoting technology transfer.
  - To build the capacity to improve the quality of climate change enabling activities.

Next steps

2. Developing climate change scenarios in Viet Nam for period 2010-2070
3. Collecting database provided for second National Communication
4. Continuing to study adaptation measures
5. Developing climate change project portfolio including potential CDM projects

Thank you for your attention

Natcom india
Ministry of Environment & Forests
Govt.of India

GHG inventory preparation - India's Experience

Subodh Sharma
National Project Director
National Communications

Ministry of Environment & Forests

The Framework of presentation

National Circumstances and Diversity of activities

Inventory Development
- Chronology of inventory development
- Inventory of 1994
- Uncertainty reduction
- Development of indigenous emission factors
- Utilisation of national emission factors

Constraints and gaps in inventory development

Need for improvement
- Sectors requiring improvement
- Steps of refinement of GHG inventory

Further Capacity building requirements

The Setting

India is a vast country (3.28 million sq km)

Diverse physiographical features

Himalayas, Coastal areas, northern plains, peninsular plateau and islands

Occupies 2.4% of the worlds land area but support 16.2% of the worlds human population

Dominating feature of climate is the Monsoon

Endowed with varied soils, climate, biodiversity and ecological regions

Under such diverse natural conditions, a billion people speaking different languages, following different religions, inhabiting in rural and urban areas live in harmony under a democratic system

Diversity in emissions

Regional and sectoral variability exists in emissions across a large country like India

Wide technology diversity complicates India specific estimates as new and vintage technologies co-exist

For example:

Energy and transformation industries

- Different fuel combustion technologies operational

Industrial Process

- Diverse production technologies

Agriculture

- Dispersed sources therefore difficult to assess activity data

Land use Land use Change and Forestry

- Assessment of all forest types still not covered

Waste

- Rising urban population

Chronology of Inventory Development

Gases	CO_2 CH_4	CO_2 CH_4	CH_4	CO_2, CH_4 N2O, NOx, CO, NMVOC	CH_4	CO_2, CH_4 N2O
Sectors	Fossil Fuel Rice Animals	Transport Coal mines 1992 CH_4 campaign Animals-Tier-II	Seasonally integrated approach and new classification of rice fields based on water regimes developed	Additional sources: Biomass burning, cement prod. oil & nat. gas Manure crop residue soils and MSW	1998 methane Campaign & CH_4 coefficients organically amended soils	Mostly all sources
EF	Used Published EF	Used Published & also devloped for rice	developed EF for various water regimes	IPCC default + own published	EF developed for organically amended soil	EF developed for key sectors
Base year	1990	1990	1990-1995	1990-1995	1998	1994
Ref.	Mitra, 1991	Mitra, 1992	Parashar et. al., 1997	ALGAS, India, 1998	Gupta et al. 1999	NATCOM 2004

Inventory Estimation- Scope

Sectors Covered:

- Energy and Transformation
- Industrial Processes
- Agriculture
- Land Use, Land Use Change & Forestry
- Waste

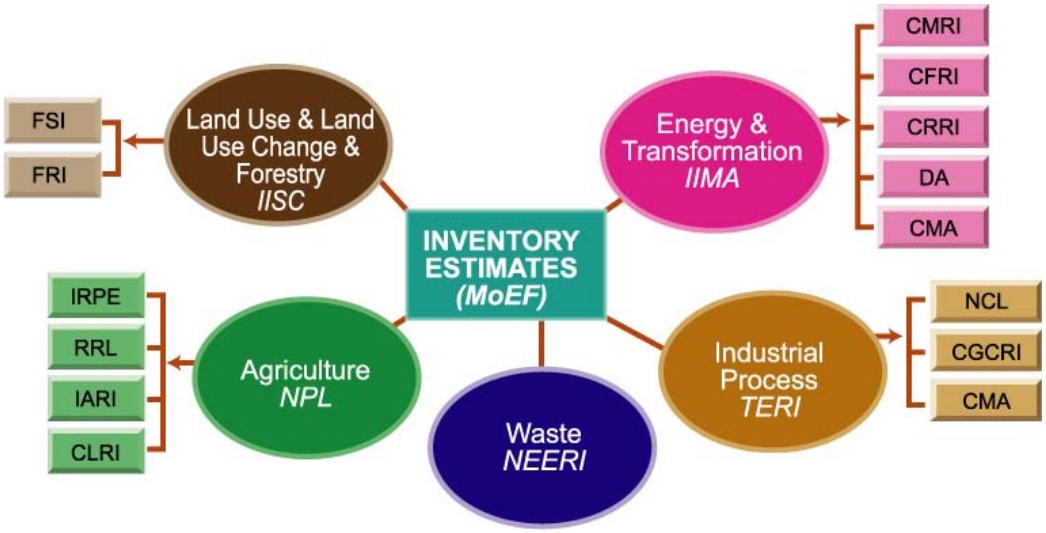
Gases Covered:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous Oxide (N_2O)

Base year: 1994

Guidelines: IPCC 1996

Inventory Estimation - Institutional Arrangement



19 Research Teams

GHG Emissions from Sources and Removals by Sinks - India 1994

GHG source and sink categories (Gg per year)	CO_2 emissions	CO_2 removals	CH_4	N_2O	CO_2 eq. emissions*
Total (Net) National Emission	817023	23533	18083	178	1228540
1. All Energy	679470		2896	11.4	**743820**
2. Industrial Processes	99878		2	9	102710
3. Agriculture			14175	151	344485
4. Land use, Land-use change and Forestry*	37675	23533	6.5	0.04	14292
5. Other sources as appropriate and to the extent possible					0
5a. Waste			1003	7	23233
5b. Emissions from Bunker fuels #	3373				3373

*Converted by using GWP indexed multipliers of 21 and 310 for converting CH_4 and N_2O respectively.

Sectoral emissions - Energy and Industrial Processes

GHG source and sink categories (Gg per year)	CO_2 emissions	CO_2 removals	CH_4	N_2O	CO_2 eq. emissions*
Total (Net) National Emission	**817023**	**23533**	**18083**	**178**	**1228540**
1. All Energy	**679470**		**2896**	**11.4**	**743820**
Fuel combustion					
Energy and transformation industries	353518			4.9	355037
Industry	149806			2.8	150674
Transport	79880		9	0.7	80286
Commercial/institutional	20509			0.2	20571
Residential	43794			0.4	43918
All other sectors	31963			0.4	32087
Biomass burnt for energy			1636	2.0	34976
Fugitive Fuel Emission					
Oil and natural gas system			601		12621
Coal mining			650		13650
2. Industrial Processes	**99878**		**2**	**9**	**102710**

Sectoral emissions- Agriculture

GHG source and sink categories (Gg per year)	CO_2 emissions	CO_2 removals	CH_4	N_2O	CO_2 eq. emissions*
Total (Net) National Emission	**817023**	**23533**	**18083**	**178**	**1228540**
3. Agriculture			**14175**	**151**	**344485**
Enteric Fermentation			8972		188412
Manure Management			946	1	20176
Rice Cultivation			4090		85890
Agricultural crop residue			167	4	4747
Emission from Soils				146	45260

Sectoral Emissions – Land Use, Land Use Changes and Forestry

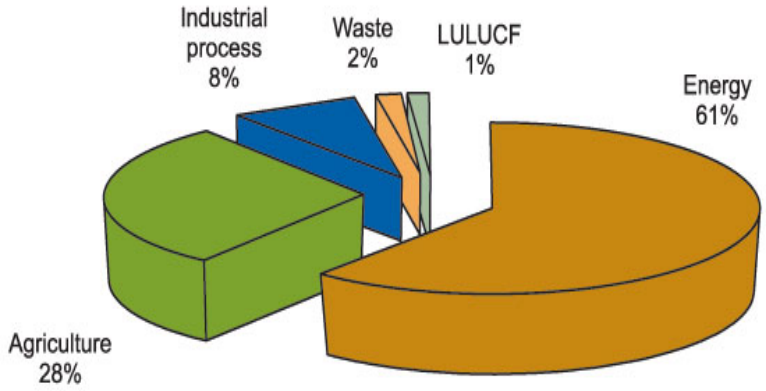
GHG source and sink categories (Gg per year)	CO_2 emissions	CO_2 removals	CH_4	N_2O	CO_2 eq. emissions*
Total (Net) National Emission	**817023**	**23533**	**18083**	**178**	**1228540**
4. Land use, Land-use change and Forestry*	**37675**	**23533**	**6.5**	**0.04**	**14292**
Changes in forest and other woody biomass stock		14252			(14252)
Forest and grassland conversion	17987				17987
Trace gases from biomass burning			6.5	0.04	150
Uptake from abandonment of managed lands		9281			(9281)
Emissions and removals from soils	19688				19688

Sectoral Emissions – Waste Management

GHG source and sink categories (Gg per year)	CO_2 emissions	CO_2 removals	CH_4	N_2O	CO_2 eq. emissions*
Total (Net) National Emission	**817023**	**23533**	**18083**	**178**	**1228540**
5. Other sources as appropriate and to the extent possible					0
5a. Waste			**1003**	**7**	**23233**
Municipal solid waste disposal			582		12222
Domestic waste water			359		7539
Industrial waste water			62		1302
Human sewage				7	2170
5b. Emissions from Bunker fuels #	**3373**				**3373**
Aviation	2880				2880
Navigation	493				493

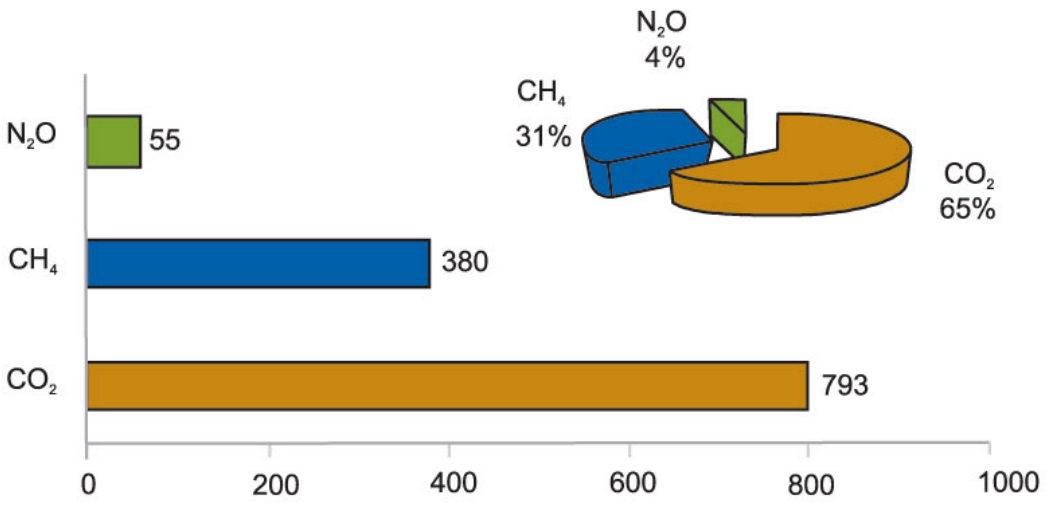
Not counted in the national totals.

Sectoral Distribution of GHG emissions – India 1994



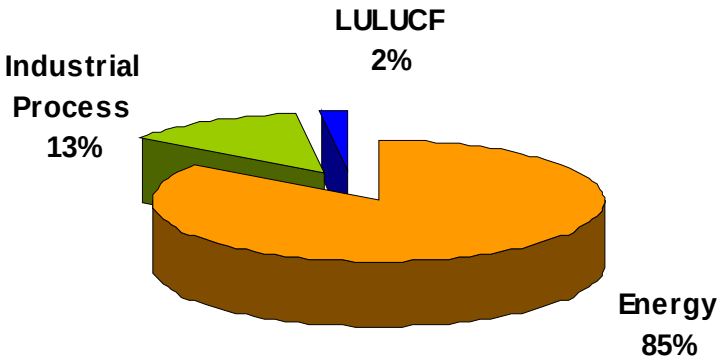
Emissions in terms of CO_2 equivalent

Relative GHG Emissions - India 1994



CO_2 equivalent emission distribution (Mt)

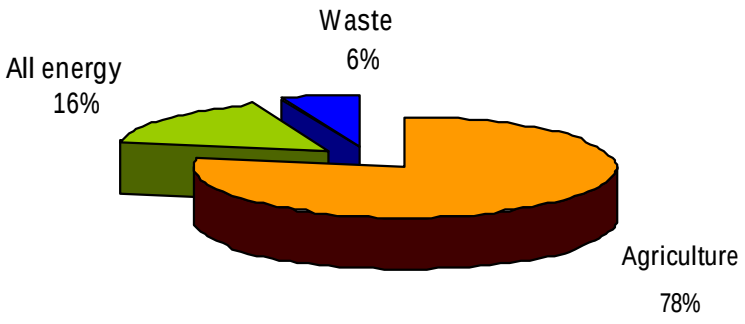
CO_2 Emission Distribution in 1994



Key sources: Energy and transformation industries

Steel & Cement Production

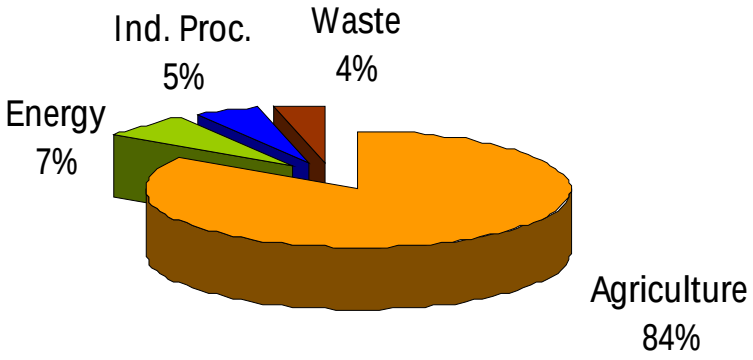
CH_4 Emission Distribution in 1994



Key sources : Enteric fermentation

Rice cultivation

N_2O Emission Distribution in 1994



Key sources: N_2O emissions from Soils

Levels of inventory estimations

Tier 1 Takes into account the gross consumption and average emissions factors.
e.g. National level fuel consumption and common emission factors (tC/unit fuel used),

Tier 2 Refers to estimations based on sub-sectoral consumption and emissions coefficients developed representing specific conditions.
e.g. Fuel combustion attributed to technology types (like Sub-critical pulverized coal for power generation)

Tier 3 Refers to emission estimates made using detailed activity and specific emission coefficients
e.g. emission factors expressed directly in terms of unit of activity like tC/kWh of power generated

Share of different Tiers used for NATCOM GHG estimates	
Tier-I approach	23%
Tier-II approach	70%
Tier III approach	7%

Uncertainties in Inventory Estimation

- Top down and bottom up estimates of national activity data have variations due to aggregation errors
- Existing activity data reporting formats are not meant for inventory reporting purposes
- Most of the IPCC default emission coefficients not representative of India specific coefficients
- Methodological issues

Uncertainty Reduction

To capture the diversity of Indian emission characteristics

To enhance the quality of the inventory

Fresh emissions measurements / estimations were undertaken in some sectors

Energy and Transformation Sector

Calorific values of Indian coals
CH_4 from Coal mining
GHGs from Road Transport
CO_2 from some power, steel & cement plants

Industrial Process

N_2O from Nitric Acid Production
CO2 from Cement , Lime and Dolomite

Agriculture Sector

CH_4 from Enteric Fermentation
CH_4 from Rice Cultivation
N_2O from Soils
GHG from biomass combustion

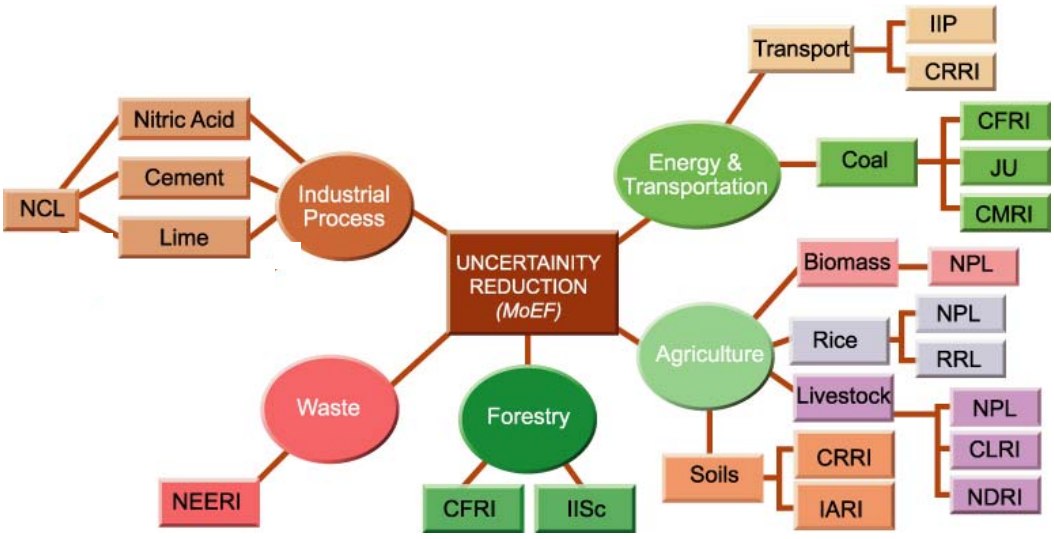
Forestry

Estimation of annual growth rates

Waste

CH_4 Municipal Solid Waste

Uncertainty Reduction – Institutional Arrangement



17 Research Teams

Indigenous Emission Factors Developed for India

		Emission Factor (EF)	Reference
Indian Coal	NCV TJ/Kt	t CO_2/TJ	
Coking coal	24.18±0.3	25.53	Choudhury et al., 2004
Non-coking coal	19.63±0.4	26.13	
Lignite	9.69±0.4	28.95	
Road Transport sector		TCO/Tj	
Gasoline	2W/3W	43.9 ± 7.3	Singh et al., 2004a, Singhal et al, 2004
	Car/Taxi	61.5 ± 4.0	
Diesel Oil	MCV/HCV	71.4 ± 0.55	
	LCV	71.4 ± 0.5	

India specific emission factors ……..contd.

		Emission Factor (EF)	Reference
Coal Mining		m^3CH_4/ton	Singh, 2004
Underground mining			
During Mining	Degree I	2.91	
	Degree II	13.08	
	Degree III	23.64	
Post mining	Degree I	0.98	
	Degree II	2.15	
	Degree III	3.12	
Surface mining		1.83	
During Mining		0.23	
Post mining			

India specific emission factors ……..contd.

	Emission Factor (EF)	Reference
Cement manufacturing	tons/ton of clinker	Rao et al., 2004
	0.534 - 0.539	
Nitric acid production	kg per ton of N2O	
Medium pressure plant	6.48 – 13.79	Rao et. al., 2004
High pressure plants	1.54 – 4.13	
Dual pressure plant	0.24 – 0.57	

India specific emission factors ……..contd.

	Emission Factor (EF)	Reference
Rice Ecosystem	g CH_4/m^2	Gupta et al., 2004
Upland	0	
Rain fed Flood Prone	19.0±6.0	
Rain fed, Drought Prone	7.0±2	
Irrigated, Continuously Flooded	17.5±4.0	
Irrigated Single Aeration	6.6±1. 9	
Irrigated Multiple Aeration	2.0±1.5	
Deep Water	19.0±6.0	

India specific emission factors ……..contd.

		Emission Factor	Reference
Enteric fermentation		g CH_4 / animal	Singhal et al., 2004 Swamy et al., 2004
Dairy cattle	Indigenous	28±5	
	Cross bred	43±5	
Non dairy cattle (Indigenous)	0-1yrs	9±3	
	1-3 year	23±8	
	Adult	32±6	
Non-dairy cattle (Cross Bred)	0-1 year	11±3	
	1-2 ½ year	26±5	
	Adult	33±4	
Dairy buffalo		50±17	
Non- Dairy buffalo	0-1 year	8±3	
	1-3 year	22±6	
	Adult	44±11	
Sheep		4±1	
Goat		4±1	

Possible Reasons for Variation in Some Coefficients

Coefficient type	Possible reasons for variation of Indian coefficients from IPCC default values
CO_2 from coal combustion	Coal composition, boiler/ combustion efficiency, regional variations across the country, coal definition issues
Industrial process emissions	Technological variability in level and extent of control processes
CH_4 from enteric fermentation	Thinner cattle, not so rich feed type
CH_4 from rice paddy cultivation	Irrigation practices, fertilizer and soil types in India are not conducive to high CH_4 production
CH_4 from Municipal Solid Waste	Waste composition, waste collection levels and mechanisms, dump management, reduction technologies

Status of Preparation GHG inventory – Energy Sector

	Percentage of the total National CO_2 eq. emissions	Tier used in the Initial NATCOM	Type of emission factor used
Energy sector			
Energy and transformation industries	28.9	Tier II	I
Industry	12.3	Tier I	D
Transport	6.5	Tier II	I
Residential	3.6	Tier I	D
Biomass burnt for energy	2.8	Tier I	D
All other energy sectors	2.6	Tier I	D
Commercial-institutional	1.7	Tier I	D
Coal mining	1.1	Tier II	I
Oil and natural gas system	1.0	Tier I	D

I: Indigenously developed, D: IPCC Default Emission factors

Status of Preparation GHG inventory – Industrial Processes

	Percentage of the total National CO_2 eq. emissions	Tier used in the Initial NATCOM	Type of emission factor used
Industrial Processes			
Iron and Steel production	3.6	Tier I	D
Cement production	2.5	Tier II	I
Nitric acid production	0.2	Tier II	I
Ammonia production	1.2	Tier I	D
All Others	0.9	Tier I	D

I: Indigenously developed, D: IPCC Default Emission factors

Status of Preparation GHG inventory – Agriculture

	Percentage of the total National CO_2 eq. emissions	Tier used in the Initial NATCOM	Type of emission factor used
Agriculture sector			
Enteric Fermentation	15.3	Tier III	I
Rice Cultivation	7.0	Tier III	I
Emission from Soils	3.7	Tier I	D
Manure Management	1.6	Tier I	D
Agricultural crop residue	0.4	Tier I	D

I: Indigenously developed, D: IPCC Default Emission factors

Status of Preparation GHG inventory – LULUCF and Waste

	Percentage of the total National CO_2 eq. emissions	Tier used in the Initial NATCOM	Type of emission factor used
LULUCF			
Emissions and removals from soils	1.6	Tier I	D
Forest and Grassland Conversion	1.5	Tier I	D
Trace gases from biomass burning	0.0	Tier I	D
Uptake from abandonment of Managed lands	-0.8	Tier I	D
Changes in Forest and other woody biomass stock	-1.2	Tier I	D
Waste sector			
Municipal Solid Waste Disposal	1.0	Tier I	D
Domestic/Industrial Waste water	0.7	Tier I	D
Human Sewage	0.2	Tier I	D

I: Indigenously developed, D: IPCC Default Emission factors

Constraints and Gaps in Inventory Estimation

Gaps and constraints	Description	Potential measures (examples)
Data organization	Published data not available in IPCC-friendly formats for inventory reporting	Design consistent reporting formats
	Inconsistency in top-down and bottom-up data sets for same activities	Data collection consistency required
	Mismatch in sectoral details across different published documents	Design consistent reporting formats
Non-availability of relevant data	Time series data for some specific inventory sub-categories, e.g., municipal solid waste sites	Generate relevant data sets
	Data for informal sectors of economy	Conduct data surveys
	Data for refining inventory to higher tier levels	Data depths to be improved
Non-accessibility of data	Proprietary data for inventory reporting at Tier III level	Involve industry and monitoring institutions
	Data not in electronic formats	Identify critical datasets and digitize
	Lack of institutional arrangements for data sharing	Establish protocols
	Time delays in data access	Awareness generation

Constraints and Gaps in Inventory Estimation

Gaps and constraints	Description	Potential measures (examples)
Technical and institutional capacity needs	Training the activity data generating institutions in GHG inventory methodologies and data formats	Arrange extensive training programmes
	Institutionalize linkages of inventory estimation with broader perspectives of climate change research	Wider dissemination activities
Non-representative emission coefficients	Inadequate sample size for representative emission coefficient measurements in many sub-sectors	Conduct more measurements
Limited resources to sustain national communication efforts	Sustain and enhance research networks established under Initial National Communication	Global Environment Facility (GEF)/ international funding
	India-specific emission coefficients	Conduct adequate sample measurements for key source categories
	Vulnerability assessment and adaptation	Sectoral and sub-regional impact scenario generation, layered data generation and organization, modelling efforts, case studies for most vulnerable regions
	Data centre and website	National centre to be established

Sectors requiring improvement - Energy

	Percentage of the total National CO_2 eq. emissions	Tier used in the Initial NATCOM	Desirability of switching over to a higher tier in the future	Whether improvement in activity data Required	Desirability of use of IPCC Good Practice guidance
ENERGY					
Energy and transformation industries	28.9	Tier II	Tier III	Y	Y
Industry	12.3	Tier I	Tier II	Y	Y
Transport	6.5	Tier II	Tier III	Y	
Residential	3.6	Tier I	Tier II	Y	
Biomass burnt for energy	2.8	Tier I	Tier II		
All other energy sectors	2.6	Tier I	Tier II		
Commercial-institutional	1.7	Tier I	Tier II		
Coal mining	1.1	Tier II	Tier III	Y	
Oil and natural gas system	1.0	Tier I	Tier II	Y	

Sectors requiring improvement - Industrial Processes

	Percentage of the total National CO_2 eq. emissions	Tier used in the Initial NATCOM	Desirability of switching over to a higher tier in the future	Whether improvement in activity data Required	Desirability of use of IPCC Good Practice guidance
INDUSTRIAL PROCESSES					
Iron and Steel production	3.6	Tier I	Tier III	Y	Y
Cement production	2.5	Tier II	Tier III	Y	Y
Ammonia production	1.2	Tier I	Tier I		
All Others	1.1	Tier I	Tier I		

Sectors requiring improvement - Agriculture

	Percentage of the total National CO_2 eq. emissions	Tier used in the Initial NATCOM	Desirability of switching over to a higher tier in the future	Whether improvement in activity data Required	Desirability of use of IPCC Good Practice guidance
AGRICULTURE					
Enteric Fermentation	15.3	Tier III	Tier III	Y	Y
Rice Cultivation	7.0	Tier III	Tier III	Y	Y
Emission from Soils	3.7	Tier I	Tier II	Y	
Manure Management	1.6	Tier I	Tier I		
Agricultural crop residue	0.4	Tier I	Tier I		

Sectors requiring improvement - LULUCF

	Percentage of the total National CO_2 eq. emissions	Tier used in the Initial NATCOM	Desirability of switching over to a higher tier in the future	Whether improvement in activity data Required	Desirability of use of IPCC Good Practice guidance
LULUCF					
Emissions and removals from soils	1.6	Tier I	Tier III	Y	Y
Forest and Grassland Conversion	1.5	Tier I	Tier III	Y	Y
Trace gases from biomass burning	0.0	Tier I	Tier II	Y	Y
Uptake from abandonment of Managed lands	-0.8	Tier I	Tier III	Y	Y
Changes in Forest and other woody biomass stock	-1.2	Tier I	Tier III	Y	Y

