

**Training Workshop on GHG emission inventories
Bangkok, 1-3 May 2007**

ACTIVITIES ON GHG EMISSION INVENTORY IN VIETNAM

**Mr. Nguyen Mong Cuong
Research Center for Climate Change
and Sustainable Development**

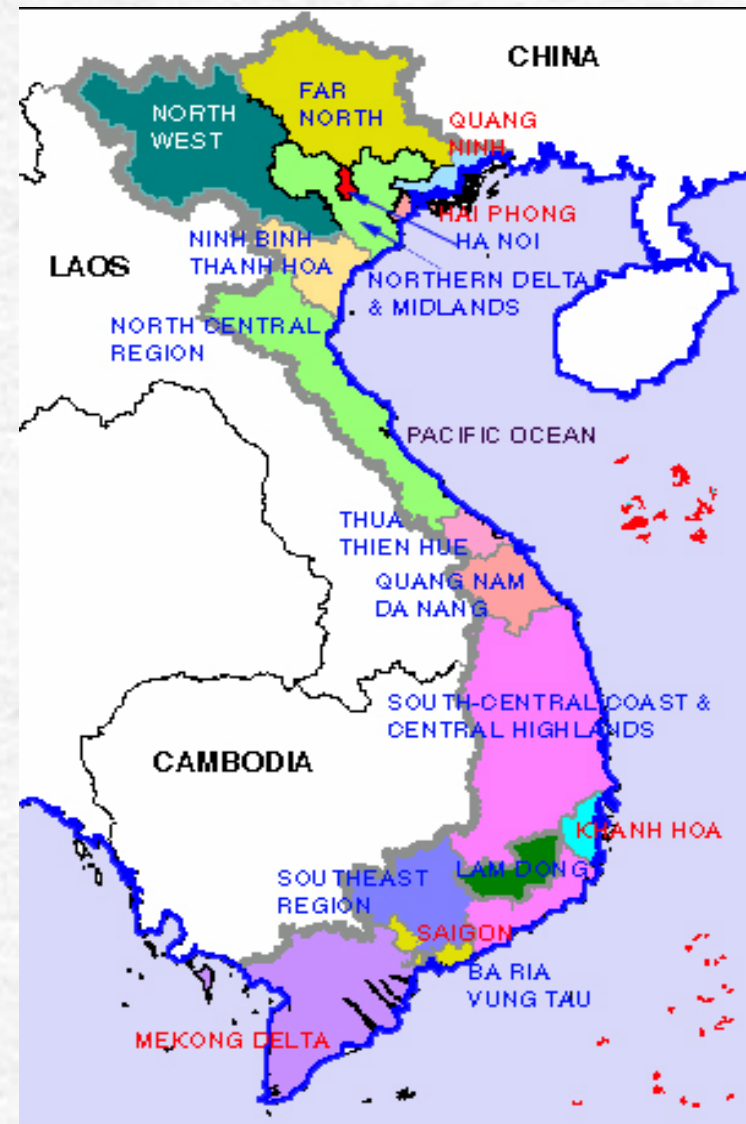
Contents

1. Introduction
 2. Activities on GHG emission inventory
 3. Major gaps on GHG inventory
 4. Proposed activities in the National GHG Inventory in Viet Nam
- Conclusion



1. Introduction

- Viet Nam ($8^{\circ}27'-23^{\circ}23' N$ and $102^{\circ}08'-109^{\circ}30' E$) with the land area of 330,990 km² located in Southeast Asia, It's stretching 1,650 km from north to south consists of 3,260 km of coastline and about 3,000 small islands.
- Three quarters of the land is mountainous and hills with the elevation mostly from 100 to 1000m.
- The population of Viet Nam was 77,6 million (2000) with average annual growth rate of 1.36%
- It is predominantly an agricultural country with 74% of its population are involved in agriculture.



