

The Development of GHG Inventory for Energy Sector & Industrial Processes - Malaysia

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Outline

- Background of the Study
- Data collection methodology
- Discussion by Sectors
 - Approach and estimation used in the GHG Inventory
 - Emission calculation methodology used in the inventory (Tier 1, Tier 2 and Tier 3)
 - Issues and challenges faced in the development of the inventory
- Recommendations to improve GHG inventory preparation

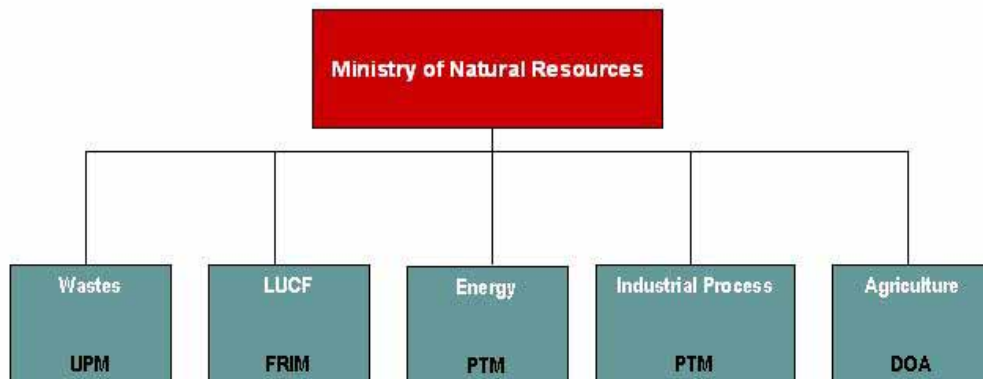
National Communication 2 (NC2)



- Under the NRE obligations
 - Sets out national inventory of GHGs and the assessment of the possible impacts of climate change, and makes suggestions for possible initiatives to address this issue.
- Members for NC2 is MEWC, MITI, MOA, DOS, FRIM, DOE, PTM, MARDI, UPM etc.

MEWC – Ministry of Energy, Water and Communications
MITI – Ministry of International Trade and Industry
MOA – Ministry of Agriculture
DOS – Department of Statistic
FRIM – Forest Research Institute
DOE – Department of Environment
PTM – Pusat Tenaga Malaysia
MARDI – Malaysian Agricultural Research and Development Institute
UPM – University Putra Malaysia

Country's Structure



UPM – Universiti Putra Malaysia
FRIM – Forest Research Institute
PTM – Pusat Tenaga Malaysia
DOA – Department of Agriculture

GHG Inventory Project



- PTM has been assigned to undertake the inventory part for energy and industrial processes
- In line with the 1996 IPCC guidelines, emissions are estimated from major sources of the following categories:
 - Energy – fuel combustion
 - Industrial processes
- Three priority GHGs will be estimated, namely carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O).

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Objective of the Study



Principle Objective:

- To assess the current status and develop the GHG inventories in Malaysia energy sector

Other Objectives:

- In support of the Second National Communication development
- Emission baseline for energy sector
- Establish GHG database management system

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Scope of the Inventory



The scope of the study shall include:

- i. Inventories in Energy Sector i.e. Power, Transport (Aviation, Road, Rail, Navigation) Industry, Residential, Commercial and Non-energy
- ii. Inventories in Industrial processes (metal, chemical & mineral)

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Project Output



- Report on the GHGs Inventory in the energy sector in Malaysia
 - Development of data collection method (base year 2000)
 - Input to IPCC Guideline
 - Development of GHG Inventory
- Suggestions for areas of improvement in the preparation of the GHG Inventory

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Project Activities



1. Establishing methodology to be used
 - Review of data requirement (Revised 1996 IPCC Guidelines)
2. Data listing and data collection
 - Development of GHG database
 - Development of data collection method
 - Data collection activities
3. Data input in IPCC Worksheet
 - Analyze data based on data input
4. Analyses & Recommendation
 - Areas of improvement in the preparation of the GHG Inventory

Establishment of Methodology



- Review of 3 different methodologies have been undertaken
 - Tier 1, Tier 2 and Tier 3
- The Tier 1 Methodology Revised IPCC 1996 Guidelines was chosen based on study conducted with DANIDA
- Review of NEB has been made – to find out the level of detail of data available to be used in the GHG Inventory
 - NEB data used for the Reference Approach
 - No details on each of the end-use sectors e.g. for transport, no indication if the fuel is for road transport or rail transport

Methodological Framework

- Tier 1 methods rely on widely available fuel data
- Tier 2 methods may be regarded as those dividing fuel consumption on the basis of sample or engineering knowledge between technology types which are sufficiently homogenous to permit the use of representative emission factors
- Tier 3 methods generally estimate emissions from activity figures (km travelled or ton x km carried, not fuel cons.) and specific fuel efficiency or fuel rates or, alternatively, using an EF expressed directly in terms of a unit of activity.