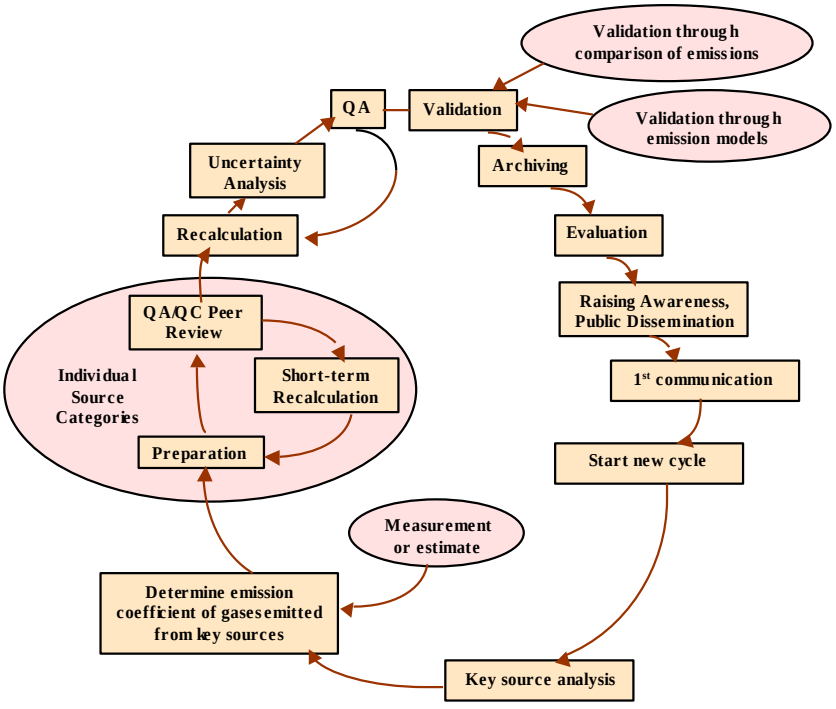
Sectors requiring improvement – Waste Management

	Percentage of the total National CO_2 eq. emissions	Tier used in the Initial NATCOM	Desirability of switching over to a higher tier in the future	Whether improvement in activity data Required	Desirability of use of IPCC Good Practice guidance
WASTE MANAGEMENT					
Municipal Solid Waste Disposal	1.0	Tier I	Tier III	Y	Y
Domestic/Industrial Waste water	0.7	Tier I	Tier II	Y	
Human Sewage	0.2	Tier I	Tier I		

Steps of refinement of GHG estimations

- Through higher sectoral disaggregation and hence riding the Tier ladder
- Following Good Practices of Uncertainty Management and Quality Assurance and Quality Control
- Comparing emission estimates with model runs
- Comparisons with national, regional and global inventories

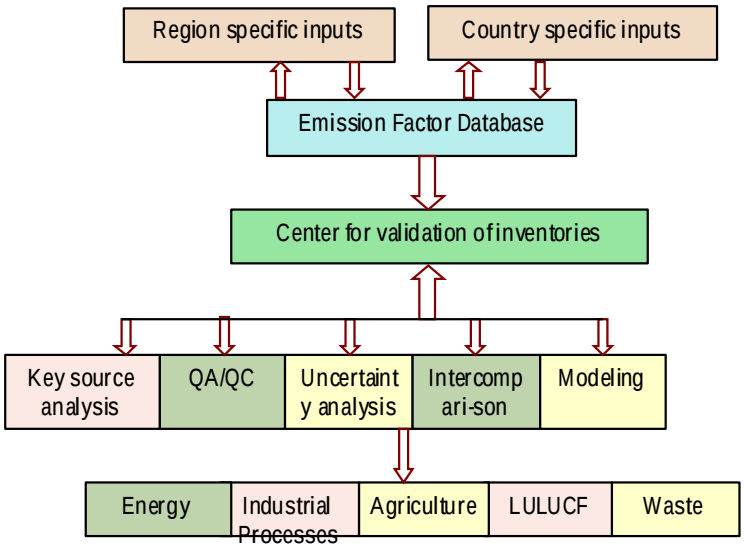
Steps for refinement of GHG estimations



Capacity Building efforts required for further refinement

- Continuous and improved networking
- Bridging data Gaps
- Strengthening existing emission coefficients
- Training on inventory development for estimating inventories of new gases, revised guidelines for preparation of inventories
- Developing emission factors representing Indian conditions for new gases to be reported
- Establishing an Emission Factor Data Base and a Nodal Centre for validation of inventories

Framework for a centre for validation of emission inventories and an emission factor database



Natcom india
Ministry of Environment & Forests
Govt.of India

中华人民共和国
气候变化初始国家信息通报

The People's Republic of China
Initial National Communication on Climate Change

2nd Workshop on GHG Inventory in Asia Region

Shanghai February 7, 2005

1

Contents

- Preparation for the INC
- Institutional Arrangement
- Process of Developing the INC
- Contents of the INC
- Experiences

2

Preparation for the INC

- China ratified the Convention in early 1993
- COP2 adopted the guidelines for preparing national communications from non-Annex I parties
- China started preparation its work in 1996, including consultation with UNDP China Office
- A PDF project was initiated in 1999

3

Preparation for the INC

PDF Process

- **Budget:** 324,000 US dollar
- **Duration:** 12 month
- **Objective:** To assess previous works and identify the capacity needs in China for preparation of initial national communication, in particular national GHGs inventory.

4

Preparation for the INC

Focusing Areas

- National GHG inventories:
  - **Energy;**
  - **Industrial processes;**
  - **Agriculture;**
  - **Land use change and forestry;**
  - **Waste management**
- Vulnerability and adaptation assessment:
- **Climate change scenarios, Agriculture, Water resources, Ecosystem, Coastal zone and sea level, Health**

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Preparation for the INC

Previous Works Reviewed

- ***Response Strategy on Global Climate Change in China*** *supported by ADB and completed in 1993;*
- ***China: Issues and Options in GHG Emissions Control*** *supported by the GEF and UNDP (executed by World Bank) and completed in 1994;*
- ***China Climate Change Country Study*** *supported by the US Country Studies Program and completed in 1998;*
- ***Asian Least-Cost GHG Abatement Strategy (ALGAS)*** *funded by GEF/UNDP, executed by ADB and completed in 1998;*
- Other domestically supported projects

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Preparation for the INC

Some Results from PDF

- **Needs identified:**
  - ☑ Understanding the methodology
  - ☑ Expanding the coverage of the inventories
  - ☑ Developing national emission factors
  - ☑ Collecting of data and Improving data quality
  - ☑ Analyzing climate change related policies
  - ☑ Enhancing public awareness of climate change
- A project proposal for " Enabling China to prepare its initial national Communication " was developed based on the outcomes of the PDF project.

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Preparation for the INC

Design of the " Enabling China to Prepare Its INC " Project

- Seven immediate objectives
- Project activities including training, workshops, collection and analysis of data, development of emission factors, study tours, involvement of international consultants, experts review of the reports, government review of the reports, etc.
- Project output: INC
- Project budget
- GEF: $3,500,000
- Chinese government: $240,000
- Project duration: 28 months

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Institutional Arrangement

- **Executing Agency**
  - National Development and Reform Commission (NDRC), under the guidance of National Coordination Committee on Climate Change
- **Establishment of the Steering Committee**
  - Providing guidance to the project implementation
  - Chaired by NDRC, consisting of members from MoFA, MOST, MoF, SEPA, CMA, ERI, and UNDP China Office

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Institutional Arrangement

- **Designation of the NPD, NPM and NPC**
  - NDRC appointed Mr.Gao Guangsheng, Director general of the Office to NCCCC, as the National Project Director (NPD)
  - Mr. Ma Aimin, Deputy Division Director of the NCCCC, was appointed as the Project Manager
  - Mr.Xu Huaqing, Director of Research Center for Energy, Environment and Climate Change, ERI, was recruited as the Project Coordinator
- **Project office**
  - Established within ERI, NDRC

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Institutional Arrangement

- Selection of the contractors through bidding process
- Criteria for contractors
- Evaluation Committee established to make final selection
- Five organizations contracted for the project

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Institutional Arrangement

Contractors

- **Energy Research Institute**, for **energy** sector and **industrial processes** inventories
- **Institute of Atmospheric Physics**, Chinese Academy of Science, for **agricultural** sector inventory
- **Chinese Academy of Forestry**, for **land use and forest** sector inventory
- **Chinese Research Academy of Environmental Sciences**, for **municipal waste** inventory
- **Administrative Center for China ' s Agenda 21**, for public awareness

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Process of Developing the INC

- PDF project in mid-1999
- INC Project approved by GEF Council on May 9th, 2000
- Project document signed in July, 2001
- Project inception in October, 2001
- First disbursement in November, 2001
- Submission in November, 2004

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Process of Developing the INC

- **Phase 1: inception**
  - Oct.2001-April, 2002
  - Project inception workshop and Inception workshops of contractors
  - Better understanding of UNFCCC guideline and IPCC methodologies, experts identification and networks, assessment of data availability, technical approaches, examination of previous works, etc.

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Process of Developing the INC

- **Phase 2: implementation**
  - May, 2002-Dec.2003
  - Development of GHG inventories by sectors
  - Activity data,emission factors
  - Draft of INC report outline and the first draft

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Process of Developing the INC

- **Phase 3:** finalization
  - Jan.2004-Nov.2004
  - Compilation of national GHG inventory
  - Experts and government review and improvement of INC reports (draft 2-draft 5)
  - Approval procedure
  - Submission of China ' s INC through UNFCCC secretariat

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Process of Developing the INC

Promulgation of China ' s INC

- The Initial National Communication was approved by the State Council
- A promulgation ceremony was conducted on Nov. 9th, 2004

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Contents of the INC

- **National Circumstances**
- **National GHG Inventory**
- Impacts of Climate Change and Adaptation
- Policies and Measures Related to Climate Change Mitigation
- Research and Systematic Observation
- Education, Training and Public Awareness
- Needs for Funds, Technologies and Capacity Building

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Contents of the INC

National Circumstances

- Located in the east of the Asian continent, on the western shore of the Pacific Ocean
- China has a landmass of 9,600,000 km^2
- Extremely diverse: tropical in the south and frigid in the north

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Contents of the INC

National Circumstances

- China has a shortage as well as an uneven distribution of water resources
  - ☑ **Per capita water resources are about one fourth of the world average**
- Coal dominant energy reserves
  - ☑ **Per capita energy resources are less than half of the world average**

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Contents of the INC

National Circumstances

- Huge population (1267 million), although the growth rate is less than 1% in the year 2000
- Two thirds of population living in the rural areas
- Low income developing country with per capita GDP USD 1,000
- Need for development in many areas

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Contents of the INC

National GHG Inventory

- **Sectors:** Energy, industrial processes, agriculture, land use change and forestry, wastes
- **GHGs:** CO_2, CH_4, and N_2O
- **Methodologies:**
  - ☑ Revised 1996 IPCC guidelines adopted;
  - ☑ IPCC good practice guidance and uncertainty management in national greenhouse gas inventory used as reference;
  - ☑ Necessary improvement in accordance with China ' s circumstances

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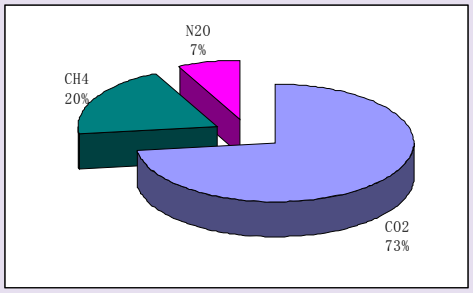
Contents of the INC

National GHG Inventory



- **CO_2 :** 2.666 billion tons (728 million ton-C) from fossil fuel combustion and industrial processes
- **CH_4:** 34.29 million tons from rice growing, animal husbandry, energy production and waste management
- **N_2O:** 0.85 million tons, from agriculture, industrial processes and energy sectors

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Contents of the INC

National GHG Inventory

- Difficulty in forecasting the future emission
- Analysis of factors which will influence the future trends of GHG emission
- These factors include:
  - Population growth and increasing urbanization, improvement of living standard
  - Economic development
  - Changes of economic structure and technological progress
  - Changes in forestry and ecological preservation and construction

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Contents of the INC

Impacts of Climate Change and Adaptation

- **The trend of climate change:**
  - ☑ the warming would continue in the future
- **Water:**
  - ☑ The runoff of major rivers has decreased in the past 40 years
  - ☑ It is likely that the runoff of major rivers will decrease in northern China and increase in southern China.

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Contents of the INC

Impacts of Climate Change and Adaptation

- The mountain glaciers have been shrinking and the water supply in western China might be threatened in the future

- **Agriculture:**
  - ☑ Plant growth will be speeded up and crop growing period will be shortened;
  - ☑ The cost for agricultural production will increase;
  - ☑ The distribution of crops will change, with the northern boundary extending northwards;
  - ☑ The grain production potential will be reduced due to climate change and extreme weather

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Contents of the INC

Impacts of Climate Change and Adaptation

- **Sea level:**
  - ☑ It is projected that the sea level rise over five typical coastal zones would range from 31cm to 65 cm by 2100;
  - ☑ The map shows the areas which are likely submerged in Guangzhou, south China when the sea level rises 30 cm

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Contents of the INC

Policies and Measures Related to Climate Change Mitigation

Cross-sector policies and measures

- **Sustainable development strategy:**
  - ☑ China ' s Agenda 21 developed in 1994, Sustainable development strategy integrated into national economic and social development plans
- **Relevant laws and regulations:**
  - ☑ Law for promotion of clean production;
  - ☑ Energy conservation law;
  - ☑ Renewable energy law (under preparation)

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Contents of the INC

Policies and Measures Related to Climate Change Mitigation

- Industrial policies:
  - ☑ Providing guidance for investment;
  - ☑ Inventories of products and technologies to be encouraged;
  - ☑ Equipments and technologies to be phased out
- Economic incentives:
  - ☑ Tax reduction;
  - ☑ Low interest loan

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Contents of the INC

Policies and Measures Related to Climate Change Mitigation

- **Policies and measures in different sectors:**
  - ☑ Management system;
  - ☑ Public awareness;
  - ☑ Technology improvement;
  - ☑ Standard, labeling, certification;
  - ☑ Demonstration projects;
  - ☑ ……

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Contents of the INC

Policies and Measures Related to Climate Change Mitigation

- Energy supply
- Energy conservation
- Industry
- Building
- Transportation
- Agriculture
- Forestry
- Waste management
- International cooperation

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Contents of the INC

Research and Systematic Observation

- A large three-dimensional network for observation of the atmosphere has been established, including 143 reference climate stations, 530 basic weather stations and 1736 ordinary weather stations.
- Marine observation and monitoring system, including stations for ocean observation, voluntary observation vessels, buoy observations, marine investigation vessels, seashore ice-monitoring radars.

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Contents of the INC

Research and Systematic Observation

- Terrestrial observation system mainly consists of a network measuring data for hydrological systems, ice-snow, ecological systems, agro-meteorology and environmental protection.
- Meteorological satellite also plays important role for remote-sensing observation.

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Contents of the INC

Research and Systematic Observation

- Climate change related research in the past years, including those sponsored by the Government and by international communities.
- Needs for future scientific research also identified, including research on the atmosphere science, impact of and adaptation to climate change, and national strategy and policies for addressing climate change issues.

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Contents of the INC

Education, Training and Public Awareness

- Survey was made on the public awareness of climate change
- Education through media (newspapers, radios and TVs)
- Establishment of websites on climate change (www.ccchina.gov.cn)

- Training and workshops
- Publications: Books, newsletters
- Works by artists

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Contents of the INC

Needs for Funds, Technologies and Capacity Building

- Development of national GHG inventory
  - ☑ Training
  - ☑ Statistics system
  - ☑ Improvement of emission factors
- Mitigation and adaptation
  - ☑ Technologies for mitigation
  - ☑ Technologies for adaptation
  - ☑ Research and systematic observation
- Capacity building
  - ☑ Needs identified primarily, self-assessment is going on

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Experiences

- Lack of activity data:
  - ☑ Statistics system can not provide all necessary data, some rely on experts ' judgment.
- Reliability and quality of data
  - ☑ Different data from different sources
- Emission factor:
  - ☑ IPCC default data could not be applied directly in China;
  - ☑ Data from specific sample observation may not fully reflect the situation due to time and financial constrains

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Experiences

- Lack of work for impact assessment and adaptation options
- The models used for assessing the impacts of climate change have mainly been introduced from abroad, whilst few models have been developed in China
- The assessment on the impacts of climate change is preliminary and there are still a lot of uncertainties

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Experiences

- A time-consuming process, adequate time allocation is necessary for ensuring the quality of the INC report:
  - ☑ Complicated procedure for applying financial resources
  - ☑ Difficulties with implementing agency
  - ☑ Understanding of UNFCCC guidelines and IPCC methodologies
  - ☑ Collection and analysis of information
  - ☑ Review and approval process

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Experiences

- A resource-demanding process, full financial support critical for the success:
  - ☑ In addition to the input from GEF, the Chinese government also provided resources;
  - ☑ Based on works completed in the past years
- Capacity building, an important part of the exercise:
  Professional expert team;
  - ☑ Training, continuous learning by doing process;
  - ☑ International exchange of information and expertise

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Experiences

- Political and Public Awareness, support from the different stakeholders needed
- Early preparations for the future
- ……

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Thanks for your attention!

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Current Status of the GHG Inventory in Japan

Mimi Nameki
Deputy Director
Climate Change Policy Division
Global Environment Bureau
Ministry of the Environment

Workshop on GHG Inventories in Asia Region
February 7-8, 2005

環境省 Ministry of the Environment

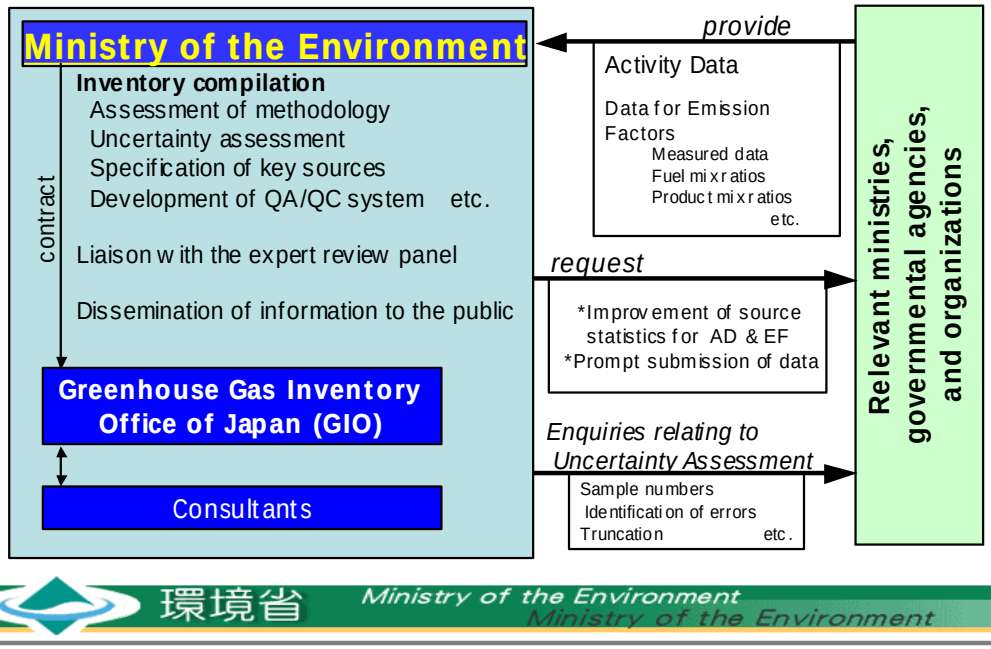
Outline

- National Level: Japan's National Inventory
  - Background
  - Trends in overall emissions and removals
- Local Level: Guideline for local governments
  - to promote local activities against Climate change by establishing area specific action plan, Global Warming Countermeasures Area Promotion Plan
  - Plan, Do, Check, Action

How we actually use Inv as a basis of policy making

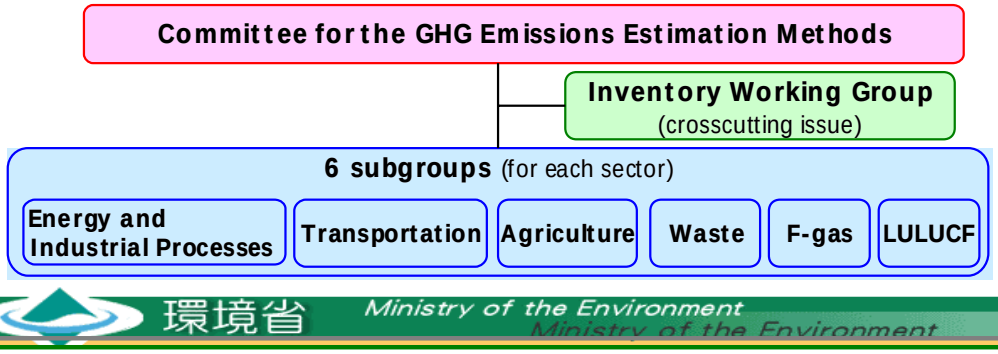
環境省 Ministry of the Environment

Current Institutional Arrangement



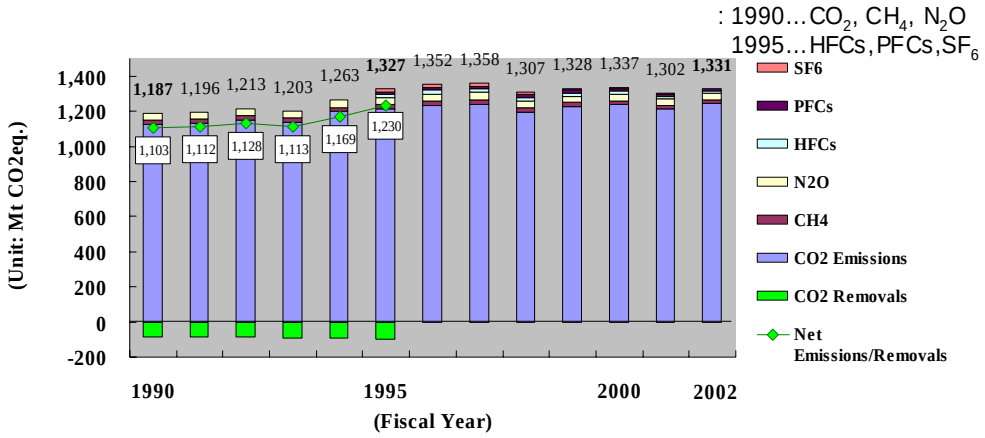
Current Institutional Arrangement

- "the Committee for the GHGs Emissions Estimation Methods", since 1999,
- Members: external experts, approximately 60
- The committee is in charge of methodological development of the inventory



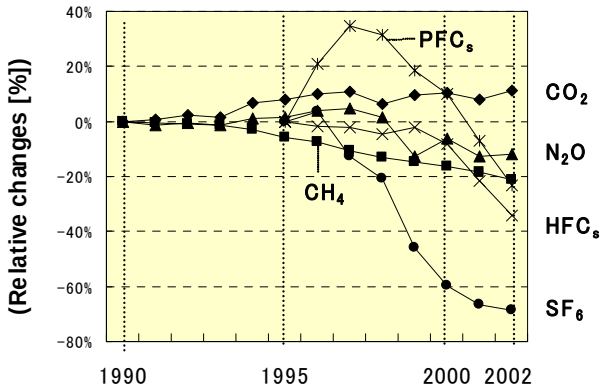
Trends in overall emissions and removals

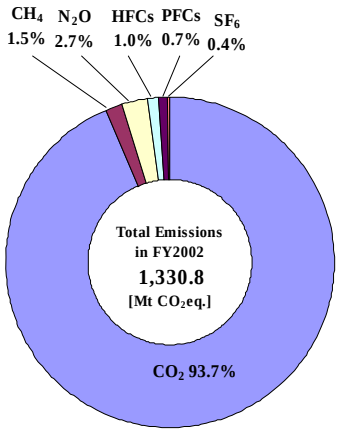
- Overall emission of GHGs:
  - 1,331 [Mt CO_2 eq.] in 2002 (CO_2, CH_4, N_2O, HFCs, PFCs, SF_6)
- Increased by 7.6% since KP's Base Year



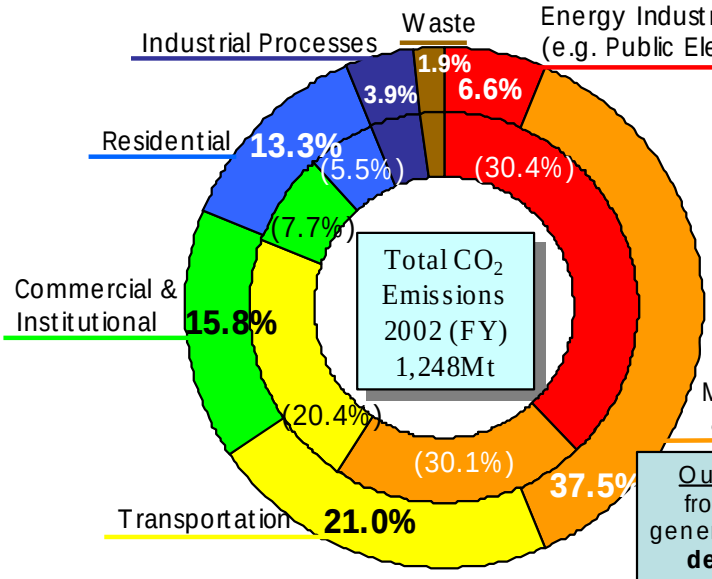
Trends in overall emissions

- CO_2 +11.2%, CH_4 -21.1%, N_2O -11.9% (since 1990)
- HFCs -34.1%, PFCs -23.4%, SF_6 -68.7% (since 1995)
- Share of CO_2 amounts to be 93.7%





CO_2 Emissions by Sectors in 2002



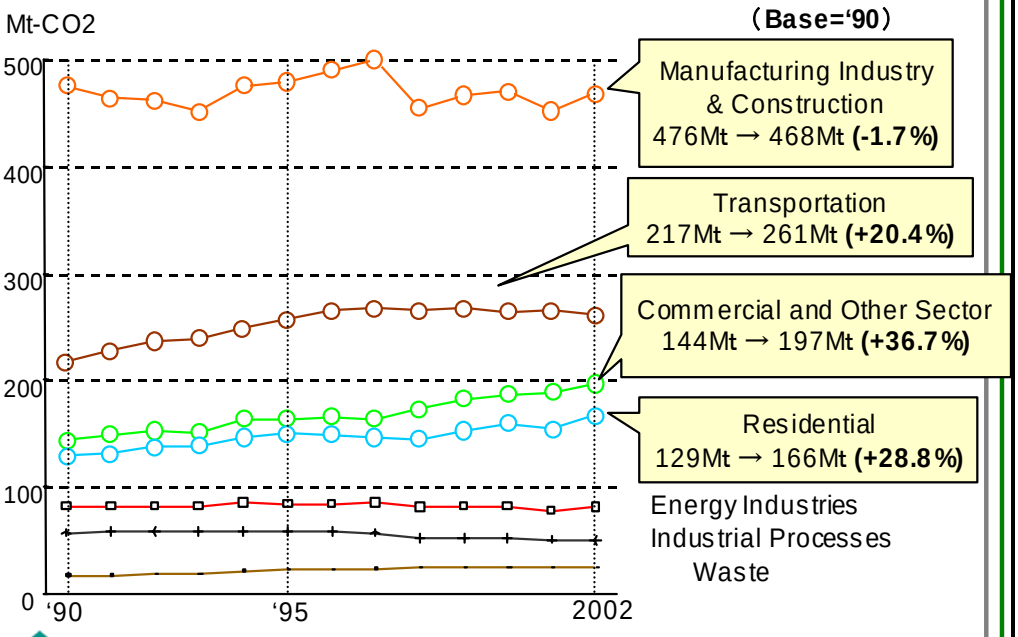
※Because of the round off, the total may not be 100%.