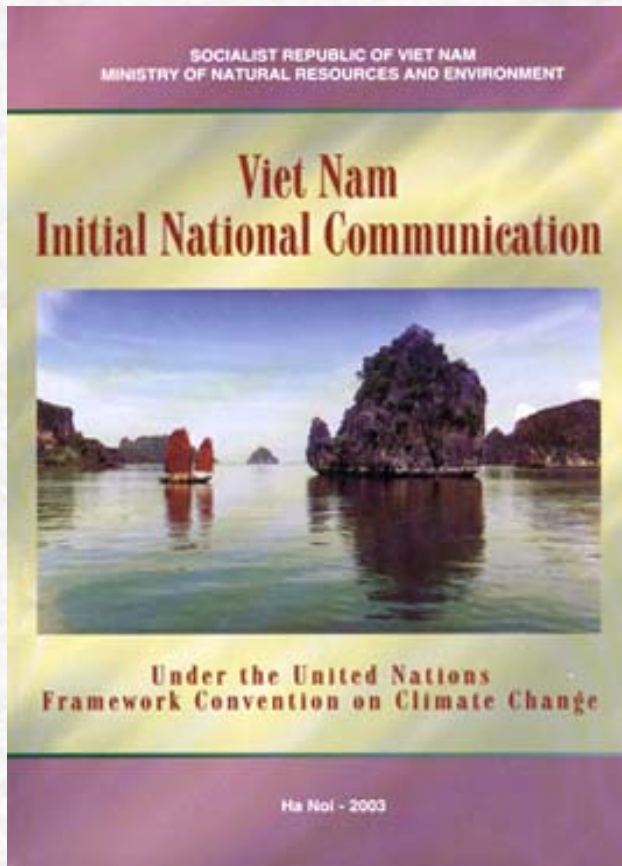
1. Introduction (Cont.)

- The forest areas are 9.3 million ha, forest coverage increases from 27% in 1991 to 33.2% in 2000.
- The agricultural lands are 7.4 million ha
- The average annual GDP growth rate was 7.5% during 1990-2004. GDP per capita (2004) 560 USD
- Sectoral contribution to GDP (2000):
 - Industry: 36.7%
 - Services: 38.7%
 - Agriculture, Forestry, Fishing: 24.5%
- Viet Nam ratified UNFCCC on 16 November 1994 and Kyoto Protocol on 25 September 2002.

Institutional arrangements for preparing National Communications included GHG emission inventory



2. Activities on GHG emission inventory



- **Completed National GHG Inventories for 1990, 1993, 1994 and 1998.**
- **National GHG Inventories focused on CO₂, CH₄ and N₂O in:**
 - **Energy**
 - **Industrial Processes**
 - **Agriculture**
 - **Land Use and Land Use Change and Forestry (LULUCF)**
 - **Waste**

2. Activities on GHG emission inventory (Cont.)

- The Methodology of GHG emission inventory followed the guidance of the IPCC revised version 1996
- Data: The data mainly is collected from General Statistics Office, some of data come from Ministry offices, some data and information come from researches and studies of related science and technology institutes.

2. Activities on GHG emission inventory (Cont.)

2.1. 1994 National GHG Inventory

a. Energy sector

➤ **GHG emissions from fuel combustion:**

- ✓ In 1994, Viet Nam produced 6.2 million tons of coal, 7.1 million tons of oil. All crude oil is exported. Coal is partly exported, partly goes to meet domestic needs. Firewood remains an important fuel source in the Viet Nam energy structure. It occupies 56% total domestic fuel consumption.
- ✓ GHG emissions by fuel combustion in 1994 were estimated at 21.580 million tons of CO_2 ; 120.509 thousand tons of CH_4 and 1.756 thousand tons of N_2O .
- ✓ CO_2 is mainly emitted by coal and oil combustion, meanwhile CH_4 and N_2O from biomass burning.

The total GHG emissions by fuel combustion are 24.655 million tons of CO_2 equivalent

2. Activities on GHG emission inventory (Cont.)

➤ GHG fugitive emission:

GHG fugitive emission is mainly generated by coal, oil and gas exploitation and transportation.

- ✓ CH₄ fugitive emission from coal exploitation in 1994 was 39.749 thousand tons.
- ✓ CH₄ fugitive emission from oil and gas exploitation in 1994 was 7.015 thousand tons.

The total CH₄ fugitive emission from coal, oil and gas exploitation in 1994 was 46.764 thousand tons.

➤ GHG emission from energy sector activities :

The total emission from energy sector activities (electricity generation, industry and construction, transport, services/commerce, household, agriculture, forestry and fishery...) was 25.637 million tons of CO₂ equivalent

2. Activities on GHG emission inventory (Cont.)

b. Industrial processes:

- Industrial processes and industrial products were manufactured or used in Viet Nam in 1994 relating to the emissions of CO₂, CH₄, NO_x, NMVOC, CO and SO₂
- The total CO₂ emission from industrial processes was 3.807 million tons, mainly from construction material manufacturing: cement production occupied 2.677 million tons; lime baking 651 thousand tons and steel rolling 475 thousand tons.