Data Collection Strategy

- Initial contact with data provider
- Follow up with written data request – example: table with indication of default value
- Follow up with telephone call, visit

Support data collection with

- letter explaining GHG-inventory
- Supporting letter from NRE

ENERGY SECTOR



Identification of GHG Sources

- For the inventory, emissions from energy sector are estimated from the following categories/sources:
 - Fuel Combustion
 - Fugitive Emissions from Coal Mining
 - Fugitive Emissions from Oil and Gas System
 - Burning of biomass fuel in energy industries sector
 - GHGs that need to be addressed are CO₂, CH₄ and N₂O

Structure of Methodology

- Tier 1 structure is used which relies on widely available fuel data
 - Reference Approach
 - Top down approach
 - Fundamental: overall energy balance
 - Sectoral Approach
 - Bottom up approach
 - Fundamental: energy consumption for sectors
 - Default Emission Factors or national/sector specific Emission Factors
- **Base year : 2000**

Structure of Methodology (Cont'd)

- Reference Approach/Sectoral Approach (CO₂)
 - Step 1: Estimate apparent/sectoral fuel consumption in original unit
 - Step 2: Convert to a common energy unit
 - Step 3: Multiply by emission factors to compute the carbon content
 - Step 4: Compute carbon stored
 - Step 5: Correct for carbon un-oxidised
 - Step 6: Convert carbon oxidised to CO₂ - emissions

Structure of Methodology (Cont'd)

- Sectoral approach (Tier 1: CH₄, N₂O, NO_x, CO, NMVOC and SO₂)
 - Step 1: Estimate annual fuel consumption per sector in energy units
 - Step 2: Estimate emission factors for each gas
 - Step 3: Estimate the emission for each gas
 - Estimate EF for SO₂ from S-content of fuel

Data Requirement

Tier 1

- Fuel consumption based on type of fuel
- Fuel consumption aggregated (coal, natural gas, oil, etc.)
- Default Emission Factors (IPCC 1996 Guidelines)

Preliminary Result

ENERGY SECTOR

		1994	2000	Increase (%)
GDP at 1987 prices	million RM	153,881	209,365	36%
Population	'000	20,112	23,275	16%
Apparent energy consumption	ktoe	31,858	54,135	70%
CO ₂ emission per capita	ton/capita	4.195	5.782	38%
CO ₂ emission (Reference approach)	Gg CO ₂	84,415	140,110	66%

Result from NC1

Sources & Sinks	1994					
	CO ₂		CH ₄		N ₂ O	
Categories	Gg	%	Gg	%	Gg	%
Total National Emissions	144,314					
a. Fuel Combustion	84,415	86.7				
b. Fugitive Emissions from Fuel			593	26.6		
c. Fugitive Emission from Biomass Fuels			42	1.9	0.35	86.4

% derived from total emissions by total categories in NC1

Preliminary Result (NC2)

Sources	2000		
	CO ₂	CH ₄	N ₂ O
Categories	Gg	Gg	Gg
Total National Emissions	140,110		
Reference Approach	140,110		
Sectoral Approach	130,747		
a. Fuel Combustion	130,747		
b. Fugitive Emissions from Fuel		1,199	
c. Fugitive Emission from Biomass Fuels			8.12

Issues & Challenges

Energy Sector (esp. for Sectoral Approach)

1. Unavailability of relevant data e.g. data for fuel consumption in transport, agriculture sector
2. Data are scattered around in many organizations; hence, time-consuming to compile the data
3. Delays in receiving data from relevant agencies
4. Further info required, that include:
 - Fuel Consumption for domestic/international aviation and maritime (navigation)
 - Fuel Consumption for railways, pipeline transport
 - Fuel Consumption for agriculture/forestry/fishery sector segregation between mobile and stationary sources

INDUSTRIAL PROCESSES



Identification of GHG Sources

- Emissions from industrial processes are identified from the following sources:
 - Mineral Production and Use
 - Chemical Production and Use
 - Metal Production
 - Halocarbons (e.g. HFCs, PFCs) Production and Use
 - Others sources (e.g. Pulp & Papers, Food & drink production)
- Data required for inventory
 - The GHGs that need to be addressed are CO₂, CH₄ and N₂O
 - Encouraged to report the halocarbons emissions
 - Optional to address other GHG emissions depending on availability of data