Outside: CO_2 emissions from heat and power generation are **allocated to demand side sectors**

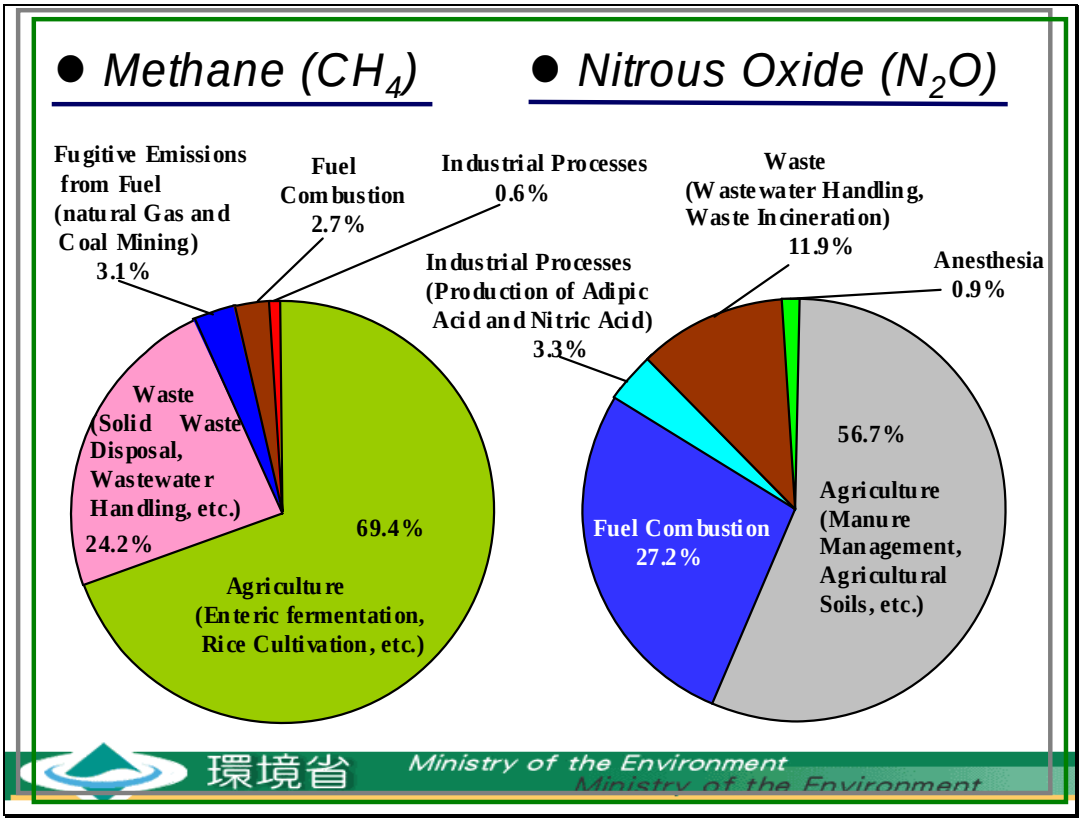
Inside: **direct** CO_2 emissions

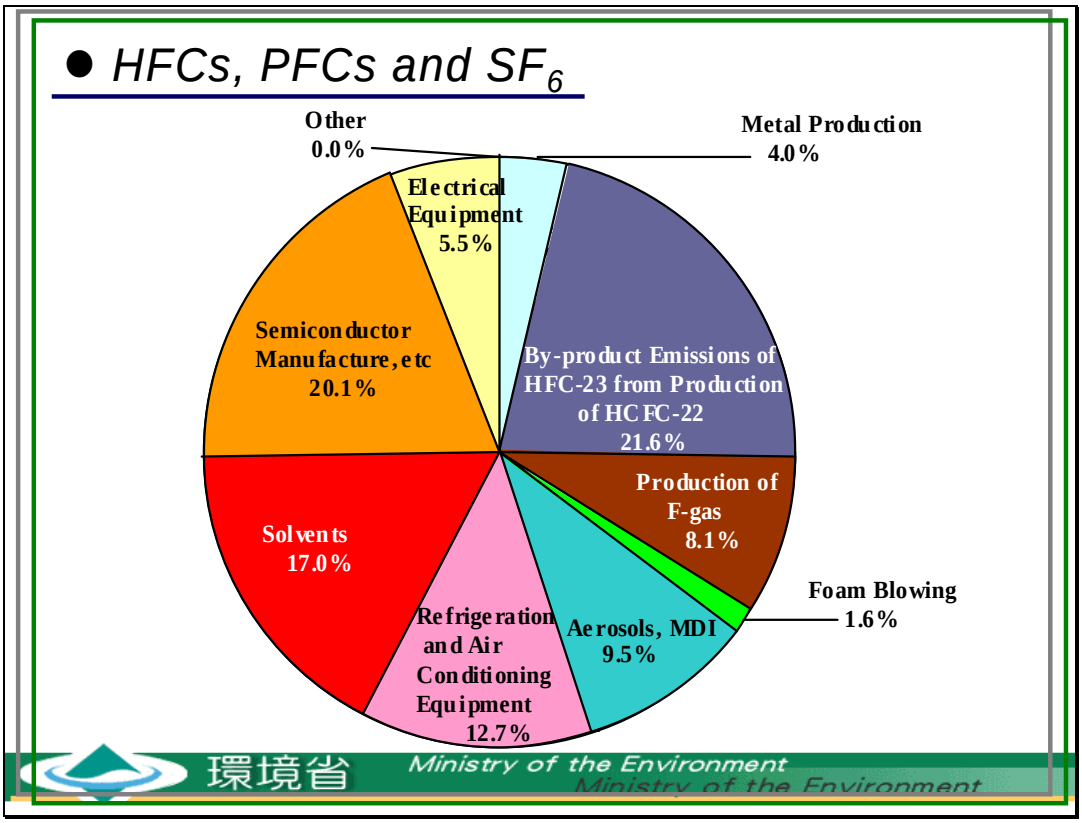
環境省 Ministry of the Environment

Trends of CO_2 Emissions of each Sectors



環境省 Ministry of the Environment


● Methane (CH_4)
Fugitive Emissions from Fuel (natural Gas and Coal Mining) 3.1%
Fuel Combustion 2.7%
Industrial Processes 0.6%
Waste (Solid Waste Disposal, Wastewater Handling, etc.) 24.2%
69.4%
Agriculture (Enteric fermentation, Rice Cultivation, etc.)
● Nitrous Oxide (N_2O)
Waste (Wastewater Handling, Waste Incineration) 11.9%
Anesthesia 0.9%
Industrial Processes (Production of Adipic Acid and Nitric Acid) 3.3%
56.7%
Agriculture (Manure Management, Agricultural Soils, etc.)
Fuel Combustion 27.2%
環境省
Ministry of the Environment


● HFCs, PFCs and SF_6
Other 0.0%
Metal Production 4.0%
Electrical Equipment 5.5%
Semiconductor Manufacture, etc 20.1%
By-product Emissions of HFC-23 from Production of HCFC-22 21.6%
Production of F-gas 8.1%
Foam Blowing 1.6%
Aerosols, MDI 9.5%
Refrigeration and Air Conditioning Equipment 12.7%
Solvents 17.0%
環境省
Ministry of the Environment

Guideline to Establish Global Warming Countermeasures Area Promotion Plan

Guideline for Local Governments

Background

- ***1990***: Action Program for Arrest Global Warming
- ***1993***: Guideline to Establish "Global Warming Countermeasure Area Promotion Plan"
- ***2002***: Revision of "Law to Promote Global Warming Countermeasures"
  - Each Entities' (National Government, Local Government, Enterprising body, Citizen) responsibilities are clearly indicated
  - Under this Law, Local Governments are encouraged to promote their area specific plan of GW countermeasures
- ***2003***: Revision of Guideline to Establish "Global Warming Countermeasure Area Promotion Plan"

Objective of the Guideline

- **To facilitate Local Government establishing GW Countermeasure Area Promotion Plan**

- **The Guideline is:**

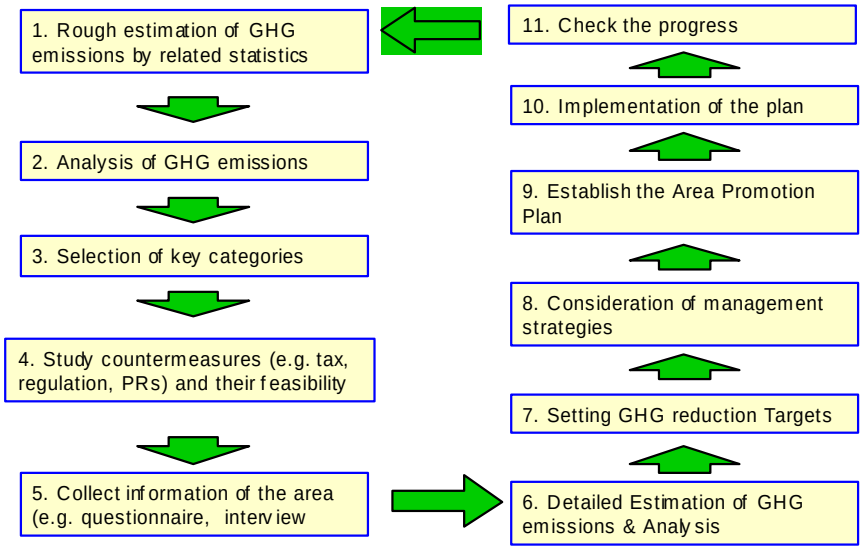
  to grasp the actual GHG emissions to find the key emission sources to be addressed

  (geographical, socio-economical characteristics need to be considered)

  to evaluate the effects of conducted countermeasures against climate change

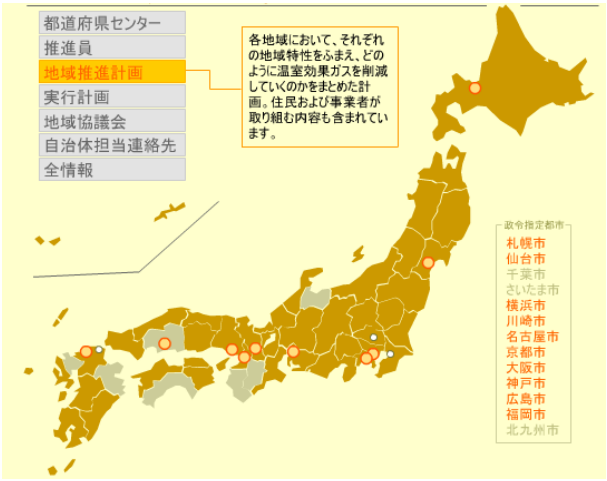
Global Warming Countermeasure Area Promotion Plan

Work Flow of the Area Promotion Plan



Current Status

- **44 Prefectures and Large Cities have established GW Countermeasure Area Promotion Plans as of April 2004**



Summary of the Guideline

Target User

- **Prefectures (47) and Large Cities (13) (government ordinance designated cities)**
- **Municipalities are also expected and encouraged to use the Guideline**

Target Coverage

- **GHG Emissions from any activities in the area**
- **Evaluation of countermeasures, which are strongly expected to promote in the area**

G W Countermeasure Area Promotion Plan

Target Activities of Area Promotion Plan

- GHG emissions caused by anthropogenic activities in the area are expected to be covered.
- Activities are classified into 5 categories; *Energy Industries, Manufacturing and Construction Industries (Blue Workers) , Resident & Commercial (White Workers and daily lives), Transport, Waste*

Relationship with category of GHG Inventory

1. Energy Industries	1 A fuel combustion, 1 B fugitive emissions
2. Industries	CO_2 allocated by electricity consumption*
	1 A fuel combustion
	2 Industrial Processes (incl. F-gas), 4 Agriculture
3. Resident & Commercial	CO_2 allocated by electricity consumption*
	1 A fuel combustion
4. Transport	1 A fuel combustion
5. Waste	6 Waste

*These emissions are indirect emissions

G W Countermeasure Area Promotion Plan

Policy and Measures of Local Government on Global Warming

- Countermeasures according to each local government's geographical & social-economical conditions
- Countermeasures need not to cover all activities
- Feasibility counts

To Grasp the actual GHG emissions

- Estimate GHG emissions in the area, by category, and/or by gas
- Estimation methods are indicated in the guideline (Chapter 1 - 5)
- Each local government should choose methods taking into consideration its area-specific conditions

Global Warming Countermeasure Area Promotion Plan

Target of the Area Promotion Plan

- **can be quantitative or qualitative**
- **each local governments' targets can be deferent according to its geographical and/or socio-economical characteristics**

Examples of Target,

E1 : To reduce the certain % of total GHG emissions in the area compared to the base year by target year

E2: To reduce the certain % of GHG emissions related to domestic life compared to the base year by target year

E3: To reduce the certain % of GHG emissions per capita in the area compared to the base year by target year

E4: "Some" industrial segment will reduce the certain % of total GHG emissions compared to the base year by target year

Global Warming Countermeasure Area Promotion Plan

Responsible Entity

- **Countermeasures for all or main stakeholders in the area (citizens, companies and local government itself)**
- **Establishment of a forum for stakeholder dialogues is encouraged.**
  (e.g. Local Conference for Global Worming Countermeasures)

Target Period

- **Revision in conjunction with the national Policy Programme is preferable.**
- **National Policy Programme on Climate Change takes step by step approach.**
  - ***1st Step: 2002 – 2004***
  - ***2nd Step: 2005 – 2007***
  - ***3rd Step: 2008 - 2012***


Thank you !!
環境省
Ministry of the Environment

Development of Application Procedure of the Tier 2 Methodology for CH_4 Emission from Korean Landfills

Seungdo Kim
Pyrolysis Research Laboratory
Dept. of Environmental System Eng.
Hallym University

Introduction

Hierarchy of Solid Waste Management in Korea

- Reduction
- Reuse
- Recycling
- Energy Recovery
- Incineration
- Landfill

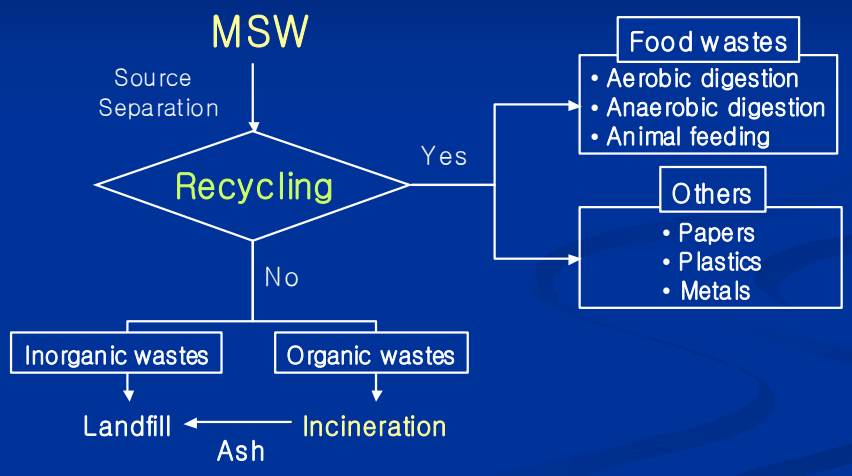
Treatment Trend of Municipal Solid Waste in Korea

Year	Landfill (%)	Incineration (%)	Recycling (%)
1995	72.3	4.0	23.7
2000	47.0	11.7	41.3
2005	31.0	23.0	46.0

MSW Compositional Generation Rate(2001 year)

Item			Generation	Landfill	Incineration	Recycling
Total (ton/day)			48,498.6	21,000.2	6,576.3	20,922.1
Municipal Solid Waste	Combustibles	Sum (ton/day)	28,663.6	15,550.6	6,475.7	6,637.3
		Food wastes (%)	32.81	34.31	8.93	56.76
		Papers (%)	16.78	62.53	35.64	1.83
		Woods (%)	7.01	52.56	45.19	2.25
		Rubber &Leather (%)	3.48	66.45	32.90	1.65
		Plastics (%)	7.25	66.90	31.42	1.68
		Others (%)	16.37	78.26	20.84	0.90
	Non-Combustibles	Sum (ton/day)	5,582.5	5,311.6	80.2	190.7
		Briquette ash (%)	1.76	91.52	—	8.48
		Metals & Glasses (%)	2.78	94.86	1.16	3.98
		Earth & Sand (%)	3.08	97.83	0.02	2.15
		Others (%)	8.67	95.02	2.32	2.66
	Recyclables	Sum (ton/day)	14,252.5	138.0	20.4	14,094.1
		Papers(%)	45.10	0.26	0.08	99.66
		Glasses (%)	15.47	1.34	—	98.66
		Metals (%)	19.82	0.40	—	99.60
		Cans (%)	4.44	2.38	—	97.62
		Plastics (%)	8.60	1.85	0.72	97.43
		Others (%)	6.56	4.51	0.72	94.77

Management Schemes of MSW in Korea

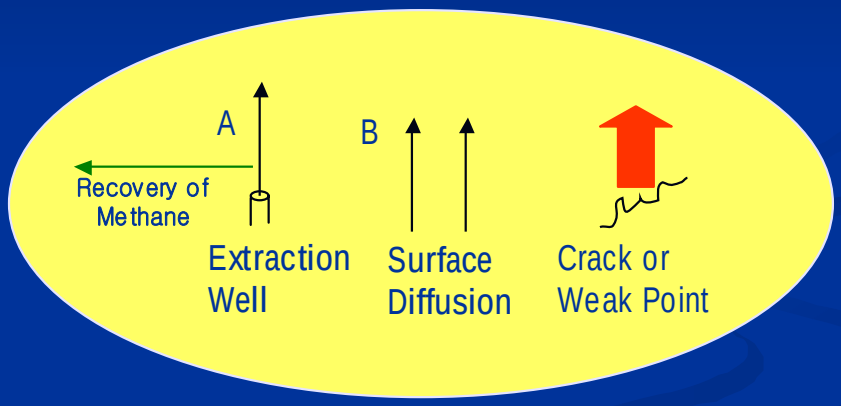


Estimation Methodology of CH_4 from Landfill : Tier 2

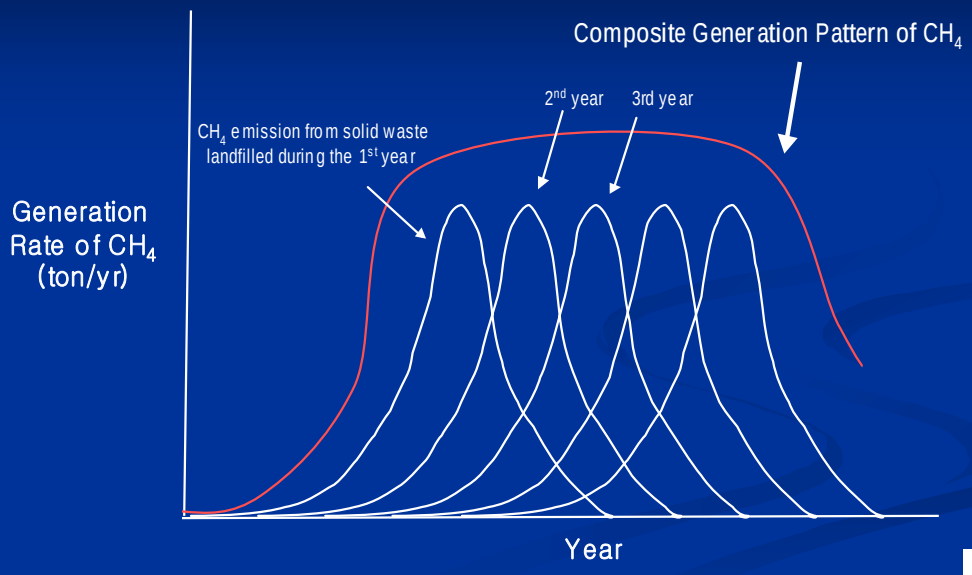
Questions to be Answered

- Why should we apply the Tier 2?
- How much the accuracy may be improved as a result of applying the Tier 2?
- What would be the most efficient approaches to adopt the Tier 2?

Methane Emission from Landfill: (1) Extraction Well, (2) Surface Diffusion



Emission Pattern of CH_4 from Landfill over time



Methodologies suggested by IPCC

- **Tier 1**

CH_4 (ton/yr) = (MSW_T x MSW_F x MCF x DOC x DOC_F x F x 16/12 –R) x (1-OX)

❖**Assumptions**

(1) CH_4 generated by the waste is released in the same year the waste is deposited

(2) Landfilled amount is relatively constant over time

↓

If waste disposal increases at about 2% per year over a 20~30 year period, the Tier 1 method would overestimate emissions by about 20~25%.

Methodologies suggested by IPCC

- **Tier 2**

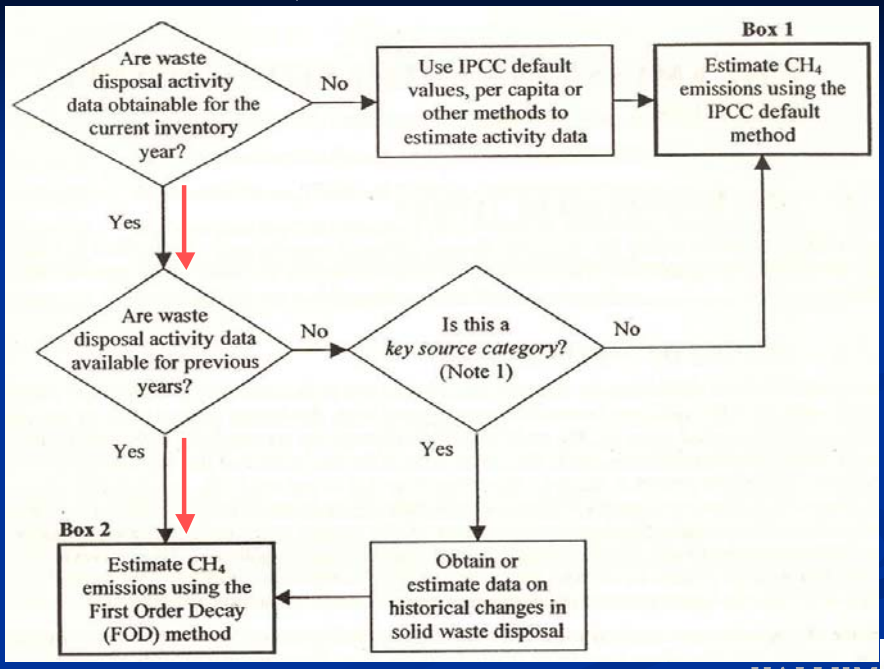
$$Q_{CH_4} = L_0 \times M_t \times \{\exp(-kc) - \exp(-kt)\}$$

L_0 : Methane Generation Potential
M_t : Annual amount of solid waste landfilled
k : Methane generation constant (yr^{-1})

❖**Basics**

(1) CH_4 is emitted over a long period of time rather than instantaneously
(2) First-order decay model has been broadly used to model generation rate of CH_4 from landfills

Decision Tree for CH_4 Emissions from Solid Waste Disposal Sites



What are the difficulties in applying the Tier 2?

- Lack of information on MSW landfilled previously
  - resulting in difficulty in estimating L_0 value
- Lack of information on how to measure the surface diffusion of CH_4
  - resulting in difficulty in estimating k value

Methane Generation Kinetics

Methane Generation Kinetic Equation $\frac{dM_{CH_4}}{dt} = k \cdot L_0 \cdot M_{sw}$

Tier 2	$Q_{CH_4} = L_0 \times M_t \times \{\exp(-kc) - \exp(-kt)\}$
Revised Tier 2	$Q_{CH_4}(t) = \sum_{i=1}^{N} M_0(i) L_0(i) [\exp\{-k(t-i)\} - \exp\{-k(t-i+1)\}]$

Key Parameters for Tier 2 Methodology

- L_0 (Methane Generation Potential)
  - L_0 = MCF x DOC x DOC_F x F x 16/12
    - ✓ MCF: 0.4~1.0
    - ✓ DOC: Country Specific Equation

DOC(%) = 0.114 x FW + 0.320 x PA + 0.366 x WO + 0.571 x RU + 0.061 x SL + 0.114 x AN + 0.285 x OT

    - ✓ DOC_F : 0.5~0.6
    - ✓ F: 0.4~0.6

Key Parameters for Tier 2 Methodology

- **k (Methane Generation Constant)**

(1) First Methodology

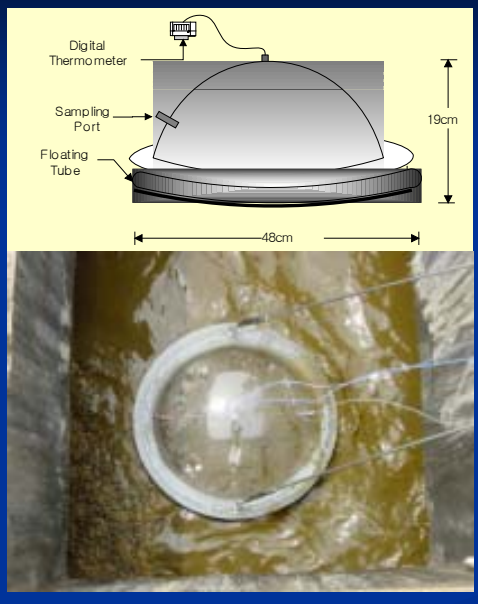
$$k = \frac{-\beta + \sqrt{\beta^2 - 4\alpha\gamma}}{2\alpha}$$

where

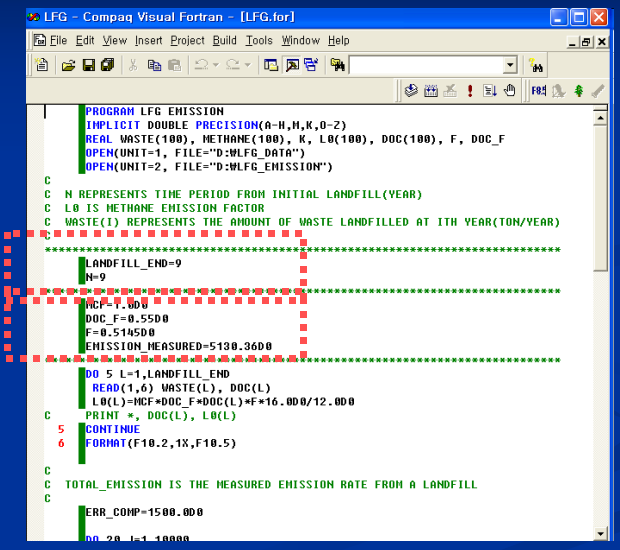
$$\alpha = \frac{c^2 - t^2}{2}, \beta = t - c, \gamma = \frac{Q_{CH_4}}{L_0 M_t}$$

(2) Second Methodology
Best fit to generation rate of CH_4 at a certain year

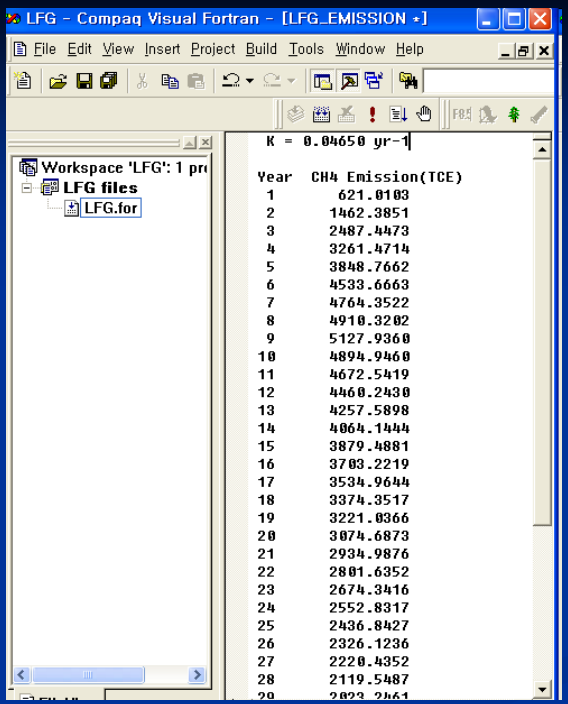
Surface Diffusion Measurements

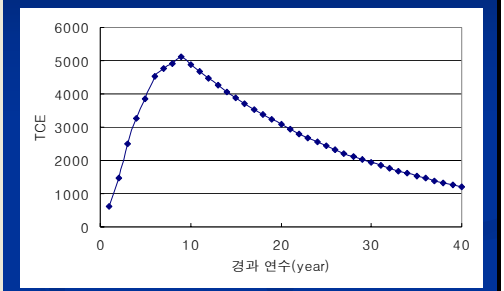


Fortran Code for Estimating *k* value



Fortran Output

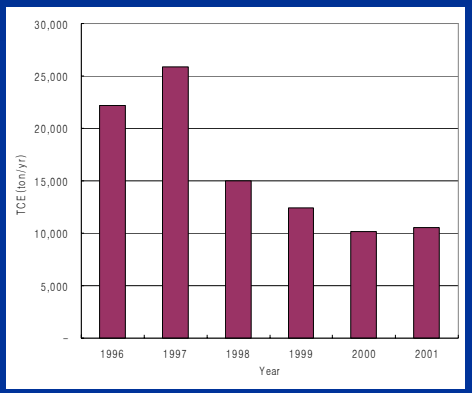




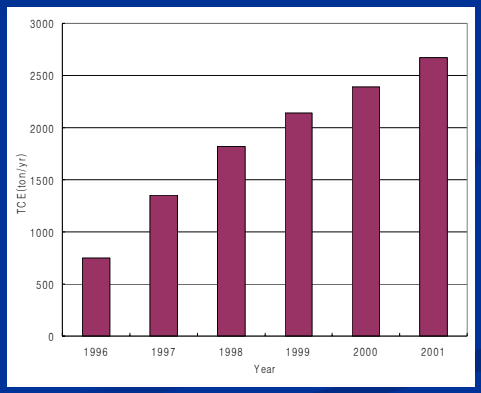
L_0 and K values for Korean Landfills

- L_0 : 0.15~0.30 ton-CH_4/ton-waste
- k : 0.04~0.09 yr^{-1}
  - IPCC default value : 0.05 yr^{-1}

Comparison of CH_4 emission from a Korean Landfill between Tier 1 and Tier 2



Tier 1



Tier 2

Estimation procedures for CH_4 emission by the Tier 2

Classification of landfills by characteristics

↓

Estimation of k values for characteristic landfills

↓

Estimation of CH_4 emissions form individual landfills

↓

Summation of CH_4 emission from individual landfills

Considerations on changing emission methodology from Tier 1 to Tier 2

- **Pre-requisites**
  - Collecting information on landfill histories of all landfills: landfill amount, compositions of solid wastes, and landfill period etc.
  - Monitoring the seasonal emission rates of CH_4 from the surfaces of representative landfills
- **Predicted Problems**
  - Uncertainty arising from the assumption of the landfill histories of non-sanitary landfills
  - Difficulty in data managements: QA/QC and UA

Thank you very much!