2. Activities on GHG emission inventory (Cont.)

c. Land use and land use change and forestry (LULUCF):

- Estimation of CO₂ emission and sequestration in this sector was focused on the following activities:
 - ✓ Change in forest area and woody biomass stocks in natural and planning forests.
 - ✓ Forestry and grassland conversion, forest exploitation.
 - ✓ Forest natural renovation in abandoned farmland.
- Estimation of GHG emissions / up takes:
 - ✓ CO₂ sequestration by forest biomass growth: in 1994, Viet Nam had 8.252 million ha of natural forest, 1.049 million ha of planning forest and 9.778 million ha classified as forestland without forest. The total planning trees in 1994 are 350 million. CO₂ being sequestered by forest is 39.272 million tons.

2. Activities on GHG emission inventory (Cont.)

- **CO₂ emission from forest and grassland conversion: in 1994, there were 338, 000 ha of land use change, in which 40,600 ha under evergreen forest.**

GHGs emissions from these activities were estimated as below:

- **CO₂ : 56.72 million tons**
- **CH₄ : 0.18 million tons**
- **N₂O : 0.00124 million tons**
- **CO : 1. 57 million tons**
- **NO_x : 0.0447 million tons**

2. Activities on GHG emission inventory (Cont.)

CO₂ sequestration by natural regeneration in abandoned farmland.

The natural regeneration of forest in abandoned farmland or degraded forest for the period of about 20 years is 820,000 ha. Estimated CO₂ absorbed amount is 11.05 million tons.

- **CO₂ emission in the Inventory year by soil from previous land use change and management.
Estimated CO₂ emission amount is 8.824 million tons.**

The total GHGs emitted into the atmosphere by LULUCF sector in 1994 are 19.38 million tons of CO₂ equivalent.

2. Activities on GHG emission inventory (Cont.)

d. Agriculture:

➤ Livestock:

CH₄ emission from livestock sector is 465.565 thousand tons, 336.585 thousand tons of which is from enteric fermentation and 128.980 thousand tons from manure management.

➤ Rice cultivation:

The total rice cultivated area in 1994 is 6.599 million ha, more than 60% of which under constantly flooded irrigation, the rest is not constantly irrigated and mostly relies on rainfall.

The total CH₄ emission from wetland rice field is 1559.7 thousand tons among which , 873.8 thousand tons in the North and 685.9 thousand tons in the South of Viet Nam

2. Activities on GHG emission inventory (Cont.)

➤ Prescribed burning of savanna:

- ✓ The main emission source in this sub-sector is savanna prescribed burning due to slash and burn farming practices of the mountainous ethnic minorities.
- ✓ The total emissions in this sub-sector are 15.91 thousand tons of CH₄, 417.5 thousand tons CO, 0.20 thousand tons N₂O and 7.11 thousand tons NO_x

➤ Field burning of agricultural residues.

The emissions in this sub-sector are as follows:
51.72 thousand tons CH₄, 1086.07 thousand tons CO, 1.19 thousand tons N₂O and 43.17 thousand tons NO_x

2. Activities on GHG emission inventory (Cont.)

➤ **Agricultural soil:**

The total emission in this sub-sector is 26.02 thousand tons N₂O, including:

- ✓ **N₂O emitted directly from soil: 16.63 thousand tons**
 - ✓ **N₂O emitted directly from animals: 0.004 thousand tons**
 - ✓ **Indirectly N₂O emission: 9.39 thousand tons**
- **The total GHG emissions from agricultural sector are 52.45 million tons of CO₂ equivalent**

2. Activities on GHG emission inventory (Cont.)

e. Waste

➤ Municipal solid waste.

Estimated CH₄ emission from waste is 66.298 thousand tons, mainly from big cities.

➤ CH₄ emission from domestic and commercial waste water is 1.027 thousand tons

➤ CH₄ emission from industrial waste water processing is 0.79 thousand tons

➤ N₂O emission from human is 3.66 thousand tons.