Structure of Methodology

- The Tier 1 Methodology of Revised 1996 IPCC Guidelines will be used
 - based on recent PTM/DANIDA study on GHG Inventory - Industrial Processes
- Review of publications has been made – to assess the availability of data to be used in the inventory
- Surveys on industries are necessary to support the readily available data from publications or studies
- Assumptions will be made depending on the processes in the relevant industries

Data Sources

Sources	Necessary data required	Comments
Department of Statistics	<ul style="list-style-type: none"> ● Statistics of production, import and export data of minerals ● Information on production of specific chemical substances 	● Dept. of Statistic doesn't cover all the products
Department of Minerals & Geosciences	<ul style="list-style-type: none"> ● Information on extraction of minerals ● Information on consumption of minerals ● Production of metals 	Mineral Yearbooks and other relevant publications available
Ministry for International Trade and Industry	Statistics imports and export <ul style="list-style-type: none"> ● HFCs/PFCs/SF₆ ● Chemicals 	Statistics are in RM value
Department of Environment	<ul style="list-style-type: none"> ● Production/Import/Export of HFCs/PFCs ● Producers of HFCs/PFCs ● Legal requirements to producers ● Information on products containing halocarbons 	Any studies in DOE for past 15 years may help to get the relevant data
Companies producing the minerals, metals, chemicals, halocarbons and others e.g. PETRONAS	Processes in the plant to get the most relevant data	

Issues & Challenges

Industrial Processes

- Lack of information on industrial processes relevant to GHG emissions
- Delays in receiving data from relevant agencies
- Data are scattered around in many organizations; hence, time-consuming to compile the data
- The published data are different from one source to another for the same year

Conclusions

Conclusions



- Fundamental issues on data collection still to be addressed
- Need to establish effective networking with data/information providers
- Capacity building for data providers
- Need to establish a central data repository, specifically to cater to GHG inventory needs

Notwithstanding the abovementioned, much progress has been made in the GHG inventory exercise

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Recommendations



- Focal point for data collection/collation
 - Energy Databank – PTM
 - Other Data – Statistics Department, Counterparts involved
 - Establish cooperation with data providers
 - Establish format (methodology) of data sheet for data collection
- Implementing Authority
 - Providing info is made mandatory
 - Use existing regulations from authorities e.g. Dept. of Environment, Statistics department to add in extra info required in the IPCC guidelines
- Regular Updates
 - Required to ensure sustainability of GHG Inventory
 - Monitoring of emissions level in Malaysia

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Thank You



Our Function :
PTM is the agent for public & private energy sectors

Pusat Tenaga Malaysia
Malaysia One-Stop Energy Centre

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We Offer
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Data on Energy Efficiency
Consultancy and Building
Consultancy
Energy Efficiency
Energy Statistics
Research
Consultancy A&E Projects
Rental of PTM Building
equipment
Regularly updated information on energy
A well equipped resource centre
In-house publications
A complete ESCOs directory

Malaysia Energy Database Information System

Energy Audit Equipment

Weekly Info Energy
Makro polong urah
Kawasan Jimat tenaga
Palm oil to be used to
power car engines
Generators
Harga minyak tidak boleh
naik mendadak
Ekonomi dipakca
Biofuel station in the
pipeline
Biofuel Storage
Biofuel policy a boon to
palm oil industry: Sabu
Call for more biofuel tank
issue first

12:05 AM Today 15 September 2005

New PTM Building (Zero Energy Office)

Malaysia Industrial Energy Efficiency Improvement Project (MIEEIP)

Biomass Generation & Co-generation in Sabu (GEM) in Malaysia (Biogen)

Malaysia Building Integrated Photovoltaic (BIPV) Technology Application Project

PTM Membership Updates
Currently we have a total of 102 Members:
■ 60 Corporate Members
■ 42 Individual Members
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■ Why become a member?
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■ Corporate
■ Individual

Highlights
■ Download non ECRA Paper & Newsletters
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Upcoming Events
■ National Convention for Energy Professional 2005: Achieving Sustainable Development Through Fossil Fuel Conservation
Venue: Sheraton Bayview 1, Crown Plaza Putera Hotel
Date: 15th September 2005
...get brochure

■ BIPV - Building Integrated Photovoltaic (BIPV), Architecture, Engineering & Standards
Venue: Hilton Kuala Lumpur
Date: 12th September 2005 (10.30 am onwards)
To participate please download this brochure...
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■ BIPV - Building Integrated Photovoltaic (BIPV): Policy & Financial Frameworks Promoting Sustainable Photovoltaic (PV) Markets
Venue: Hilton Kuala Lumpur

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