Pyrolysis Research Laboratory

HALLYM UNIVERSITY

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

NATIONAL GREENHOUSE GAS INVENTORIES PROGRAMME

WMO UNEP

IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry

Leandro Buendia
Programme Officer, IPCC-NGGIP-TSU

2nd Workshop on GHG Inventories in Asia Region (WGIA)
7-8 February 2005, Shanghai, China

1

Contents

- Background Information
- What is good practice guidance?
- Contents of GPG-LULUCF
- Summary of steps in LULUCF Inventory
- Conclusions

2

Background Information

- Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (3 Volumes & software)
- Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (GPG2000)
  - ✓ Energy
  - ✓ Industrial Processes
  - ✓ Agriculture
  - ✓ Waste

- ❖ to avoid the risk of inconsistency with the SR-LULUCF
- ❖ KP sink negotiations were not concluded in 2000

3

Background Information

Good Practice Guidance for Land Use, Land-use Change and Forestry (GPG-LULUCF)

- Published in 2003

4

What is good practice guidance?

GPG2000 defines inventories consistent with *good practice* as those which contain neither over- nor underestimates so far as can be judged, and in which uncertainties are reduced as far as is practicable given national circumstances.

5

Good practice guidance further supports the development of inventories that are:

- ✓ transparent
- ✓ documented
- ✓ consistent over time
- ✓ complete
- ✓ comparable
- ✓ assessed for uncertainties
- ✓ subject quality control and assurance
- ✓ efficient in the use of resources available to inventory agencies
- ✓ uncertainties are reduced as better information becomes available

6

Contents of GPG-LULUCF

1 Overview
2 Basis for Consistent Representation of Land Areas
3 LUCF Sector Good Practice Guidance
4 Supplementary methods and good practice guidance arising from the Kyoto Protocol
5 Cross-Cutting Issues

7

1. Overview

- sets out the mandate or the overall intent of the GPG
- summarizes the practical advice provided to inventory agencies
- provides relationship to 1996 GL
- short summaries of the other chapters
- discusses policy relevant issues

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2. Basis for Consistent Representation of Land Areas

- Provides guidance on the selection of methods for identifying and representing land areas and land-use change
- Identifies 6 land-use categories
  - ✓ Forest Land
  - ✓ Cropland
  - ✓ Grassland
  - ✓ Wetland
  - ✓ Settlements
  - ✓ Other Land

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2. Basis for Consistent Representation of Land Areas

- Describes 3 approaches to identifying land areas:
  - Use of basic (and usually existing) land-use data
  - Survey of land use and land-use change
  - Geographically explicit land-use mapping
- Advice on the development of land-use databases and some examples on their usage to approaches

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2. Basis for Consistent Representation of Land Areas (Annexes)

- Examples of Approaches in Individual Countries
- Examples of International Land Cover Datasets

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3. LUCF Sector Good Practice Guidance

- Provides methodological options for the estimation of emissions and removals of CO2 and non-CO2 GHG for the LULUCF sector
  - ✓ Methodological Issues
    - Choice of Method (3 tiers; decision trees)
    - Choice of EF
    - Choice of Activity Data
    - Completeness
    - Developing a Consistent Time Series
  - ✓ Uncertainty Assessment
  - ✓ Inventory QA/QC
  - ✓ Reporting and Documentation

…Mapping back table to GL96 (Chapter 5)

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3. LUCF Sector Good Practice Guidance

- **Addresses five carbon pools**
  - ✓ Aboveground biomass
  - ✓ Belowground biomass
  - ✓ Dead wood
  - ✓ Litter
  - ✓ Soil C
- **Annexes and Appendices**
  - ✓ Biomass Default Tables for Forest Land
  - ✓ Reporting Tables and Worksheets
  - ✓ Basis for Future Methodological Development (e.g. HWP, etc.)

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4. Supplementary methods and good practice guidance arising from the Kyoto Protocol

- General concepts of land-use change monitoring and reporting for KP.
- Summary tables of all reporting requirements, before, during, and after each Commitment Period.
- Decision trees that outline criteria to determine areas subject to afforestation (A), reforestation (R), deforestation (D), and management activities.
- Supplementary methods for estimating carbon stock changes and non-CO2 emissions for land-use change (AR, D) and land use (forest management, cropland management, grazing land management and revegetation).

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4. Supplementary methods and good practice guidance arising from the Kyoto Protocol

4.3 LULUCF Projects

- Guidance for LULUCF projects on designing and implementing multi-tier measuring and monitoring plans
- Guidance is stand-alone, with cross-linkages to Chapters 3 and 5
- Does not cover:
  - ✓ baseline definition
  - ✓ Additionality
  - ✓ Leakage
  - ✓ non-permanence
  - ✓ monitoring of socio-economic/environmental impacts

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4. Supplementary methods and good practice guidance arising from the Kyoto Protocol

Annexes…

- Tool for estimation of changes in soil carbon stocks associated with management changes in cropland and grazing lands based on IPCC default data (software in CD-ROM); see slides
- Examples of allometric equations for estimating aboveground biomass and belowground biomass of trees

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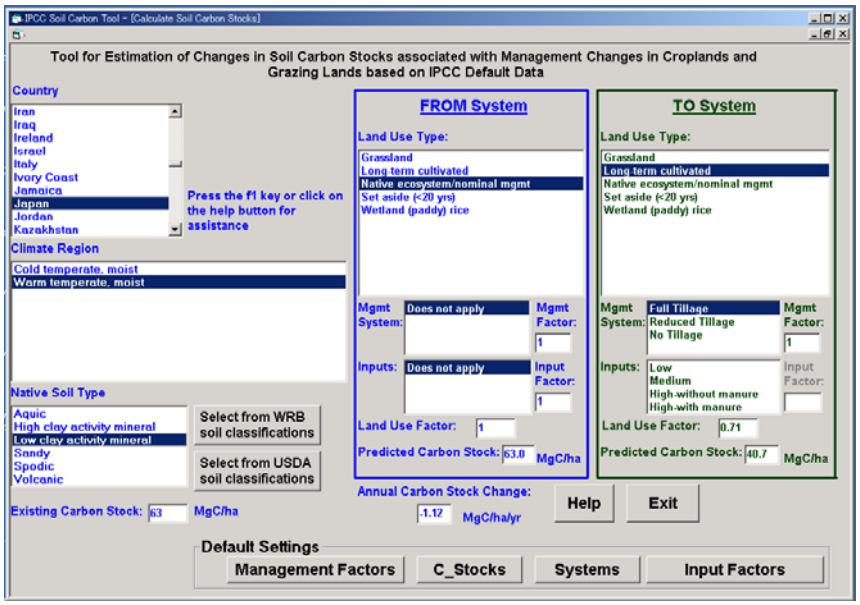

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5 Cross-Cutting Issues

- Uncertainty Assessment
- Collecting and analysing data by sampling
- Reconstruction of missing data
- Identification of Key Categories (to cover sink)
- Quality Assurance and Quality Control
- Time Series Consistency and Recalculations
- Verification approaches (e.g. comparison of inventories, modelling approaches, and direct measurements)

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Steps in LULUCF inventory preparation

1. Use the 3 approaches (Chapter 2) to estimate land areas for each land-use category relevant to your country
2. Follow the good practice guidance (Chapter 3) to estimate the emissions and removals of GHGs for each land use, land-use change and pool relevant to your country. If necessary collect additional data to improve data quality. Perform key category analysis (Chapter 5).
3. Estimate uncertainties, report emissions/removals, and implement Quality assurance/quality control procedures (Chapter 5).
4. If required: prepare supplementary information for Kyoto Protocol reporting (follow Chapter 4))

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Conclusions

- GPG produces more reliable estimates of the magnitude of uncertainties in GHG inventories
- GPG provides improved understanding of how uncertainties may be managed to produce emissions estimates that are acceptable to UNFCCC (i.e. transparency, consistency, comparability, completeness and accuracy in inventories)

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Conclusions

Draft COP/MOP decision contained in Decision -/CP.10 (FCCC/CP/2004/L.26/Add.1)

- ✓ The Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, …
  Decides that for the first commitment period Parties included in Annex I to the Convention that have ratified the Kyoto Protocol shall apply the good practice guidance for land use, land-use change and forestry, as developed by the Intergovernmental Panel on Climate Change, in a manner consistent with the Kyoto Protocol and draft decision -/CMP.1 (Land use, land-use change and forestry) and the annex to this draft decision,[1] for the purpose of providing information on anthropogenic greenhouse gas emissions by sources and removals by sinks from land use, land-use change and forestry activities under Article 3, paragraph 3, and, if any, elected activities under Article 3, paragraph 4, in accordance with Article 5, paragraph 2 of the Kyoto Protocol;
  - **(footnote1)** Noting that reporting methods contained in Chapter 4 of the Intergovernmental Panel on Climate Change Good Practice Guidance for Land Use, Land-use Change and Forestry, should ensure that areas of land subject to land use, land-use change and forestry activities under Article 3, paragraphs 3 and 4, are identifiable

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Conclusions

- **Default EF/parameters in GPG-LULUCF are soon to be accessible from the EFDB**
  http://www.ipcc-nggip.iges.or.jp/EFDB/main.php

- **The IPCC is in the process of preparing the 2006 Guidelines that will be based on:**
  - ✓ **1996 GL, GPG2000, GPG-LULUCF**
  - ✓ **Emission Factor Database (EFDB)**
  - ✓ **Advances in science and technology**
  - ✓ **The experience in the use of GLs/GPGs as well as experience from UNFCCC inventory reviews**

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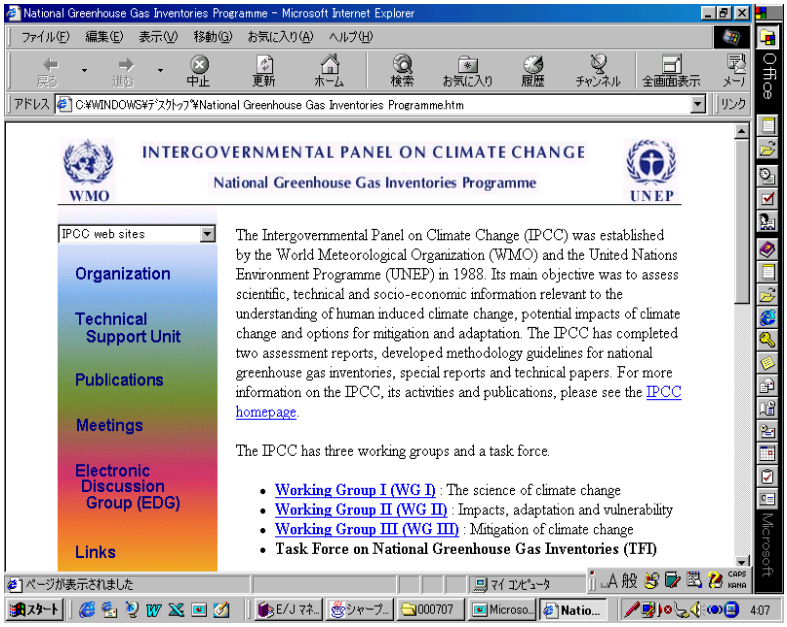
http://www.ipcc-nggip.iges.or.jp



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Asia-Pacific Network for Global Change Research

Dr. Linda Anne Stevenson

lstevenson@apn.gr.jp

Outline of Presentation

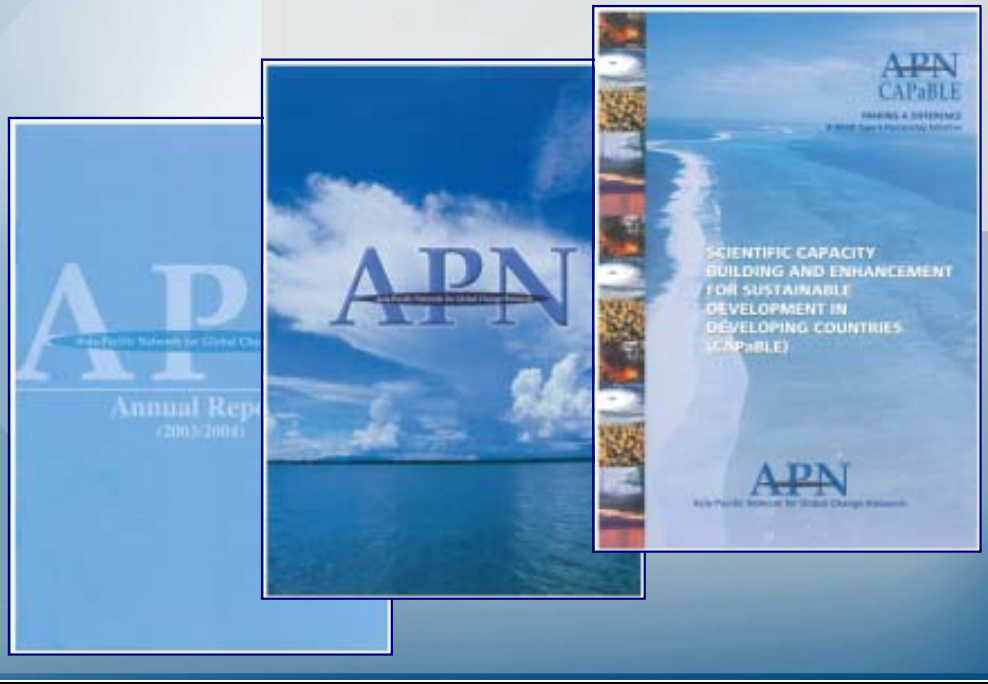
- APN – a very brief overview
- APN and CAPaBLE Programme

What is the APN?

Inter-governmental network in the Asia Pacific Region with the priority goals of:

- Fostering global change through regional cooperation and partnerships
- Increasing developing country participation in global change research through networking and capacity building
- Strengthening interactions between the natural and social sciences in global change with the policy- and decision-making community

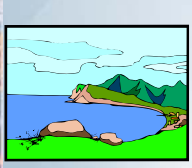
Learn more about the APN



6 Goals of the APN

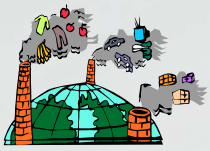
- To support regional cooperation in global change research on issues particularly relevant to the region
- To strengthen the interactions among scientists and policy-makers, provide a scientific input to policy decision making and scientific knowledge to the public
- To improve the scientific and technical capabilities of nations of the region
- To facilitate the standardisation, collection, analysis and exchange of scientific data and information relating to global change research
- To cooperate with other global change networks and organizations
- To facilitate the development of research infrastructure and the transfer of know-how and technology

APN Research Framework



Changes in Coastal Zones & Inland Waters

Climate Change & Variability



Changes in Atmospheric Composition

Changes in Terrestrial Ecosystems & Biodiversity

Integration of the findings of natural science with social and economic factors → Input to policy making and implementation

Human Dimensions of Global Change

9th SPG/IGM Meeting
Canberra, Australia
March 2004

Sombo Yamamura - Secretariat

Martin Rice – Secretariat

Linda Stevenson - Secretariat

Yuki Imanari - Secretariat

Randal Helten – Consultant

APN and CAPaBLE Programme

APN

Asia-Pacific Network for Global Change Research

CAPaBLE

APN

APN CAPaBLE

Scientific Capacity Building and Enhancement for Sustainable Development in Developing Countries

The **CAPaBLE** Programme is a concrete initiative to realize parts *110 to 114* of the Johannesburg Plan of Implementation for the **WSSD** and was registered as a WSSD Type II Partnership Initiative by the Ministry of the Environment, Japan.

The CAPaBLE programme is developing and enhancing scientific capacity in developing countries to improve their decision-making in the target areas related to

climate change and water and food security that are directly linked to their sustainable evelopment.

APN

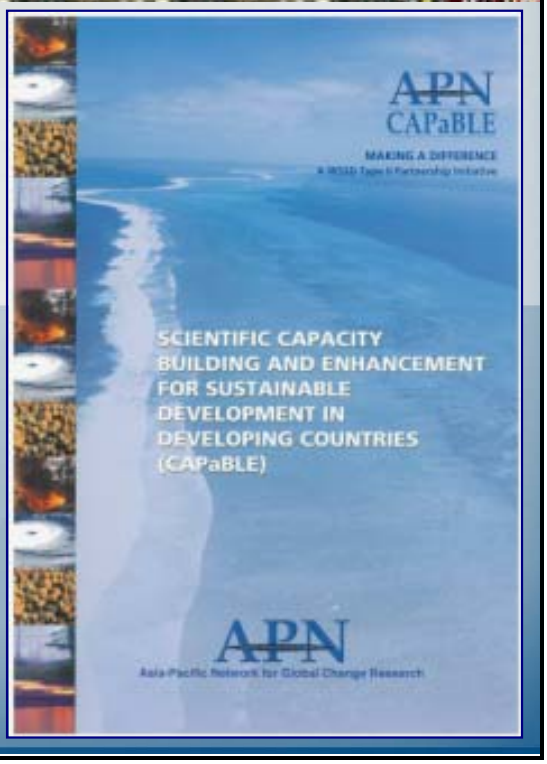
The Official Launch 8th IGM, April 2003

WORLD SUMMIT ON SUSTAINABLE DEVELOPMENT JOHANNESBURG 2002

APN CAPaBLE

Making a Difference

A WSSD Type II Partnership Initiative



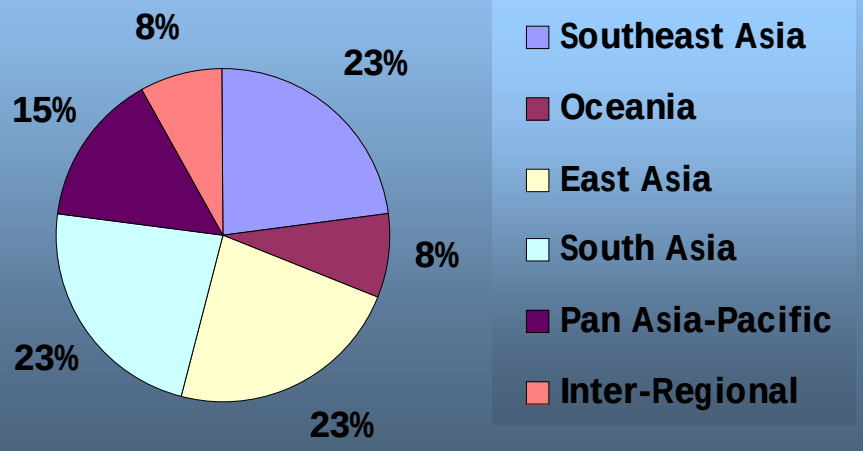
The CAPaBLE Programme is sponsored by the governments of Australia, Japan, New Zealand and the U.S.A.

Main Activities under Phase I (2003-2006)

- **Capacity Enhancement**: research projects planned and implemented by leading developing country scientists targeting specific topics related to climate change.
- **Capacity Building:** activities for aspiring scientists.
- **Dissemination**: activities for policy-makers, decision-makers & for civil-society.
- **End-Product**: an APN publication as an end-product (synthesis book that will synthesise the activities and outcomes that resulted from first Phase of **CAPaBLE**).

CAPaBLE Regional Participation

76% APN member countries participating in the first year

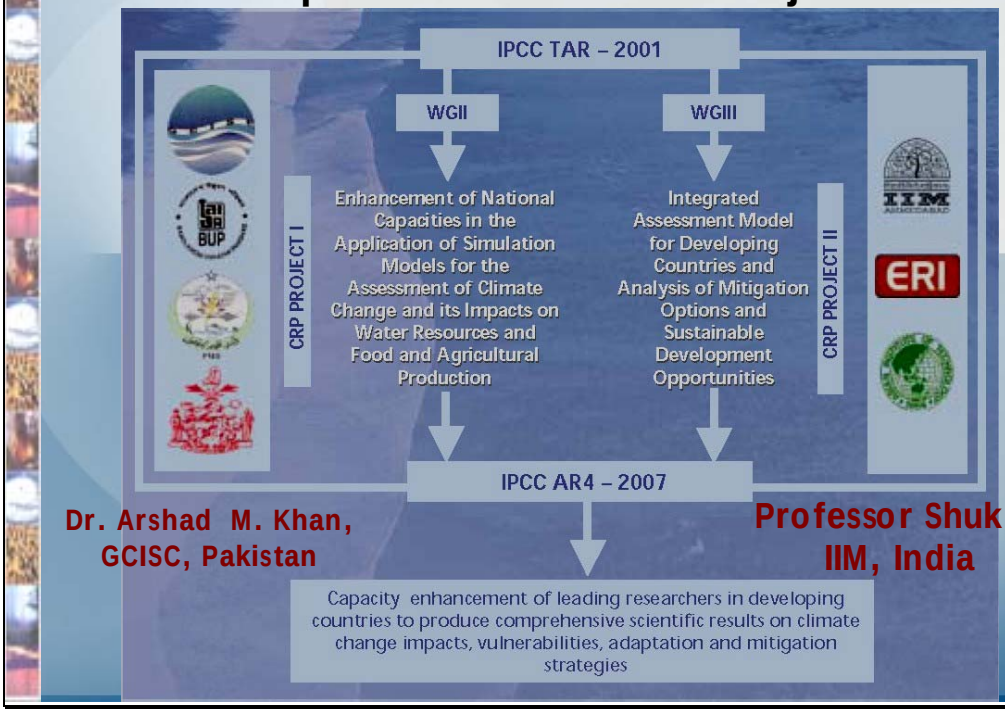


Comprehensive Research Projects

- **CRP-Theme I: Dr. Khan, GCISC**
  Enhancement of National Capabilities in the Application of Simulation Models for the Assessment of Climate Change and its Impacts on Water Resources and Food and Agriculture

- **CRP-Theme II: Professor Shukla, IIM**
  Integrated Assessment Model for Developing Countries and Analysis of Mitigation Options and Sustainable Development Options

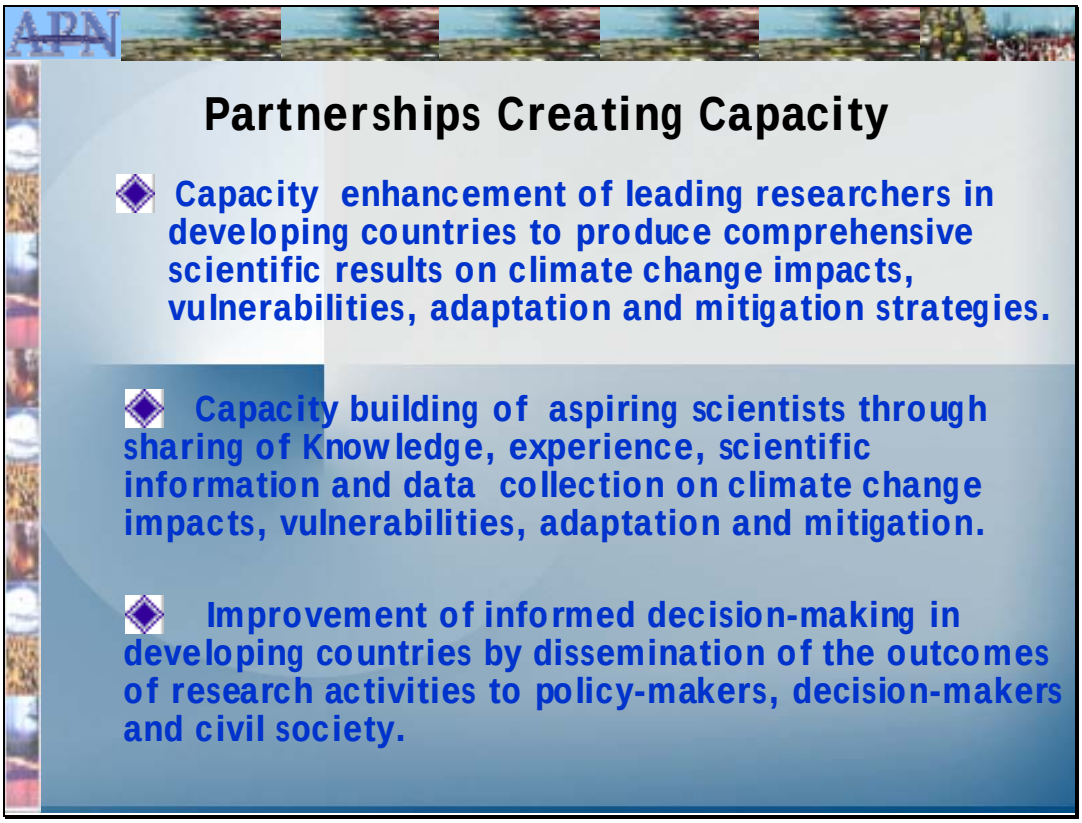
Comprehensive Research Projects



Capacity Building Activities

CB-01	Building Capacity of Mekong River Countries to Assess Impacts from Climate Change
CB-02	Training Institute on Climate and Extreme Events in the Pacific
CB-03	Capacity Building for GHG Inventory Development in Asia-Pacific Developing Countries
CB-04	Creating Climate Knowledge Networks through Strategic, Global Linkages (with IAI)
CB-05	Climate Change Mitigation with Locally Owned Technology and Systems
CB-06	UNFCCC Training Workshop on National Communications
CB-07	National CB Workshop on GC Research (Pakistan)
CB-08	Regional Climate Models /CLIVAR Workshop


Partnerships Creating Capacity
Training Institute on Climate and Extreme Events in the Pacific
APN/UNFCCC Training Workshop for the National Climate Change Focal Points in the APN Region on the Guidelines for National Communications of Non-Annex I Parties
Capacity Building for Greenhouse Gas Inventory Development in Asia-Pacific Developing Countries
WCRP Modelling Workshop / CLIVAR Conference
National Capacity Building Workshop on Global Change Research
Capacity Building Workshop on Climate Change Mitigation with Locally Owned Technology and Systems
Creating Climate Knowledge Networks through Strategic, Global Linkages
Building the Capacity of Mekong River Countries to Assess Impacts from Climate Change - Case Study Approach on Assessment of Community Vulnerability and Adapatation to the Impacts of Climate Change on Water Resources and Food Production


Partnerships Creating Capacity
Capacity enhancement of leading researchers in developing countries to produce comprehensive scientific results on climate change impacts, vulnerabilities, adaptation and mitigation strategies.
Capacity building of aspiring scientists through sharing of Knowledge, experience, scientific information and data collection on climate change impacts, vulnerabilities, adaptation and mitigation.
Improvement of informed decision-making in developing countries by dissemination of the outcomes of research activities to policy-makers, decision-makers and civil society.


APN
"As a regional forum bringing together policy-makers and researchers on practical, policy-relevant research and capacity building, the APN is making an invaluable contribution to our ability to respond to global change."
Statement: Howard Bamsey, CEO, Australian Greenhouse Office
Thank you
http://www.apn.gr.jp

Introduction of the APN CAPaBLE Project "Capacity Building for GHG Inventory Development in Asia-Pacific Developing Countries (APN CAPaBLE GHG Inventory Project)"

Hideaki Nakane, Tomoyuki Aizawa and Chisa Umemiya
Greenhouse Gas Inventory Office of Japan (GIO),
Center for Global Environmental Research (CGER),
National Institute for Environmental Studies (NIES)

Presented at the 2nd Workshop of GHG Inventories in Asia region
February 7-8, 2005

Collaborators

- **Thailand**
- *Dr. Sirintornthep Towprayoon*
- *Dr. Amnat Chidthaisong*
- King's Mongkut's University of Technology Thonburi

- **Cambodia**
- *Mr. Thy SUM*
- *Mr. Heng Chan Thoeun*
- Ministry of Environment

Relation between the pilot project and WGIA

This pilot studies will pursue training in Japan, establishment of sustainable inventory, development of the system and studies on country/regional emission factors including field measurements in Thailand and Cambodia.

In the workshops, the direction of pilot studies and the results of them will be discussed. The accomplishments of the pilot studies will be shared by the participating countries of the workshops to establish more reliable emission factors and more involvement of ASIA-PACIFIC countries with the international activities on GHG inventories.

Main objectives

1. To carry out pilot studies on improvement of GHG inventories for effective countermeasures.
2. To make sustainable systems to develop GHG inventories.
3. To provide more realistic emission factors reflecting country and regional conditions
4. To exchange information and experiences to establish accurate activity data.
5. To clarify directions to apply the methodologies developed in the pilot studies to all ASIA-PACIFIC countries.
6. To enhance involvement and leadership of ASIA-PACIFIC developing countries in the international efforts to improve GHG inventories
7. To provide policy makers with basic information to formulate and implement measures to reduce GHG emissions and enhance GHG removals.
8. To share useful information and experiences in GHG inventory preparation
9. To discuss the future activities of the Asian network

Outcomes of the first year

- *The 1st Workshop on GHG Inventories in Asia Region*
- *The first collaborator's meeting with the collaborator from Cambodia;*

(1) promoted better understating of outline of a pilot study,

(2) exchanged information of GHG inventories of Cambodia and Japan,

(3) created a well-structured file system for the Cambodia's GHG inventory,

(4) carried out a key category analysis.

- *The four-week training of the project collaborator from Thailand*

(1) promoted better understating of outline of a pilot study in Thailand.

(2) indicated the usefulness of the new portable CH_4 and CO_2 detection system,

(3) provided the necessary skills to operate and maintain the established system.

Evaluation: very positive

Details of the activities of the pilot project
will be given
by
Mr. Thy Sum and Dr. Amnat Chidthaisong.

Thank you very much!!

The 2nd Workshop on GHG Inventories in Asia Region

7 -8 February 2005

Shanghai, China

Cambodia's LULUCF inventory improvement under the APN CAPaBLE GHG Inventory Project

Presented by: Sum Thy
Chief of Climate Change Office, Ministry of Environment, Cambodia
cceap@online.com.kh

Outline of Presentation

- Why improve Cambodia's LULUCF inventory
- Scope of study
- Location of Study
- Methodology
- Progress to date
- Next activities
- Conclusion/recommendation

1. Why improve Cambodia's LULUCF inventory (1)

- Emission from LULUCF contributed about 97 % of the Cambodia's 1994 National GHG Inventory
- There was no research on emission factor (aboveground biomass, biomass growth rate), therefore the IPCC emission factors were used for the preparation of Cambodia's 1994 GHG inventory.
- In 2001, a field study on aboveground biomass and biomass increment was conducted under CCEAP-phase 2. However the data from the field survey may not reflect to the overall condition of Cambodian forests, due to:
  (1) limitation of time, financial support, and expertise
  (2) limitation of number of location and sample selected

1. Why improve Cambodia's LULUCF inventory (1)

Key category analysis

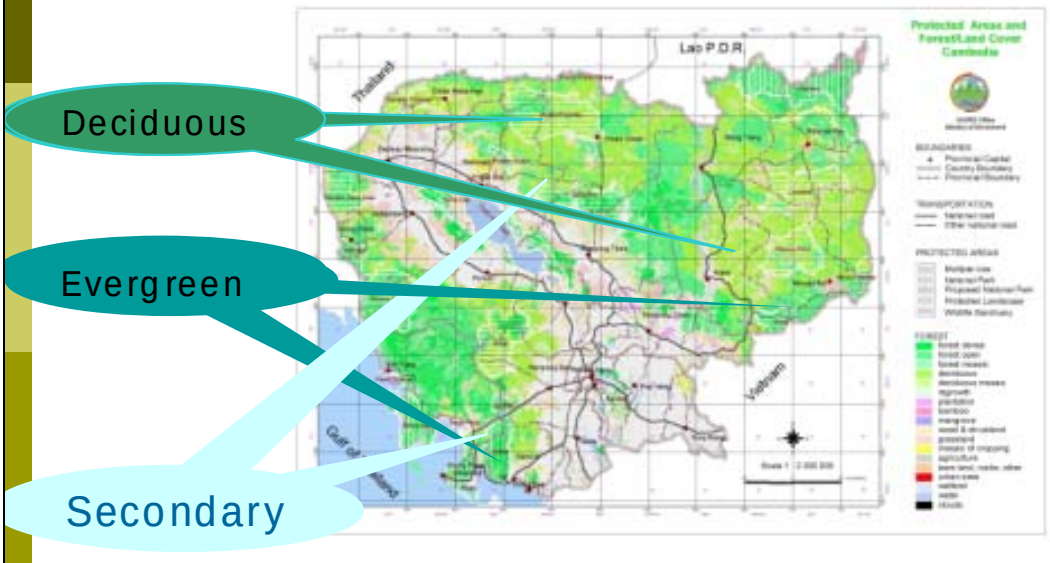
A IPCC Source Category		B Direct GHGs	C 1994 Estimate	ABS	E Level Assessment	F % Contribution	Cumulative
5A Changes in Forest / Woody Biomass	Forest - Deciduous	CO_2	-28,597.80	28,597.80	0.203	20.26%	20.26%
5A Changes in Forest / Woody Biomass	Forest - Evergreen	CO_2	-22,148.50	22,148.50	0.157	15.69%	35.95%
5B Forest & Grassland Conversion	Biomass-Decay- Forest - Secondary/Regrowth	CO_2	14,124.00	14,124.00	0.100	10.01%	45.96%
5A Changes in Forest / Woody Biomass	Forest - Mixed&Coniferous	CO_2	-11,757.90	11,757.90	0.083	8.33%	54.29%
5B Forest & Grassland Conversion	On-Site-Burning- Forest - Secondary/Regrowth	CO_2	10,169.28	10,169.28	0.072	7.20%	61.49%
5A Changes in Forest / Woody Biomass	Roundwood Harvested	CO_2	8,271.94	8,271.94	0.059	5.86%	67.35%
5B Forest & Grassland Conversion	Biomass-Decay- Forest - Deciduous	CO_2	4,154.33	4,154.33	0.029	2.94%	70.29%
5A Changes in Forest / Woody Biomass	Shrubland	CO_2	-3,974.67	3,974.67	0.028	2.82%	73.11%
5B Forest & Grassland Conversion	On-Site-Burning- Forest - Deciduous	CO_2	2,991.12	2,991.12	0.021	2.12%	75.23%
4A Enteric Fermentation	Non-dairy Cattle	CH_4	2,587.20	2,587.20	0.018	1.83%	77.06%
5B Forest & Grassland Conversion	Biomass-Decay- Forest - Evergreen	CO_2	2,586.38	2,586.38	0.018	1.83%	78.89%
5B Forest & Grassland Conversion	Off-Site-Burning- Forest - Secondary/Regrowth	CO_2	2,542.32	2,542.32	0.018	1.80%	80.70%
5A Changes in Forest / Woody Biomass	Forest - Secondary/Regrowth	CO_2	-2,179.10	2,179.10	0.015	1.54%	82.24%
4C Rice Cultivation	Rainfed	CH_4	2,177.07	2,177.07	0.015	1.54%	83.78%
5A Changes in Forest / Woody Biomass	Forest - Inundated	CO_2	-1,890.31	1,890.31	0.013	1.34%	85.12%
5B Forest & Grassland Conversion	On-Site-Burning- Forest - Evergreen	CO_2	1,862.19	1,862.19	0.013	1.32%	86.44%
5B Forest & Grassland Conversion	On-Site-Burning	CH_4	1,570.08	1,570.08	0.011	1.11%	87.55%
5B Forest & Grassland Conversion	Biomass-Decay- Shrubland	CO_2	1,440.40	1,440.40	0.010	1.02%	88.57%
5B Forest & Grassland Conversion	Biomass-Decay- Forest - Inundated	CO_2	1,204.50	1,204.50	0.009	0.85%	89.43%
4B Manure Management	Solid System and Drylot	N_2O	1,196.81	1,196.81	0.008	0.85%	90.27%
5B Forest & Grassland Conversion	On-Site-Burning- Shrubland	CO_2	1,037.09	1,037.09	0.007	0.73%	91.01%
4C Rice Cultivation	Irrigated	CH_4	981.29	981.29	0.007	0.70%	91.70%
4D Agricultural Soils	1 Direct Emissions	N_2O	971.12	971.12	0.007	0.69%	92.39%
5A Changes in Forest / Woody Biomass	Plantation	CO_2	-918.50	918.50	0.007	0.65%	93.04%
5B Forest & Grassland Conversion	On-Site-Burning- Forest - Inundated	CO_2	867.24	867.24	0.006	0.61%	93.66%
4D Agricultural Soils	3 Indirect Emissions	N_2O	848.05	848.05	0.006	0.60%	94.26%
4A Enteric Fermentation	Buffalo	CH_4	808.50	808.50	0.006	0.57%	94.83%
5B Forest & Grassland Conversion	Off-Site-Burning- Forest - Deciduous	CO_2	747.78	747.78	0.005	0.53%	95.36%

Tomoyuki AIZAWA, March 2004. 1st Collaborators' Meeting

2. Scope of study

- The field survey will focus on the main forest types that play important role as the key source/sink in the estimation of emission and removal in LULUCF.
- Selected Forest type to be conducted field survey:
  - (a) deciduous,
  - (b) evergreen, and
  - (c) secondary forests.
- Data to be measured: Annual Growth Rate and aboveground biomass of the metioned forest type.
- Proposed schedule for field survey: Starting from February 2005.

3. Location of study



4. Methodology (1)

- FAO's methodology will be adapted, but more precise as CAPaBLE Project measures biomass in necromass, understorey, and litters.
- Two permanent plots of 2,500 m^2 (50 m x 50 m) for each forest type will be established in two different provinces. All trees species with a diameter of 30 cm or greater are numbered and measured.
- Furthermore, establish three sub-plots from the same corner peg for the collection of tree information of different tree diameter classes as follows:

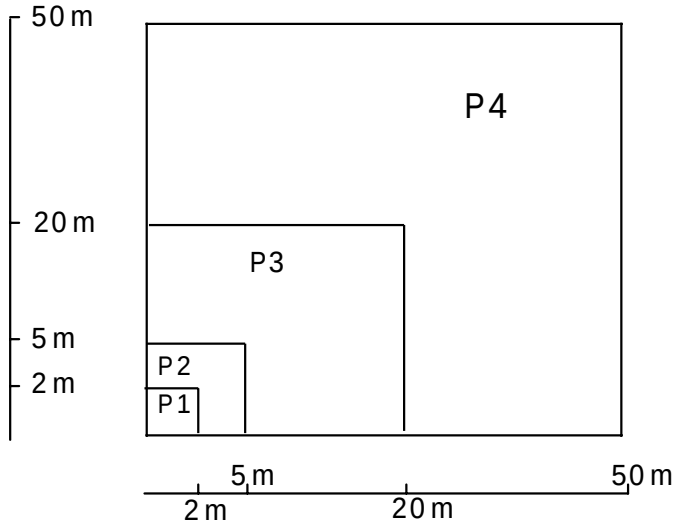
4. Methodology (2)

(a) Sub-plot 1: a 2x2=4m^2 plot in which count is made for all seedlings less than 5 cm in diameter.

(b) Sub-plot 2: a 5x5=25m^2 plot in which all sapling by species or species class, over 5 cm and under 7.5 cm in diameter, are numbered and measured.

(c) Sub-plot 3: 20x20 = 400m^2 plot in which all trees with a diameter of 7.5 cm or greater and less than 29.9 cm (>7.5-29.9cm) are numbered and measured for diameter with species recorded.

4. Methodology (3)



5. Progress to date

- Visited Greenhouse Gas Inventory Office of Japan National Institute for Environmental Studies (NIES) in March 2004 to identify the potential improvement of emission factors reflecting country and regional conditions including actual measurements.
- Assessed key source category for Cambodian GHG Inventory
- Several discussion have been made through email to find out appropriate methodology for improving the GHG inventory in LULUCF.
- Three days field training has been organized for project team.
- Selected methodology, forest types and locations for field measurement.

6. Next Activities

- Field measurement for selected forest types and locations
- Data compiling and report writing.

7. Conclusion/recommendation

- APN CAPaBLE GHG Inventory Project will help Cambodia to improve its national GHG inventory by focusing on the key factors.
- Aboveground biomass and biomass growth rate of deciduous, evergreen, and secondary forests will be developed.
- Project team will gain experiences and skills in field measurement.
- **Some difficulties:** limited budget, expertise, equipements.
- **Our recommendation:**
  (1) More research on Biomass After Conversion of each forest type would be done.
  (2) Expend collaboration with other programs/projects
  (3) APN's fund for next year activities is needed for second measurement.

Rapid and Accate Measurements of Methane Emissions from Rice Paddies under the APN CAPaBLE GHG Project

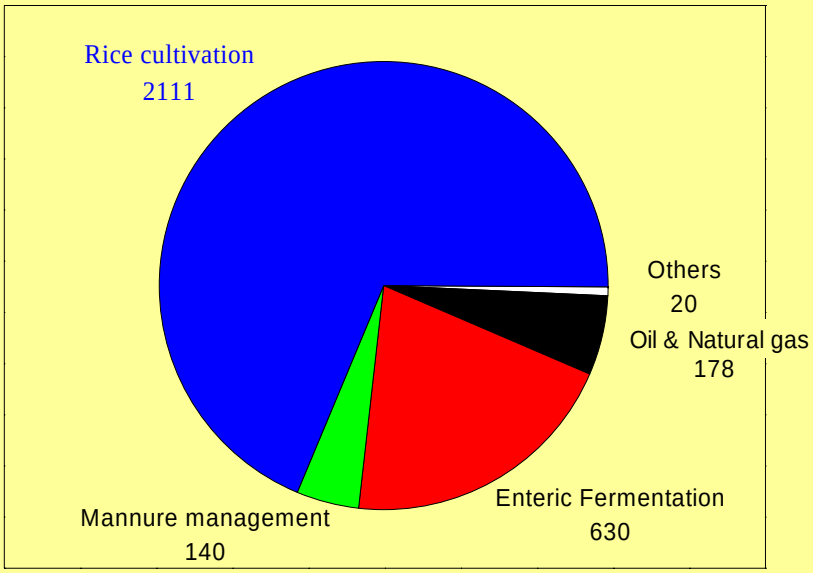
Amnat Chidthaisong

Joint Graduate School of Energy & Environment,
King Mongkut's University of Technology
Thonburi, Bangkok, Thailand

Thailand Greenhouse Gas Inventory 1994

GHGs	Emission (Gg)	CO_2-equivalent (Gg)	%
CO_2	202,458	202,458	71
CH_4	3,171	66,598	23
N_2O	56	17,317	6

Methane Emission from Thailand (Gg, 1994)



Current Inventory

➔ **Emission Factors calculated from;**

-Derived using the average of the measurements conducted in four typical rice growing areas in Thailand (1.56 kg-CH_4 per ha per d) which were under continuous flooding (no fertilizer) in the wet season during 1992 to1994

-The average methane emission rate was converted according to different water regimes and organic matter amendment using IPCC correction factors.

Table 3.1 Measured Methane Emissions in kg CH_4/ha/day from Various Rice Cultivation Areas, with and without Soil Amendments

Province	Soil series	NF	CF	CF+OM	Average
Pathum Thani	Rangsit	0.45	0.73	1.11	0.763
Ratchaburi	Nakornpathom	1.13	2.32	5.93	3.127
Surin	Roi-et	3.77	5.41	6.33	5.170
Chiangmai	Hang Dong	0.89	1.76	1.31	1.320
Average		**1.56**	**2.56**	**3.67**	**2.595**

Notes: NF = no fertilizer application

CF = with chemical fertilizer amendment

CF + OM = with both chemical and organic fertilizer amendment

Source: Jermsawatdipong, *et al.* 1994.

Table 3.2 Methane Emission Factors for Different Water Ecosystem and Organic Amendment

Category	Sub-category		Scaling factors for rice ecosystem	Correction factors for organic amendment	Emission factors kg CH_4/ha/day
Major rice					
Upland	Rainfed	–	0	1	0
	Irrigated	Continuously flooded + OM	1	2	3.120
		Continuously flooded	1	1	1.560
Low land	Rainfed	Flood prone	0.8	2	1.248
		Flood prone + OM	0.8	1	2.496
		Drought prone	0.4	1	0.624
		Drought prone + OM	0.4	2	1.248
	Deep water	Water depth > 100 cm	0.6	1	0.936
Second rice	Irrigated	Continuously flooded + OM	1	2	3.120

Local EF IPCC EF

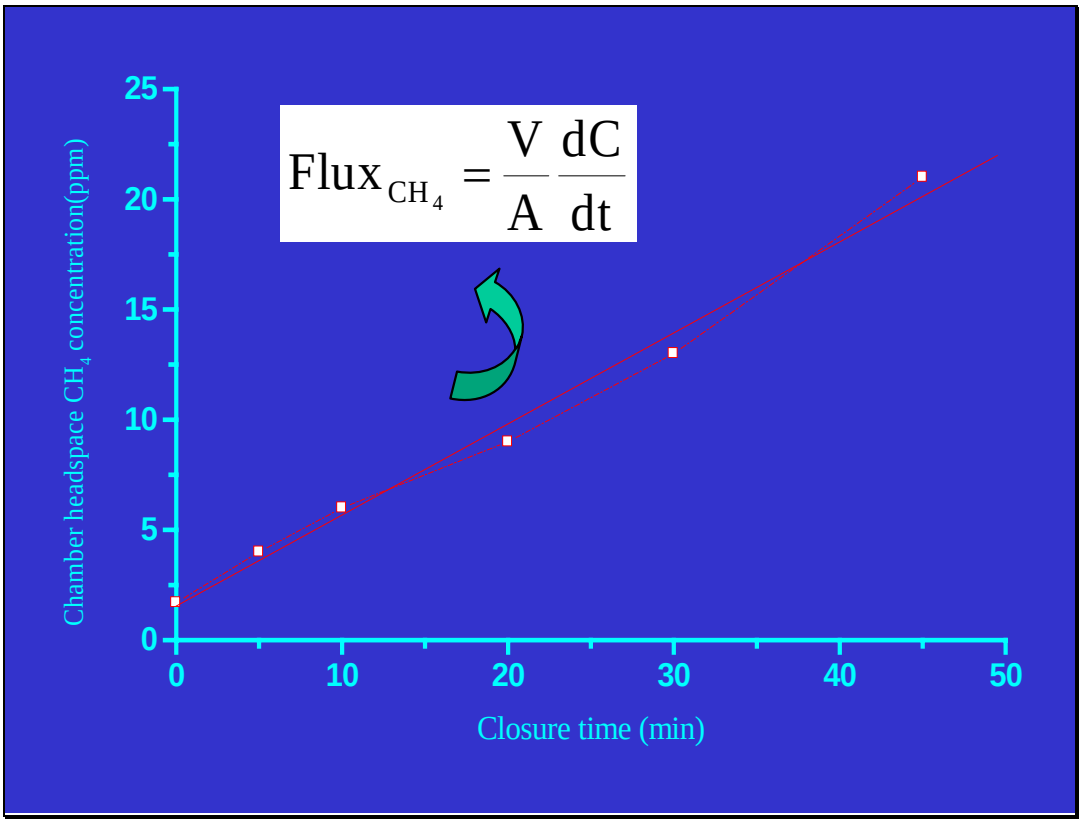
Category	Sub-category		Seasonal flux (g CH_4/sq m)	Cultivation area (ha)	CH_4 emission (Gg)	
Major rice						
Upland	Rainfed	-	0.00	34,048	0.00	0.00
Low land	Irrigated	Continuously flooded + OM	44.04	1,121,492	493.90	420
		Continuously flooded	18.72	1,121,492	209.94	210
	Rainfed	Flood prone + OM	14.98	1,100,926	164.87	165
		Flood prone	35.23	1,100,926	387.88	330
		Drought prone + OM	17.62	2,184,333	384.79	327
		Drought prone	7.49	2,184,333	163.56	164
	Deep water	Water depth > 100 cm	15.31	39,478	6.04	8
		Total		**8,887,026**	**1,811.00**	
Second rice	Irrigated	Continuously flooded	44.04	680,123	299.53	1623
		Total Emissions		**9,567,149**	**2,110.53**	225
						1,878

Methane Emission from Rice Paddy in Thailand

- **Link to main economic activity (rice production) and majority of population well-being.**
- **Room to improve emission inventory;**
  - ➔ **area covering**
  - ➔ **temporal variations**
  - ➔ **cultivation practices: organic/inorganic fertilization, water management, seasons.**

Method for Emission Measurements

➔ Static Chamber methods



Current Procedures

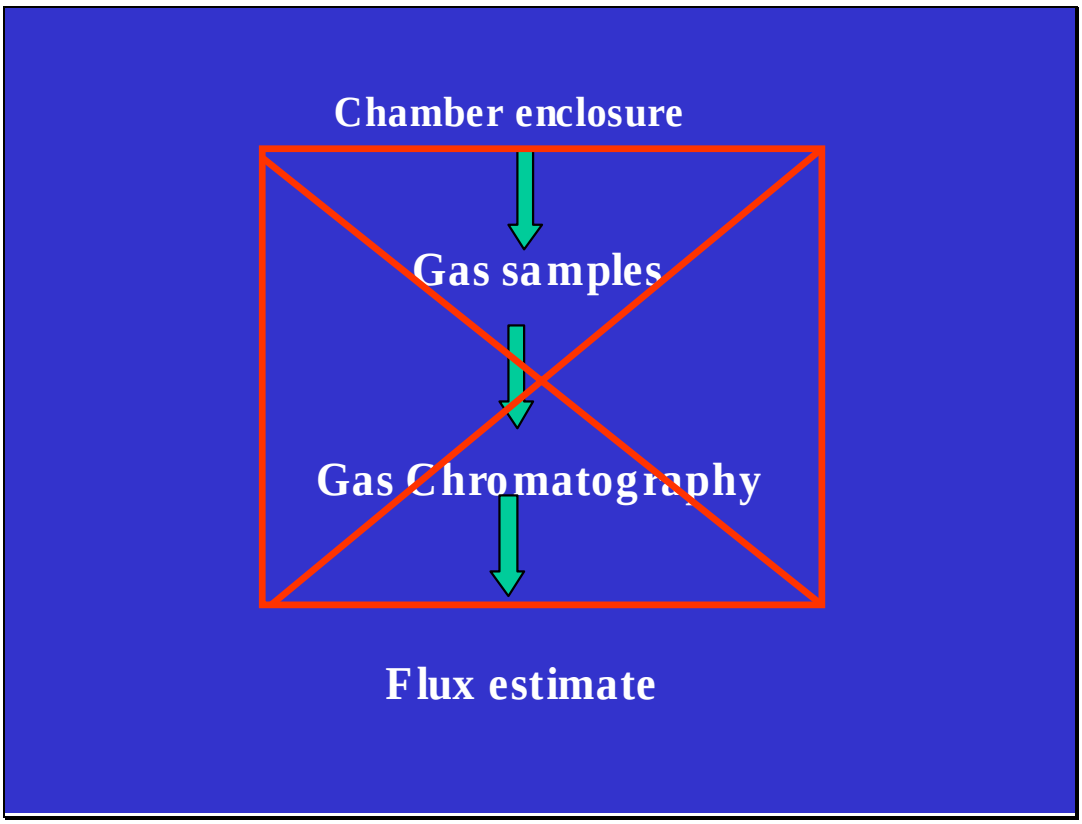
Chamber enclosure

Gas samples

Gas Chromatography

Flux estimate

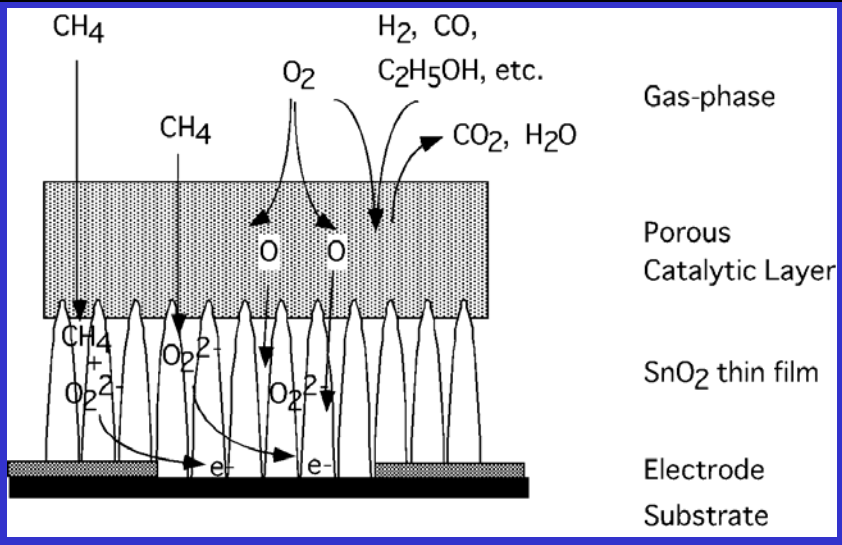
- Time consuming
- Limited replication
- Expensive
- Accuracy concerns
- Not applicable in the remote area



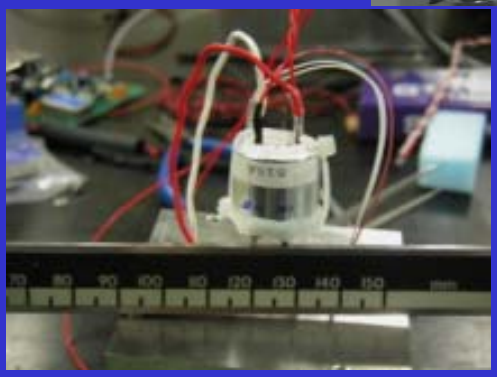
Training: Determination of CH_4 Concentration using semiconductor sensor at NIES

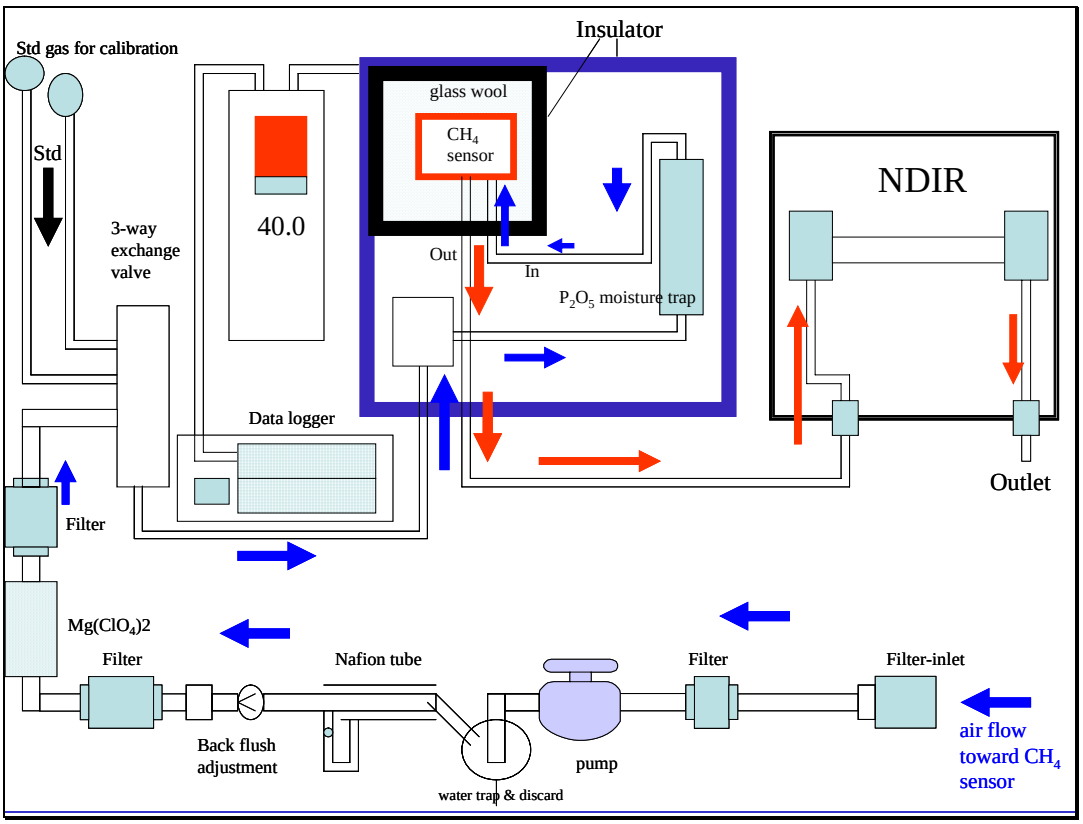
- To learn how to use the CH_4 sensor unit for determining CH_4 concentration.
- 1-30 March 2004, 15-31 August 2004

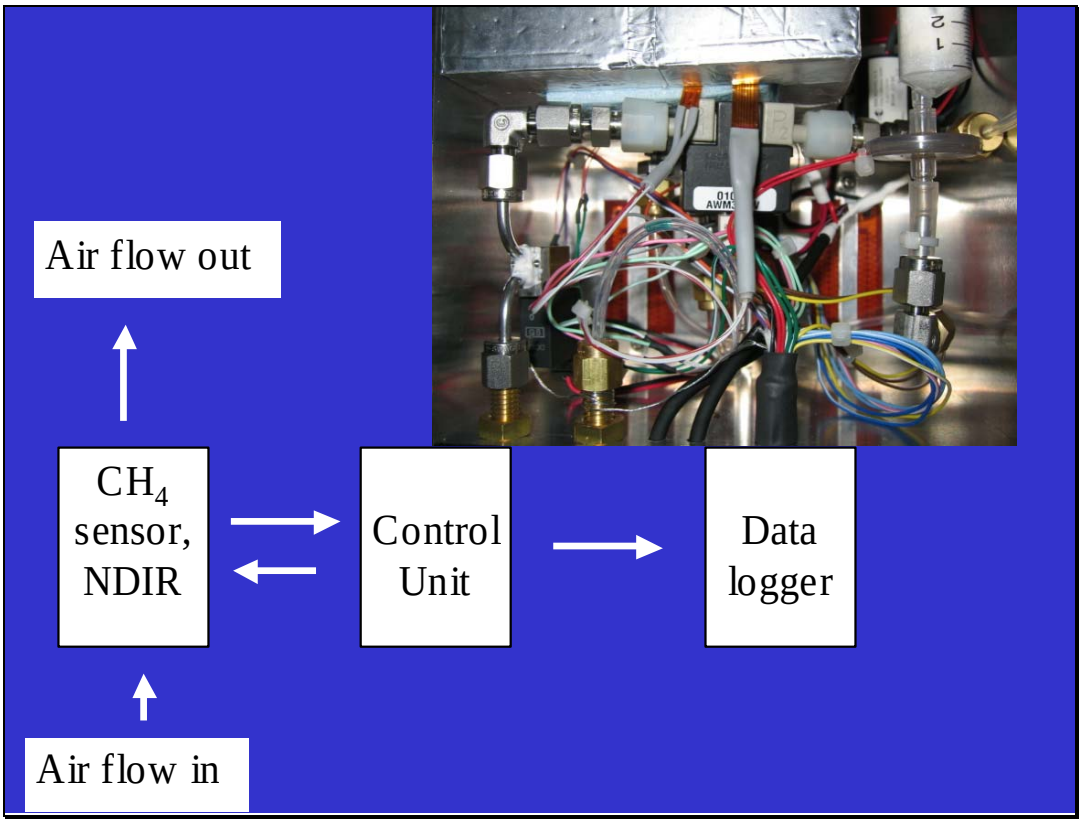
Sensing Mechanism



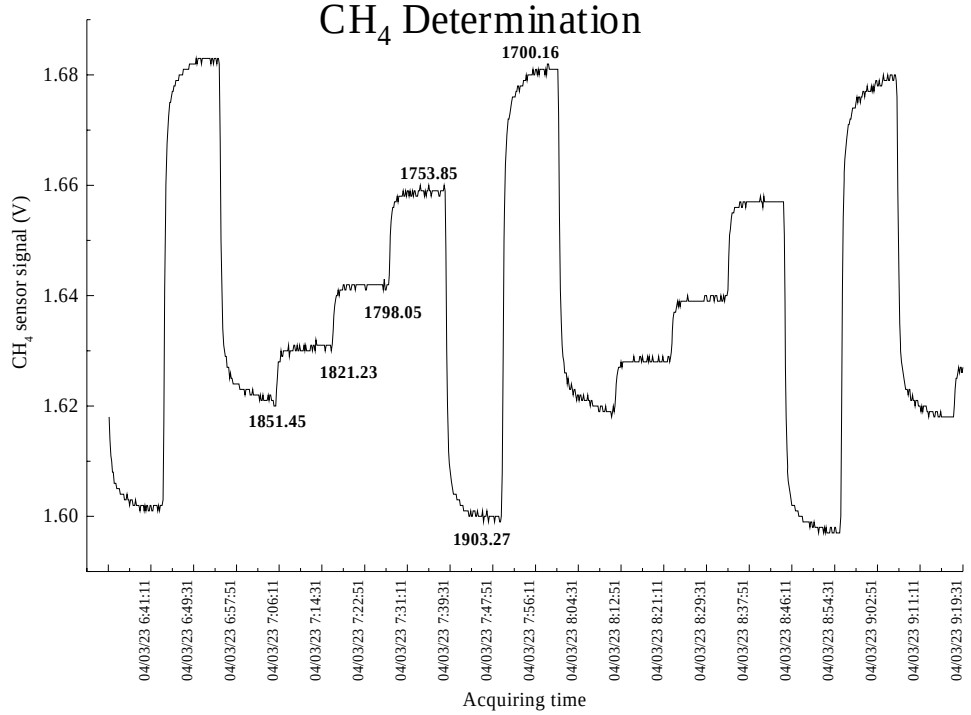
Conductiv $R+O_2^{2-} \rightarrow RO+2e^-$ ons are released; proportional to the amount of reduced gas

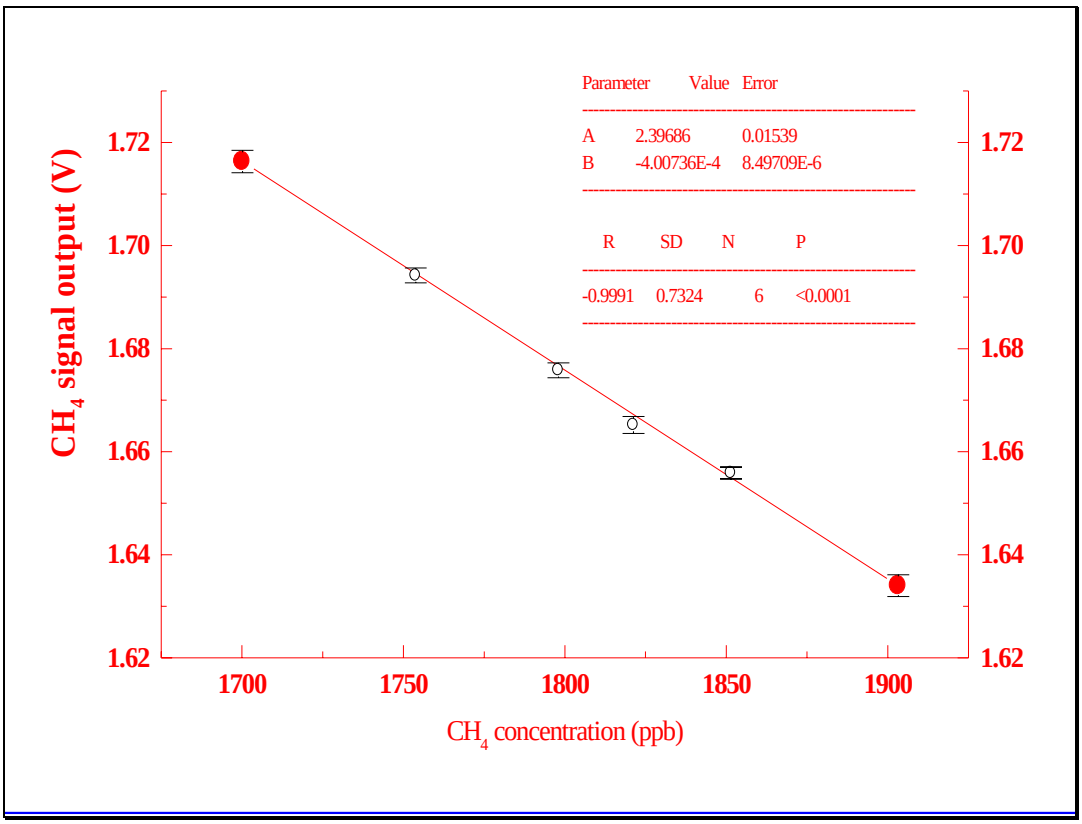


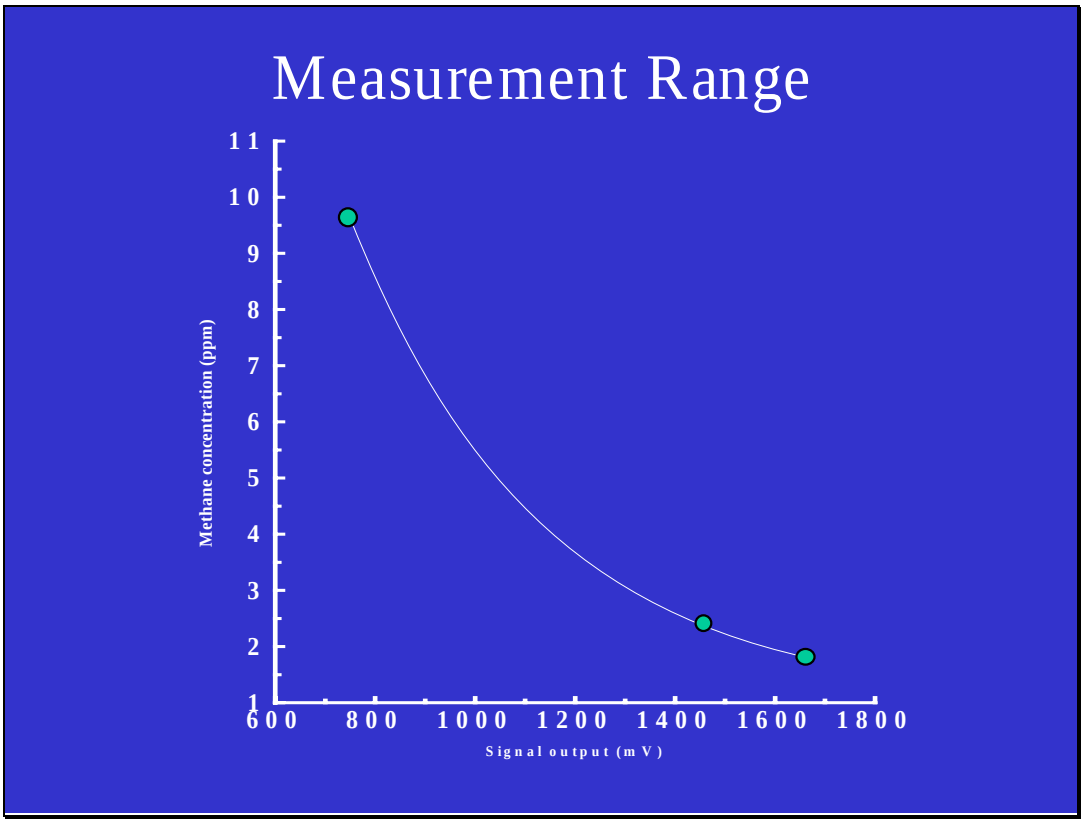

Std gas for calibration
Std
3-way exchange valve
40.0
Insulator
glass wool
CH4 sensor
Out
In
P2O5 moisture trap
NDIR
Outlet
Data logger
Filter
Mg(ClO4)2
Filter
Nafion tube
Back flush adjustment
water trap & discard
pump
Filter
Filter-inlet
air flow toward CH4 sensor

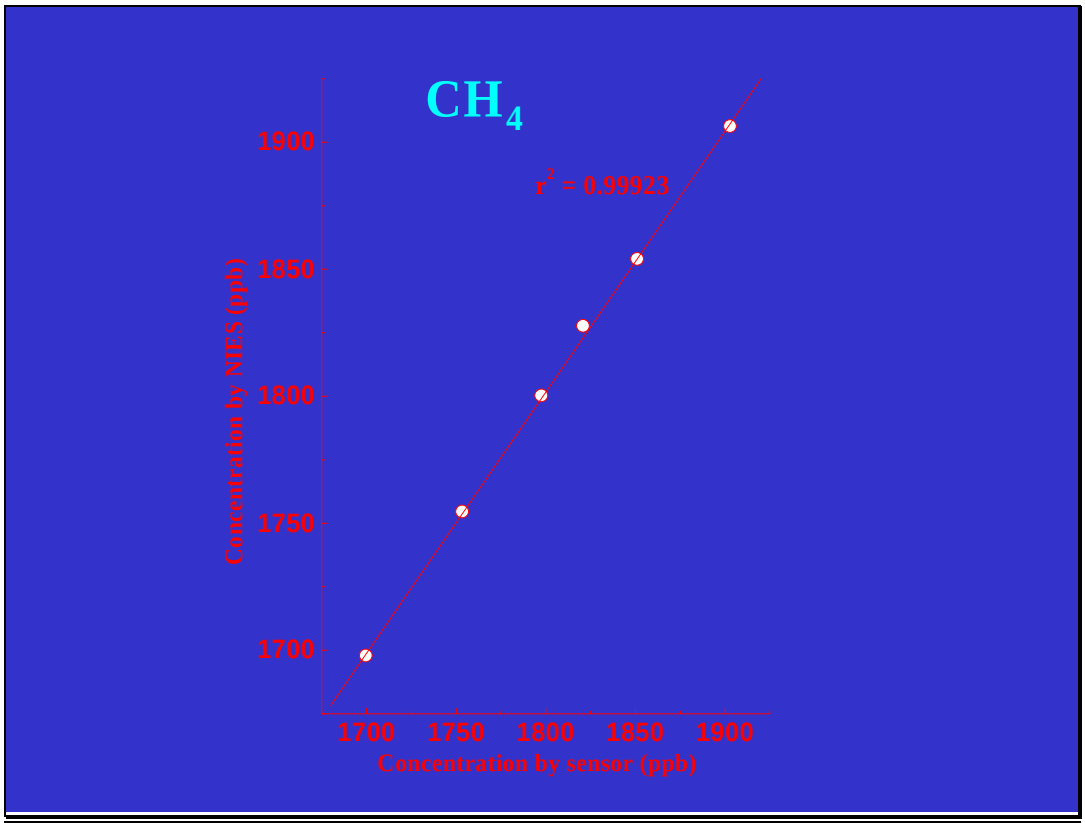

Air flow out
CH4 sensor, NDIR
Control Unit
Data logger
Air flow in

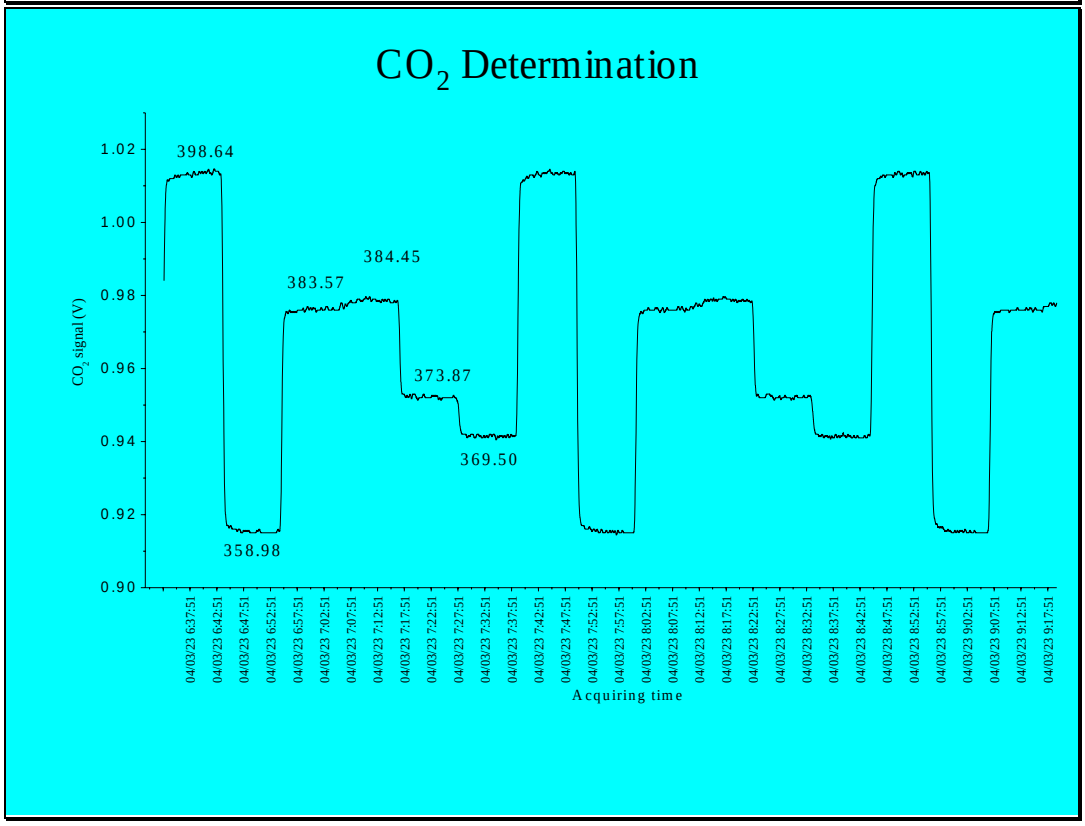
Sensor Mobile Unit

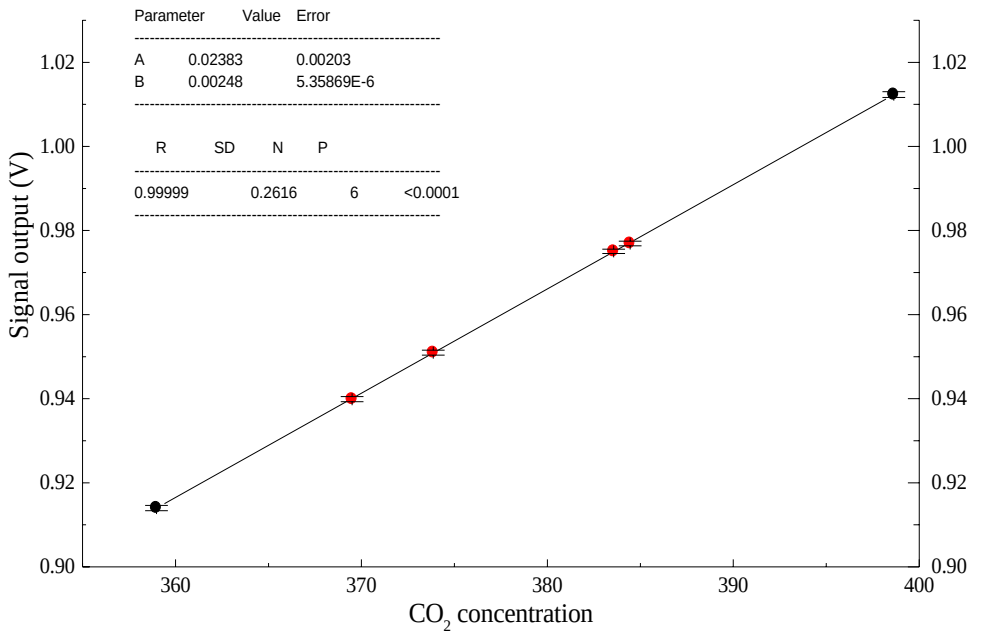


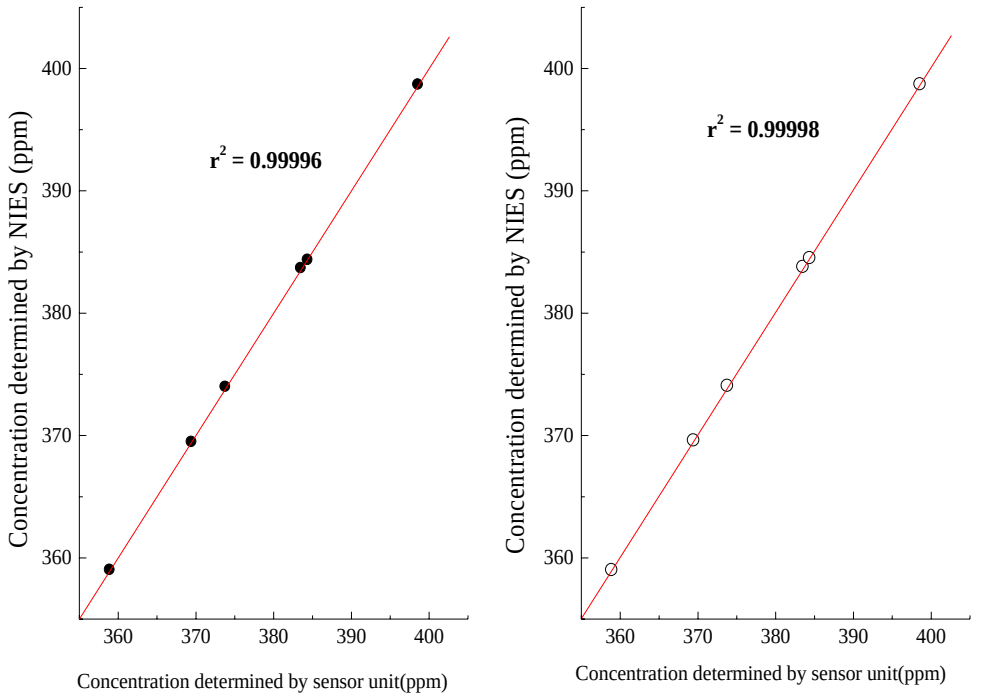

Parameter Value Error
A 2.39686 0.01539
B -4.00736E-4 8.49709E-6
R SD N P
-0.9991 0.7324 6 <0.0001
CH4 signal output (V)
1.72
1.70
1.68
1.66
1.64
1.62
1700
1750
1800
1850
1900
CH4 concentration (ppb)


Measurement Range
Methane concentration (ppm)
11
10
9
8
7
6
5
4
3
2
1
600
800
1000
1200
1400
1600
1800
Signal output (mV)

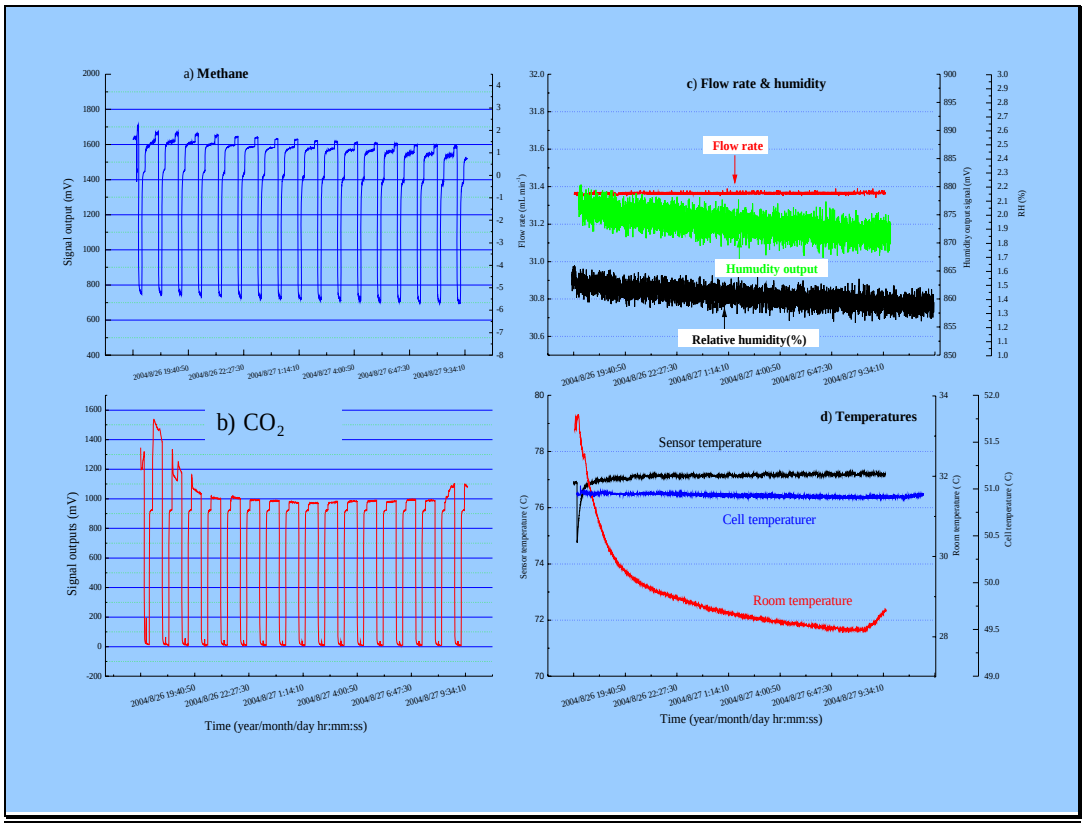

CH4
r2 = 0.99923
Concentration by NIES (ppb)
1900
1850
1800
1750
1700
1700 1750 1800 1850 1900
Concentration by sensor (ppb)

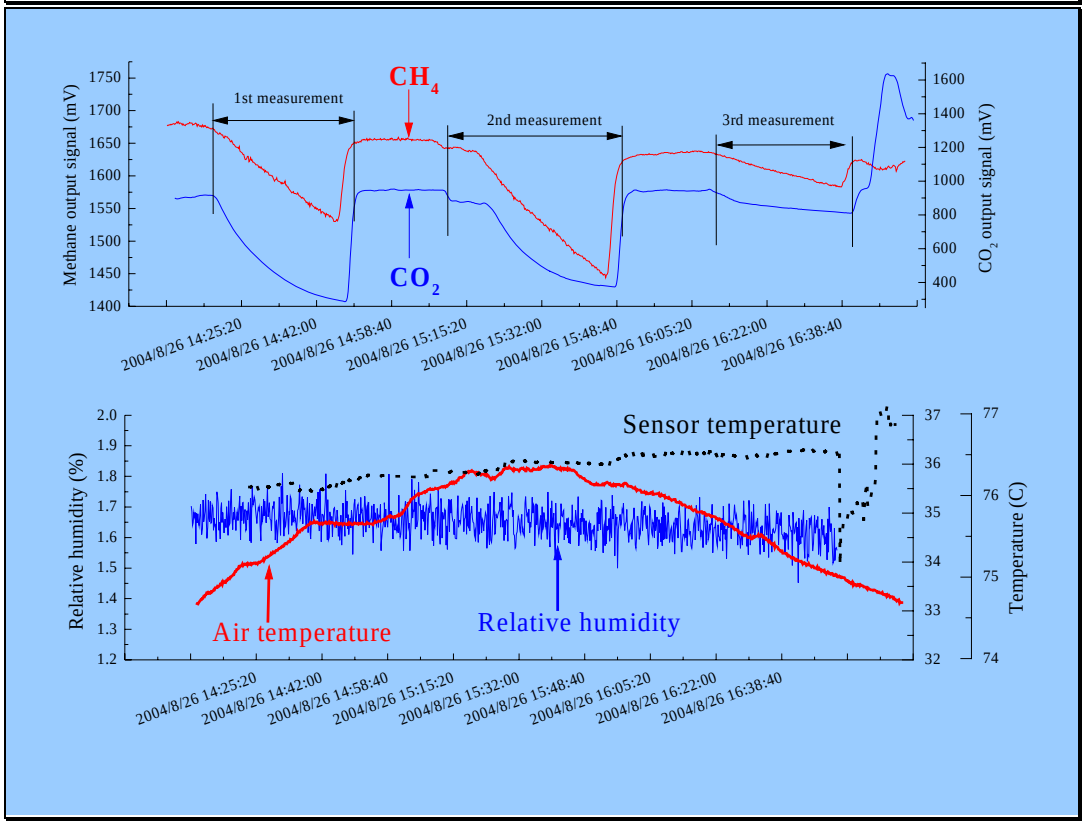

CO2 Determination
CO2 signal (V)
1.02
1.00
0.98
0.96
0.94
0.92
0.90
398.64
384.45
383.57
373.87
369.50
358.98
Acquiring time

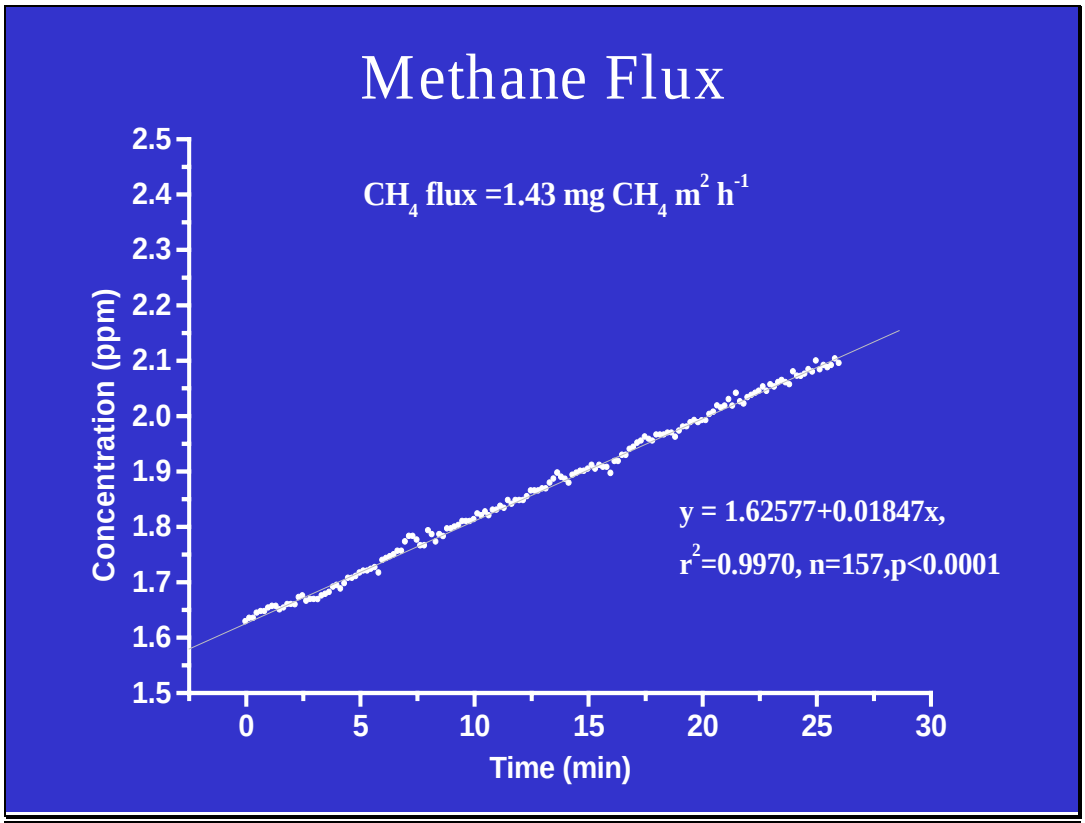

Parameter Value Error
A 0.02383 0.00203
B 0.00248 5.35869E-6
R SD N P
0.99999 0.2616 6 <0.0001
Signal output (V)
CO2 concentration

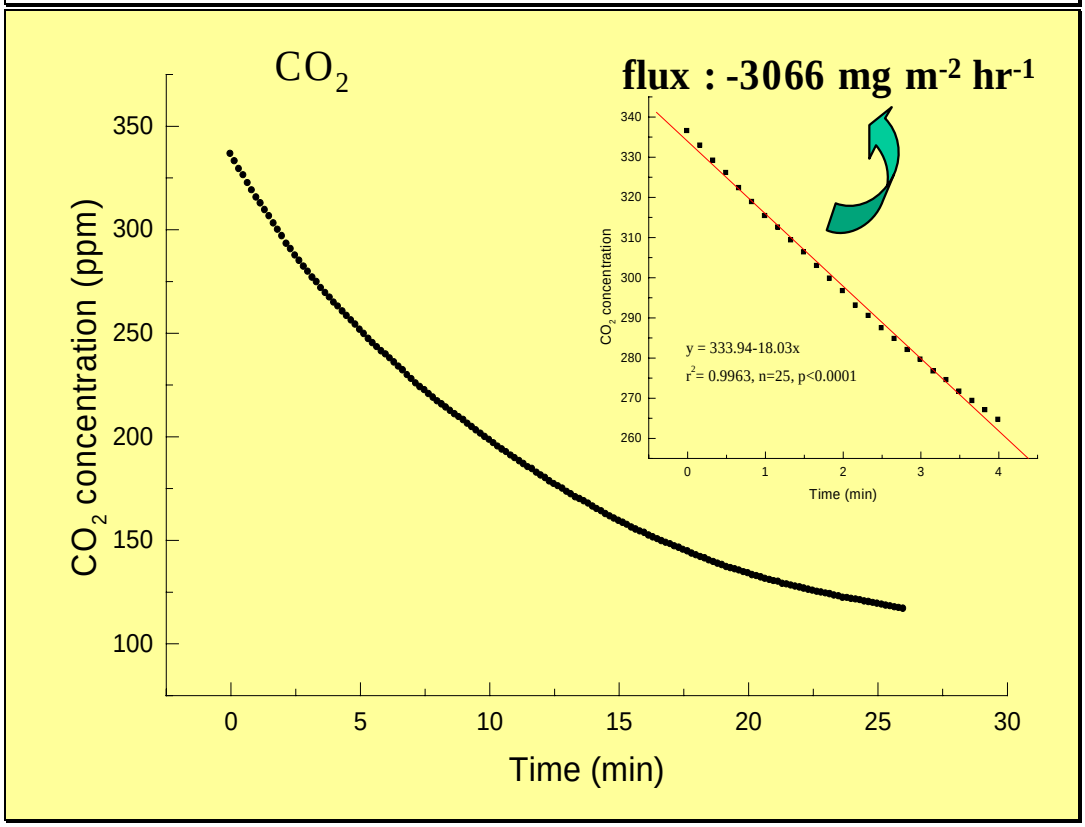

r2 = 0.99996
Concentration determined by NIES (ppm)
Concentration determined by sensor unit(ppm)
r2 = 0.99998
Concentration determined by NIES (ppm)
Concentration determined by sensor unit(ppm)

Field Deployment


a) Methane
Signal output (mV)
c) Flow rate & humidity
Flow rate
Humudity output
Relative humidity(%)
Flow rate (mL min⁻¹)
Humidity output signal (mV)
RH (%)
b) CO2
Signal outputs (mV)
d) Temperatures
Sensor temperature
Cell temperaturer
Room temperature
Sensor temperature (C)
Room temperature (C)
Cell temperature (C)
Time (year/month/day hr:mm:ss)
Time (year/month/day hr:mm:ss)


CH4
1st measurement
2nd measurement
3rd measurement
CO2
Methane output signal (mV)
CO2 output signal (mV)
Sensor temperature
Air temperature
Relative humidity
Relative humidity (%)
Temperature (C)


Methane Flux
CH_4 flux =1.43 mg CH_4 m^2 h^{-1}
Concentration (ppm)
Time (min)
y = 1.62577+0.01847x,
r^2=0.9970, n=157,p<0.0001


CO_2
flux : -3066 mg m^{-2} hr^{-1}
CO_2 concentration (ppm)
Time (min)
CO_2 concentration
y = 333.94-18.03x
r^2= 0.9963, n=25, p<0.0001
Time (min)

- The sensor unit:
- ➔ mobile, no need for external power supply
- ➔ quick measurement, reliable, accurate
- ➔ many measurement replications
- ➔ cheaper cost per measurement
- ➔ relatively easy to operate

What's next?

➔ Use for CH_4 emission measurement in Thai paddies

➔ Comparing with the conventional chamber-GC method

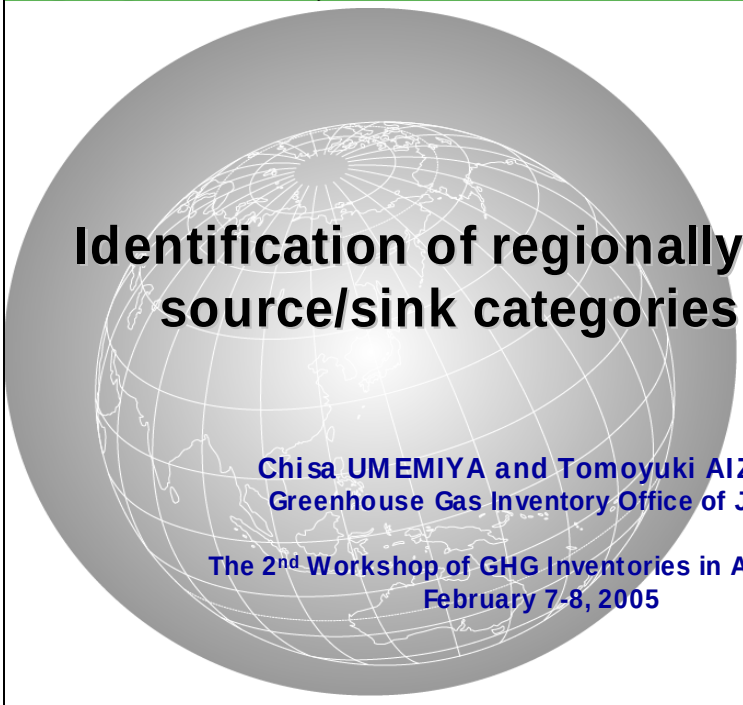
➔ Apply in various rice cultivation schemes

➔ Emission factor database for CH_4 emission in Thailand

➔ Application in other countries

Thanks

- NIES GHG Inventory Team--Japan
- Joint Graduate School of Energy & Environment (JGSEE), King Mongkut's Univ. of Technology Thonburi---Thailand
- APN—Financial supports



Identification of regionally-significant source/sink categories in Asia

Chisa UMEMIYA and Tomoyuki AIZAWA
Greenhouse Gas Inventory Office of Japan

The 2nd Workshop of GHG Inventories in Asia region
February 7-8, 2005

Outline

1. Purpose of presentation
2. Good experiences in other regions:

   UNDP-GEF Regional Capacity Development Project in Europe/CIS region
3. Regionally-significant source/sink categories in Asia
4. Summary

Purpose of presentation

- Network of Asia Region on GHG Inventories successfully established to:
  - Share experiences and information
  - Enhance technical and institutional capacity

How can we utilize Network of Asia Region more effectively in the future?

Let's see what other regions are doing!!

Good experiences in other regions

- *UNDP-GEF Regional Capacity Building Project*

✓ *Goal:* to strengthen capacity to improve quality of GHG inventories

✓ *Idea:* additional to efforts within a country while taking into account national priorities

✓ *Size:* participated by 12 countries in the regions

Source: Project document for Capacity-building for Improving the Quality of Greenhouse Gas Inventories in Europe/CIS region available at *http://www.gefonline.org/projectDetails.cfm?projID=1018 accessed on Dec. 2004*

Good experiences in other regions

- *UNDP-GEF Regional Capacity Building Project*

Overview:

Region	No. of countries	Duration	Funds (million USD)
Europe/CIS	12	3 yrs since Jun. 2003	GEF:2.263 Co-finance*1: 0.994
West & Francophone Central Africa	14	3 yrs since Jan. 2004	GEF:2.992 Co-finance*2: 0.605

*1: 0.944 from Government in kind + 0.05 from Swiss Government

*2: Only from Government in kind

Good experiences in other regions

- *UNDP-GEF Regional Capacity Building Project*

What they do:

Project objectives	Examples of actions
1) Strengthened national arrangements	"Country-solution" manual ; Review mechanism
2) Sustainable inventory team	Database of national experts; Awareness-raising campaign
3) Enhanced technical capacity	Training of trainers in GPG; National QA/QC plan
4) Improved methodology & EFs	Compilation of local EFs; ***Improved at least 3 regionally-significant EFs***

Regionally-significant source/sink categories in Asia

Methodology:

UNDP-GEF Capacity Building Project

1. Nation-by-Nation

- ✓ key category analysis nation-by-nation (level only)
- ✓ identify Top 5 KCs in each country
- ✓ count frequency of countries identifying as KC

2. Asia-combined inventory

- ✓ combine all countries' inventories into one Asia-combined inventory
- ✓ key category analysis (level only)

Influenced by large emitters!

Regionally-significant source/sink categories in Asia

Target:

Cambodia, China, India, Indonesia, Japan, Korea, Lao PDR, Mongolia, Philippines, Thailand, Viet Nam (Total 11)

Source:

Accessed on Dec. 2004

- NC1 with Base Year 1994, if not available, 1990 (8)
- NC2 with 2001 (Korea)
- ALGAS Report with 1990 (China)
- GHG Inventory for 1995 (Japan)

Regionally-significant source/sink categories in Asia

Perhaps, potential priority areas in Asia

	IPCC Categories		GHG	Freq.	Countries
#1	5.A	**Changes in Forest and Other Woody Biomass Stocks**	CO2	9	Cambodia, China, Indonesia, Japan, Korea, Lao PDR, Mongolia, Philippines, Viet Nam
#2	1.A.1	**Fuel Combustion: Energy**	CO2	8	China, India, Indonesia, Japan, Korea, Mongolia, Philippines, Thailand
#3	4.C	**Rice cultivation**	CH4	7	Cambodia, China, India, Lao PDR, Philippines, Thailand, Viet Nam
#4	5.B	**Forest and Grassland Conversion**	CO2	7	Cambodia, Indonesia, Lao PDR, Mongolia, Philippines, Thailand, Viet Nam
#5	1.A.2	Fuel Combustion: Manufacturing Industries and Construction	CO2	6	China, India, Indonesia, Japan, Korea, Thailand
#6	1.A.3	Fuel Combustion: Transport	CO2	5	India, Japan, Korea, Philippines, Thailand
#7	4.A	Enteric Fermentation	CH4	3	Cambodia, India, Mongolia
#8	5.C	Abandonment of Managed Lands	CO2	3	Indonesia, Mongolia, Viet Nam
#9	1.A.4	Fuel Combustion: Other Sectors, e.g. Commercial, Residential	CO2	3	China, Japan, Korea
#10	4.D	Agricultural Soils	N2O	1	Cambodia
#11	5.D	CO2 Emissions and Removals from Soil	CO2	1	Viet Nam

Regionally-significant source/sink categories in Asia

Comparison to those in Europe/CIS region…

Unique to Asia!

Not including LULUCF

	Asia					Europe/CIS			
	IPCC Categories			GHG	Freq. (of 11)	IPCC Categories without LULUCF		GHG	Freq. (of 12)
#1	5.A	**Changes in Forest and Other Woody Biomass Stocks**		CO2	9	6.A	**Soild Waste Disposal on Land**	CH4	7
#2	1.A.1	**Fuel Combustion: Energy**		CO2	8	1.B.2	**Fugitive Emissions from Fuels: Oil and Natural Gas**	CH4	7
#3	4.C	**Rice cultivation**		CH4	7	4.A	**Enteric Fermentation**	CH4	6
#4	5.B	**Forest and Grassland Conversion**		CO2	7	1.A.3.b	**Fuel Conbustion: Transport – Road Tranportation**	CO2	6
#5	1.A.2	Fuel Combustion: Manufacturing Industries and Construction		CO2	6	4.D	Agricultural Soils	N2O	5
#6	1.A.3	Fuel Combustion: Transport		CO2	5	1.A.1	Fuel Combustion: Energy	CO2	3
#7	4.A	Enteric Fermentation		CH4	3	1.B.1	Fugitive Emissions from Soild Fuels	CH4	3
#8	5.C	Abandonment of Managed Lands		CO2	3	4.B	Manure Management	N2O	2
#9	1.A.4	Fuel Combustion: Other Sectors, e.g. Commercial, Residential		CO2	3	1.A.2	Fuel Combustion: Manufacturing Industries and Construction	CO2	2

Regionally-significant source/sink categories in Asia

Potential regionally-significant areas

Number of countries reporting

Impacts on region

	IPCC Categories		GHG	Freq.	Countries	No. of reports	Impacts (%)
#1	5.A	Changes in Forest and Other Woody Biomass Stocks	CO2	9	Cambodia, China, Indonesia, Japan, Korea, Lao PDR, Mongolia, Philippines, Viet Nam	11	12.2
#2	1.A.1	Fuel Combustion: Energy	CO2	8	China, India, Indonesia, Japan, Korea, Mongolia, Philippines, Thailand	11	18.9
#3	4.C	Rice cultivation	CH4	7	Cambodia, China, India, Lao PDR, Philippines, Thailand, Viet Nam	10	5.6
#4	5.B	Forest and Grassland Conversion	CO2	7	Cambodia, Indonesia, Lao PDR, Mongolia, Philippines, Thailand, Viet Nam	11	8.7
#5	1.A.2	Fuel Combustion: Manufacturing Industries and Construction	CO2	6	China, India, Indonesia, Japan, Korea, Thailand	10	19.0
#6	1.A.3	Fuel Combustion: Transport	CO2	5	India, Japan, Korea, Philippines, Thailand	10	7.5
#7	4.A	Enteric Fermentation	CH4	3	Cambodia, India, Mongolia	11	4.1
#8	5.C	Abandonment of Managed Lands	CO2	3	Indonesia, Mongolia, Viet Nam	5	0.4
#9	1.A.4	Fuel Combustion: Other Sectors, e.g. Commercial, Residential	CO2	3	China, Japan, Korea	10	8.7
#10	4.D	Agricultural Soils	N2O	1	Cambodia	9	1.3
#11	5.D	CO2 Emissions and Removals from Soil	CO2	1	Viet Nam	4	0.0

Total 45.4 %

More reports can be generated?

Summary

Overall:

Our existing network has excellent potential
to evolve into more concrete project status
that can effectively contribute to an improved inventory

More precisely, my suggestion is:

- ✧ To improve accuracy of EFs and AD of regionally-significant categories since regional characteristics in key categories are identified
- ✧ To encourage information transfer in certain categories with insufficient reports by countries

→ ***Any other suggestions??***

Thank you very much!

Regionally-significant source/sink categories in Asia

Comparison to those in the world...

	IPCC Categories		GHG	Freq.
#1	5.A	Changes in Forest and Other Woody Biomass Stocks	CO2	9
#2	1.A.1	Fuel Combustion: Energy	CO2	8
#3	4.C	Rice cultivation	CH4	7
#4	5.B	Forest and Grassland Conversion	CO2	7

Not including LULUCF

IPCC Category		GHG	Brazil	EU	Former USSR	USA	World
Energy	Fuel Combustion	CO2	○	◎	◎	◎	◎
	Fugitive	CO2					
		CH4			○	○	
		N2O					
Industrial Processes		CO2					
		N2O					
		HFC					
		PFC					
		SF6					
Agriculture		CH4	△	△	△		△
		N2O		○		△	○
Waste		CH4					
Other		CO2	◎				
		CH4					
		N2O					

◎: First
○: Second
△: Third
most significant KCs

Source: CO2 Emissions from Fuel Combustion 2004 Edition (IEA, 2004)

Regionally-significant source/sink categories in Asia

KC analysis results of Asia-combined inventory

	Asia-Comboined						Level Assessment Result			
	IPCC Categories	GHG	No. of reports	Non-LULUCF (Gg CO_2eq.)	LULUCF (Gg CO_2eq.)	Absolute Value (Gg CO_2eq.)	Without LULUCF	Cumulative Total Without LULUCF	With LULUCF	Cumulative Total With LULUCF
	SUM			6,664,351	−240,107	8,502,028	1.0000		1.0000	
#1	1.A.2	CO2	10	1,618,644	0	1,618,644	0.2429	0.2429	0.1904	0.1904
#2	1.A.1	CO2	11	1,606,437	0	1,606,437	0.2410	0.4839	0.1889	0.3793
#3	5.A	CO2	11	0	−1,038,892	1,038,892	0.0000	0.4839	0.1222	0.5015
#4	5.B	CO2	11	0	743,372	743,372	0.0000	0.4839	0.0874	0.5890
#5	1.A.4	CO2	10	737,839	0	737,839	0.1107	0.5946	0.0868	0.6757
#6	1.A.3	CO2	10	640,530	0	640,530	0.0961	0.6908	0.0753	0.7511
#7	4.C	CH4	10	479,436	0	479,436	0.0719	0.7627	0.0564	0.8075
#8	4.A	CH4	11	346,245	0	346,245	0.0520	0.8147	0.0407	0.8482
#9	2.A	CO2	9	225,925	0	225,925	0.0339	0.8486	0.0266	0.8748
#10	1.B.1	CH4	10	202,258	0	202,258	0.0303	0.8789	0.0238	0.8986
#11	1.A.4	CH4	11	109,866	0	109,866	0.0165	0.8954	0.0129	0.9115
#12	4.D	N2O	9	109,827	0	109,827	0.0165	0.9119	0.0129	0.9244
#13	1.A.1	N2O	8	74,024	0	74,024	0.0111	0.9230	0.0087	0.9331
#14	2.C	CO2	8	66,851	0	66,851	0.0100	0.9330	0.0079	0.9410
#15	1.B.2	CH4	8	64,780	0	64,780	0.0097	0.9427	0.0076	0.9486
#16	4.B	CH4	11	62,292	0	62,292	0.0093	0.9521	0.0073	0.9559
	6.A	CH4	11	59,950	0	59,950	0.0090	0.9611	0.0071	0.9630
	5.C	CO2	5	0	35,168	35,168	0.0000	0.9611	0.0041	0.9671
	1.A.5	CO2	3	33,450	0	33,450	0.0050	0.9661	0.0039	0.9710
	4.B	N2O	2	30,721	0	30,721	0.0046	0.9707	0.0036	0.9747
	4.G	N2O	5	27,900	0	27,900	0.0042	0.9749	0.0033	0.9779
	6.C	CO2	8	26,383	0	26,383	0.0040	0.9788	0.0031	0.9810
	2.B	CO2	3	19,101	0	19,101	0.0029	0.9817	0.0022	0.9833

Regionally-significant source/sink categories in Asia

Nation-by-Nation & Asia-combined inventory

	IPCC Categories		GHG	Freq.	Countries	Combined	No. of reports
#1	5.A	Changes in Forest and Other Woody Biomass Stocks	CO2	9	Cambodia, China, Indonesia, Japan, Korea, Lao PDR, Mongolia, Philippines, Viet Nam	#3	11
#2	1.A.1	Fuel Combustion: Energy	CO2	8	China, India, Indonesia, Japan, Korea, Mongolia, Philippines, Thailand	#2	11
#3	4.C	Rice cultivation	CH4	7	Cambodia, China, India, Lao PDR, Philippines, Thailand, Viet Nam	#7	10
#4	5.B	Forest and Grassland Conversion	CO2	7	Cambodia, Indonesia, Lao PDR, Mongolia, Philippines, Thailand, Viet Nam	#4	11
#5	1.A.2	Fuel Combustion: Manufacturing Industries and Construction	CO2	6	China, India, Indonesia, Japan, Korea, Thailand	#1	10
#6	1.A.3	Fuel Combustion: Transport	CO2	5	India, Japan, Korea, Philippines, Thailand	#6	10
#7	4.A	Enteric Fermentation	CH4	3	Cambodia, India, Mongolia	#8	11
#8	5.C	Abandonment of Managed Lands	CO2	3	Indonesia, Mongolia, Viet Nam	–	5
#9	1.A.4	Fuel Combustion: Other Sectors, e.g. Commercial, Residential	CO2	3	China, Japan, Korea	#5	10
#10	4.D	Agricultural Soils	N2O	1	Cambodia	#12	9
#11	5.D	CO2 Emissions and Removals from Soil	CO2	1	Viet Nam	–	4

ii) Other documents

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

NATIONAL GREENHOUSE GAS INVENTORIES PROGRAMME

Emission Factor Database (EFDB)

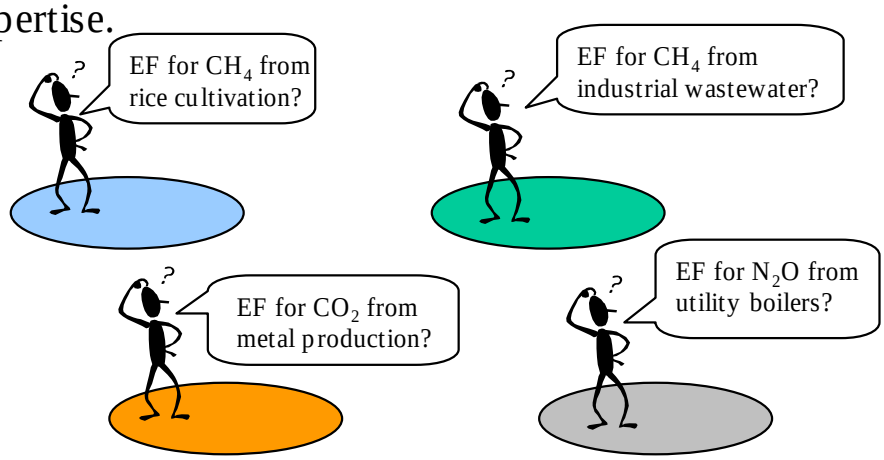
February 2005

Authored by

Kiyoto Tanabe, Technical Support Unit
IPCC National Greenhouse Gas Inventories Programme

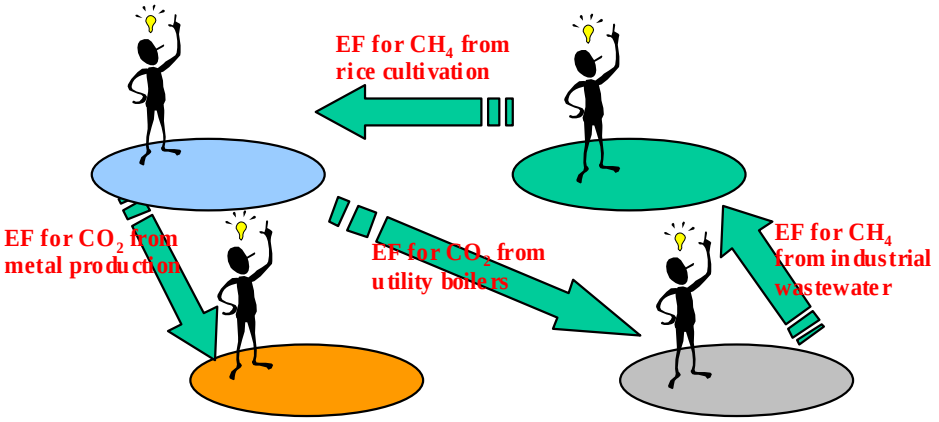
Why is the EFDB needed?

- Desirably, emission factors that reflect national circumstances should be used in inventory compilation.
- However, development of such emission factors is difficult - it is costly, time consuming, requires much expertise.



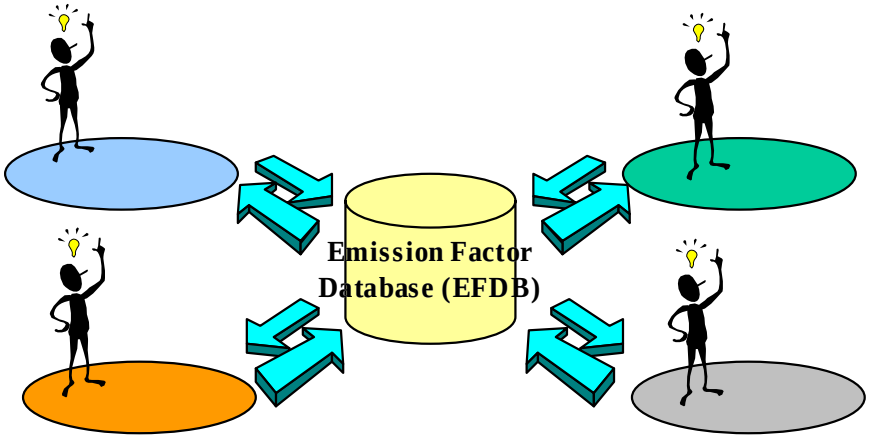
Why is the EFDB needed?

- By sharing data/information, emission factors that take into account local conditions (national circumstances) can be obtained cost-effectively.



Why is the EFDB needed?

- An easily accessible database on emission factors and other relevant parameters will facilitate sharing data/information by inventory compilers, experts, scientists worldwide.



EFDB is expected to serve as...

- **Library** of well documented emission factors and other parameters which
  - ✓**Evolves dynamically through contributions of new data from researchers, scientists, industry...**
  - ✓Provides a wide variety of emission factors and other parameters with background documentation or technical references so that users can select and use appropriate data **on their own responsibility**.
- **Communication platform** for distribution and commenting on new research and measurement data

Data contained in EFDB

- At present, EFDB contains only the IPCC default data and the data from CORINAIR94.
- New data are expected to be provided by the global scientific and inventory society.
- New data will be evaluated for acceptance by EFDB Editorial Board according to the following criteria.
  - ✓EFDB should assist countries in producing inventories that are neither over- nor underestimates so far as can be judged and in which uncertainties are reduced as far as practicable.
  - ✓To this end, the data to be included should be…

Criteria for Inclusion of New Data

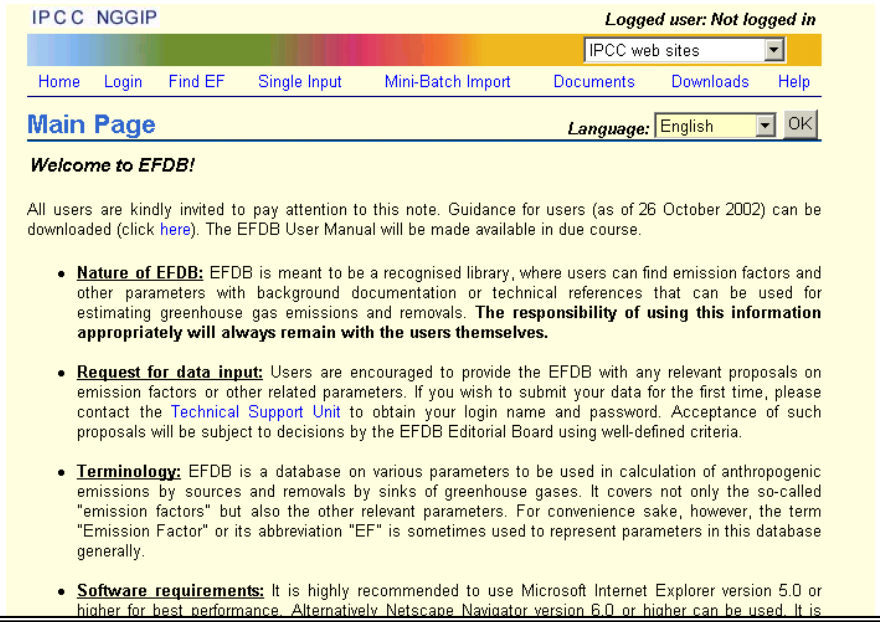
- **Robust**
  - Within the accepted uncertainty, the value is unlikely to change if there was repetition of the original measurement programme or modelling activity.
- **Applicable**
  - An emission factor can only be applicable if the source and its mix of technology, operating and environmental conditions and abatement and control technologies under which the emission factor was measured or modeled are clear and allow the user to see how it can be applied.
- **Documented**
  - Access information to the original technical reference must be provided to evaluate the robustness and applicability as described above.

"Properties"

How to Access the EFDB

- Two different applications are available.
  - ✓**Web application**
    - For all users to carry out on-line search
    - For data providers to submit new emission factors or other parameters
  - ✓**CDROM application**
    - For all users, in particular for those who have difficulty with Internet connection, to carry out off-line search
- The web application is the core of this system. New data will be made available in the Web application first.

EFDB Web application



Http://www.ipcc-nggip.iges.or.jp/EFDB/main.php

EFDB Local CDROM application

- Can be operated locally (on a stand-alone PC).
- For detailed guidance, see the **User Guide for Local CDROM application**.
- For supplementary information, see also:
  - ✓Appendices A-D of the User Manual for Web application
  - ✓Annex to the User Manual for Web application

EFDB Local CDROM application

- EFDB Local CDROM application works with MS Access MDB file, which contains the copy of the on-line web database.
- The latest MDB file will be made available
  - ✓Through the Internet: At the "Downloads" section of the web application; and/or
  - ✓In the form of CD-ROM: Will be distributed annually or biannually, possibly on the occasion of sessions of SBSTA or COP.

- Success – depending on input from the global scientific and inventory society
  - ✓EFDB is open to any relevant data proposals.
  - ✓If you have your own data on emission factors, please contact the Technical Support Unit (TSU) by e-mail <**ipcc-efdb@iges.or.jp**>.
- Continuous improvement on the content and functionality – Users' feedback will be quite important
- Your involvement is highly appreciated!!

The 2nd Workshop on GHG Inventories in Asia
7-8 February 2005
Shanghai

Mongolia's GHG inventory:ST and LT strategy

Batima P. Institute of Meteorology and Hydrology
web: www.mongolclimate.mn
E-mail: mcco@magicnet.mn

Identify sources of available data from prior and ongoing international and regional projects

- Mongolia prepared its first greenhouse gases (GHG) inventory in 1996 for the base year 1990 under the US Country Studies Programme
- Updated within the Asia Least-Cost Greenhouse Gas Abatement Strategy (ALGAS),
- As part of the enabling activities of preparation of the Initial National Communication (GEF/UNEP), the GHG inventories were updated to 1998 with base year 1994.

Problems and Gaps

Information

- No standard data for inventory
- No system in collection and checking
- No Institutional framework

Methodologies and tools

- No country specific emission factor

What should do…

Mongolia participate in the project Capacity Building for Improving the Quality of GHG Inventories Europe /CIS Region

What should do…

- **Improve reliability of activity data**
- **Increase number of NE and Train NE**
- **Archive and document**
- **Improve GHG inventory procedure**
- **Improve the EFs**
- **Establish NDB for GHG inventory**

STS:Experts involved

- National Agency for Meteorology, Hydrology and Environment Monitoring
- Institute of Meteorology and Hydrology
- Mongolian State University
- Energy Conservation Co.Ltd
- Ulaanbaatar City Governor's Office
- Expert for EF

Improve reliability of activity data

- AD assessment
- EF assessment
- Methodology assessment

Data and EF assessment

No	Sector	Activity data necessary for GHG inventory	Data source	Bariers to find activity data	How to overcome the barier
5	**Waste**				
	Landfills	*Urban population*	*Statistical year book*		
	Domestic wastewater	*Urban population*	*Statistical year book*		
	Commercial and industrial wastewater	*Annual wastewater*	*Annual Water usage Report of Water management Institute*	*This annual report is not avialable from libruary.*	*There are necessary official documantion to include in Annual report on environmental issues of Ministry of nature and Environment.*

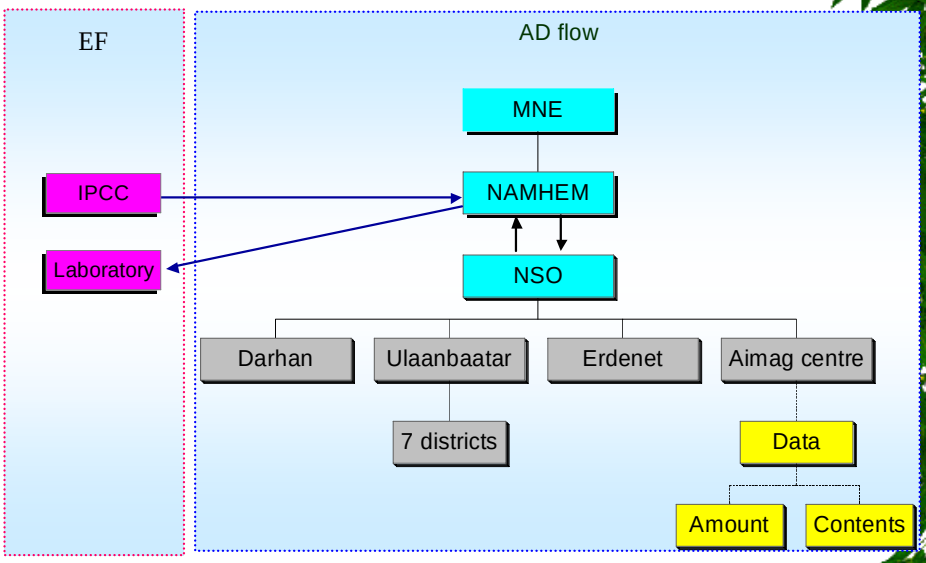
Sectors

- Mobile sources
- Waste. Urban solid waste, WW

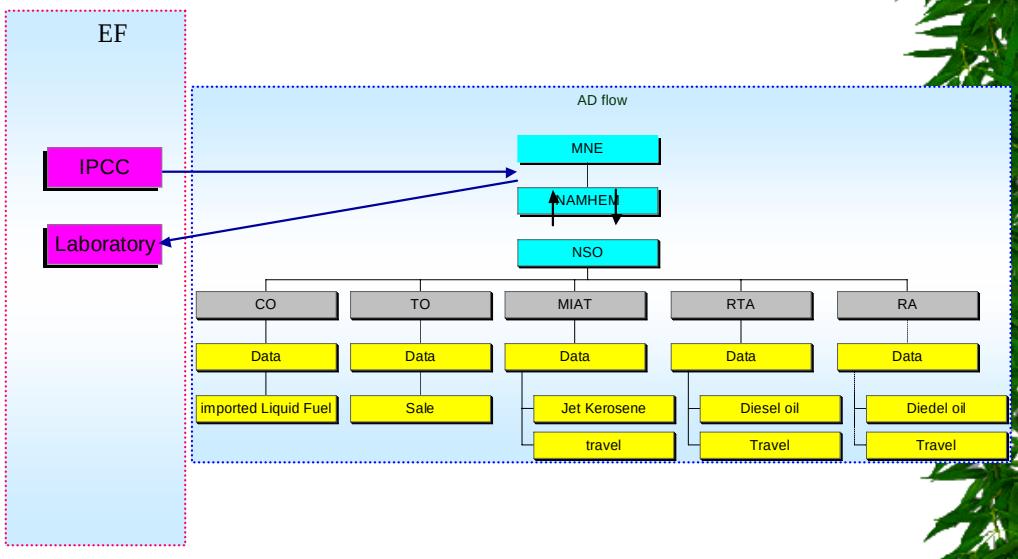
Identify prior and ongoing national sources of existing data

- Annual statistical book
- only general activity data, such as
  - fuel consumption,
  - cement production,
  - livestock population,
  - area of cultivated land

STS:Prepare data flow chart Solid waste



STS:Prepare data flow chart Mobile



Methodologies

- IPCC GPG
- IPCC default EF
- Country Specific EF

SRS:Archiving existing data and information

Prepared

- all available information
- World version
- Excel version
- Design of documentation

LTS: Improve GHG inventory procedure

- Develop NM for GHG Inventory
  - Drafting
  - Approval

Outline of NM for GHG inventory

- Introduction
- Legal framework
- Institutional framework
- Data collection
- Methodology
- EF
- Completeness
- Documentation
- Reporting
- Annex

Long-term strategy

- Establish legal framework
  - Data collection
  - Archiving and documentation
  - Preparation of GHG inventory
  - Information access (related to GHG issue)
  - Agreement/memorandum
- Establish institutional framework
  - Institutions: national/sectoral
  - Compiling/Reporting
  - Person/staff
  - QA and QC
  - Review

LTS

- Establish electronic data base
  - Access or SQL
- Implementation
  - Annual inventory


Thank you for your attention

INDONESIA:
Climate Change Activities

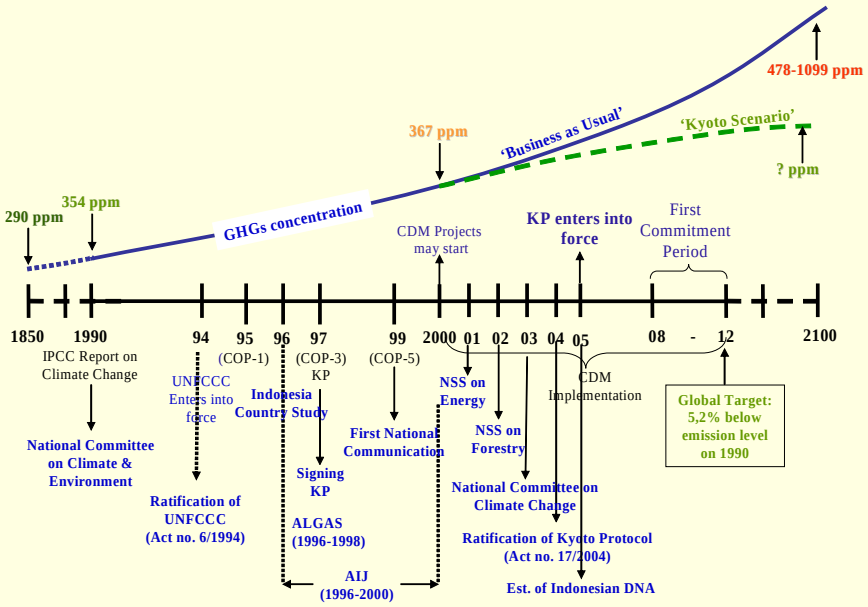
M. Natsir
Ministry of Environment

The Second Workshop on Inventories in Asia Region
Shanghai, China
7-8 February 2005

Outline

- Climate Change Activities in Indonesia
- Ratification of Kyoto Protocol
- Indonesian DNA
  - Update on process
  - Structure and working mechanism
  - Sustainable Development (SD) criteria
- CDM projects in Indonesia
- CDM Indonesia Information Desk
- Preparation of National Communication

Climate Change Activities in Indonesia



ACTIVITIES ON CLIMATE CHANGE (1)

- NSS on Energy Sector, 2001
- NSS on Forestry Sector, 2003
- Bilateral cooperation with:
  - GTZ to establish Indonesian DNA
  - The Netherlands to form National Committee on Climate Change & awareness building to all stakeholder
- Developing Regional and National Capacity regarding climate change mitigation

ACTIVITIES ON CLIMATE CHANGE (2)

- Establishment of National Committee on Climate Change by MOE Decree No. 53 of 2003
- Ratification of Kyoto Protocol through the Act no. 17/2004
- Development of Regional and National Capacity in climate change mitigation by:
  - Greenhouse Gas Emission Reduction from Industry in Asia & the Pacific (GERIAP)-UNEP (SIDA July 2002 – Dec 2005)
  - Project of Global Warming Prevention – JICA Need Survey 2003
  - Integrated Capacity Strengthening for the CDM (ICS - CDM) MOE Japan (Oct 2003 - 2004)
  - CTI Industry Join Seminar on Technology Division in ASEAN and the Pacific Region (Jan 2003, NEDO Japan)
  - Feasibility Study on Lodoyo Hydro Electric Power Plant Expansion – East Java (Japan 2003)

GERIAP PROJECTS IN INDONESIA

- The project runs from July 2002 until December 2005 and includes the following steps :
  - Capacity building through training NFPs on Cleaner Production/ Energy efficiency
  - Practical demonstration of energy efficiency resulting in four sector specific manuals
  - Review of national policies and other factors that affect industry's ability to manage energy and climate change
  - Reporting and dissemination of project outputs

GERIAP PROJECTS IN INDONESIA

Companies Commitment

6 companies commited to GERIAP as followed:

1. **Cement industry :**

PT. SEMEN CIBINONG, PT SEMEN PADANG,
PT INDOCEMENT

2. **Steel Industry :**

PT KRAKATAU STEEL

3. **Fertilizer :**

PT PUPUK KUJANG

4. **Pulp and Paper Industry :**

PT PINDO DELI PULP AND PAPER

Indonesian DNA Development (1)

- The process has been initiated in April 2003.
- The Ministry of Environment with support from GTZ and assisted by Pelangi, conducts this process
- Consultations have been conducted:
  - Multi-stakeholders consultation: 1 Steering Committee meeting
  - Interdepartmental consultation: 2 technical committee meetings
  - Consultation with departments

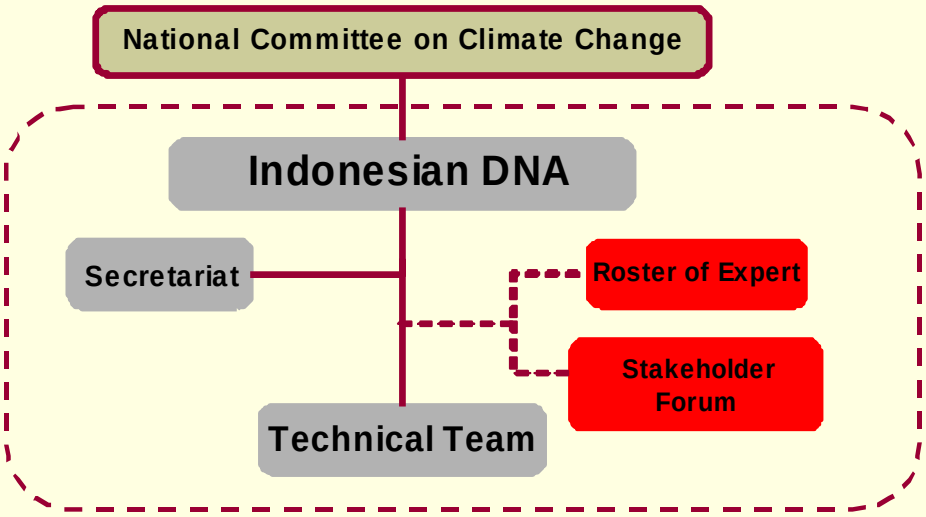
Indonesian DNA Development (2)

- DNA is expected to be finalized and operated on October 2004
- Main principles: efficient, rigorous, easy access, low cost, accountable and transparent
- Multi stakeholder consultation process continuous

Basic functions of DNA

- Stating that the country's participation in a CDM project activity is voluntary
- Stating that the project activity assists the country in achieving sustainable development
- Stating that the project have fulfilling related national environmental regulation such as environmental impact assessment
- Stating that stakeholders' comment have been taken into account

Proposed structured of DNA



CDM projects in Indonesia (1)

ENERGY SECTOR

The National Strategy Study (NSS) has developed a strategy for energy sector as followed:

- The technical potential for and cost of GHG emission reduction projects
- using both top-down and bottom-up approach
- International market scenarios, including the size of CDM market and the
- factors that will affect Indonesia's share
- The international and national institutional setting for the CDM.
- Lesson learned from pilot emission reduction projects in Indonesia.
- A range of potential CDM projects that could be implemented relatively
- quickly

CDM projects in Indonesia (2)

- Since 1996, Indonesia has actively supported the Activities Implement Jointly (AIJ) mechanism.
- The energy component financed by GTZ and coordinated by the State Ministry for the Environment, which was completed in late 2001.
- Based on NSS potential energy sector volume is 125 – 300 MT CO2 for the year 2008-2012
- Project WayangWindu Unit 2 has been accepted by CERUPT and around 20 projects are looking for potential buyers and preparing the PDDs

CDM projects in Indonesia…(3)

Potential Project in Energy Sector based on NSS:

Renewable Energy/ Electricity Supply

- Sarulla Geothermal Field in North Sumatera
- Satar Messe, Manggarai, Flores, East Nusa Tenggara
- PLN Yapen Selatan, Jayapura, Irian Jaya
- PLN East Nusa Tenggara and West Nusa Tenggara
- PLN Sulawesi

Energy Efficiency

- Suralaya Power Generation Plant

Waste Management / Fuel Switch

- PT. Fajar SuryaWisesa, Bekasi, West Java
- Ponorogo, East Java
- Torgamba Palm Oil Plantation, North Sumatera
- Pangkalanbrandan, North Sumatera

- **Energy Conservation**
  - TBA, Central Java

CDM projects in Indonesia…(4)

FORESTRY SECTOR

- Potential volume in forestry sectors : 3,020 MT CO2e
- The NSS attempts to explore issues and challenges in sink or land-use, landuse change and forestry (LULUCF) sectors.
- The current LULUCF component, is funded by AusAID, which will be deal with the implementation of the CDM
- Total CDM bolume is 36 Mt Co2 per year which provide 6% of market share
- 32.5 Mha land os potential in the forest carbon projects
- The allocation of the area for the forest carbon projects were Regreening (3.2 Mha), Agroforestry (12.7 Mha), Community forestry (9.8 Mha), Forest Plantation known as HTI (1.9 Mha), Reforestration known as Reboisasi (4.9 Mha)

CDM Indonesia Information Desk

- Will be designed as an information desk
- Requirements for CDM projects in Indonesia, i.e. national SD, priorities and other documents will be posted on the website
- Application for DNA approval on potential projects can be done online
- Potential projects will be listed on the website
- Potential buyers will be listed on the website
- Operational Entities will be listed on the website

Preparation of Indonesia's 2nd National Communication (1)

- Development of the 2nd Natcom proposal facilitated by the GEF through Climate Change Enabling Activity (Self-assessment exercise)
- Objectives: identify and fill in the gaps between the activities carried out under the First National Communication (FNC) and the current status of climate change related activities in Indonesia

Preparation of Indonesia's 2nd National Communication (2)

- Activities undertaken on self-assessment exercise:
  - Stakeholder consultation
  - Data gathering (through stocktaking exercise)
  - 2nd Natcom project proposal preparation
  - Workshop on draft of proposal
  - Finalization and submission of 2nd Natcom proposal

THANK YOU ...

M. Natsir
Ministry of Enironment
Republic of Indonesia
m_natsir@menlh.go.id
climate@menlh.go.id

iii) Appendix

Appendix

National Communications to the UNFCCC
of Countries that Participated in the 1st and/or 2nd
Workshop on GHG Inventories in Asia Region (WGIA)

(Data as of 18 Feb 2005)

	Initial National Communications	Second National Communications	Third National Communications	Download Most Recent Version
1. Cambodia	08/10/02			Cambodia (1,179 kB)
2. China	10/12/04			China (Exec. Summary)
3. India	22/06/04			India (5,892 kB)
4. Indonesia	27/10/99			Indonesia (1,167 kB)
5. Japan	20/09/94	02/12/97	31/05/02	Japan (14,178 kB)
6. Lao P.D.R.	02/11/00			Lao P.D.R (10,466 kB)
7. Mongolia	01/11/01			Mongolia (2,367 kB)
8. Philippines	19/05/00			Philippines (2,147 kB)
9. Korea (ROK)	12/02/98	01/12/03		Korea (4,265 kB)
10. Thailand	13/11/00			Thailand (5,525 kB)
11. Viet Nam	02/12/03			Viet Nam (1,007 kB)

Notes:

1. Dates are in the form DD/MM/YY.
2. Source: Website of the UN Framework Convention on Climate Change (http://unfccc.int/national_reports/non-annex_i_natcom/items/2979.phpand and http://unfccc.int/national_reports/items/1408.php) .

Greenhouse Gas Inventory Office of Japan

Center for Global Environmental Research, National Institute for Environmental Studies (NIES)

16-2, Onogawa, Tsukuba, Ibaraki, Japan 305-8506

Phone: 81-29-850-2169, Fax:81-29-858-2645 E-mail:cgergio@nies.go.jp http://www-gio.nies.go.jp

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