The total GHGs emissions in waste sector are 68.115 thousand tons CH₄, 3.66 thousand tons N₂O equal to 2.565 million tons of CO₂ equivalent

2. Activities on GHG emission inventory (Cont.)

- ❖ The total GHG emissions in 1994 in Viet Nam were 103.839 million tons of CO₂ equivalent, It is 1.4 tons CO₂ equivalent per capita.
- ❖ GHG emissions from energy sector was 25.637 million tons of CO₂ equivalent, accounted for 24.7% of total national emissions; forestry and land use change: 19.380 million tons of CO₂ equivalent, accounted for 18.7 %; agricultural sector : 52.450 million tons of CO₂ equivalent, accounted for 50.5 %; industrial processes and waste sector : 3.807 and 2.565 million tons of CO₂ equivalent , accounted for 3.7 % and 2.4 % respectively (figure 1,2,3,4)

Figure 1: CO₂ Emissions and Sink from Various Sub-sector in 1994

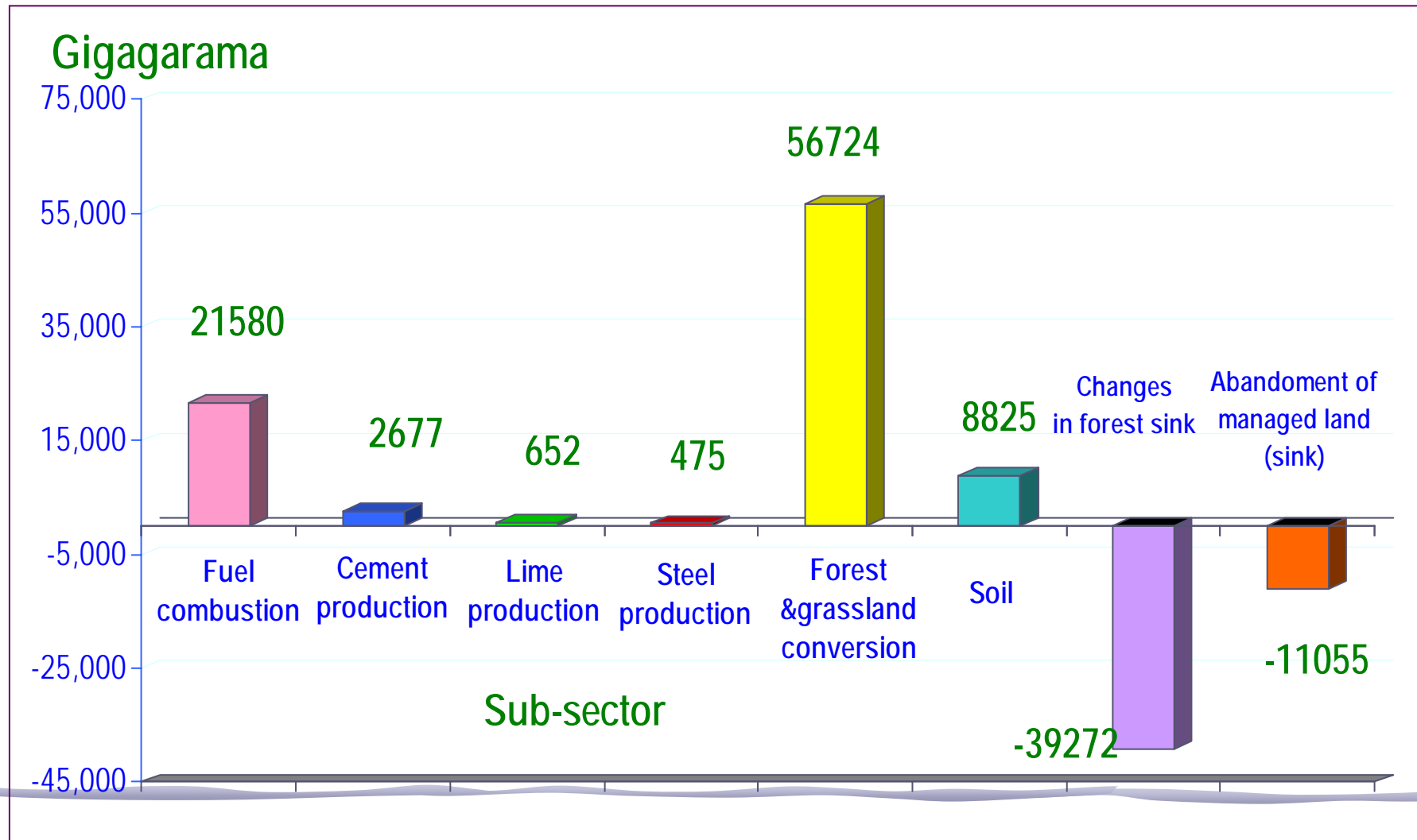
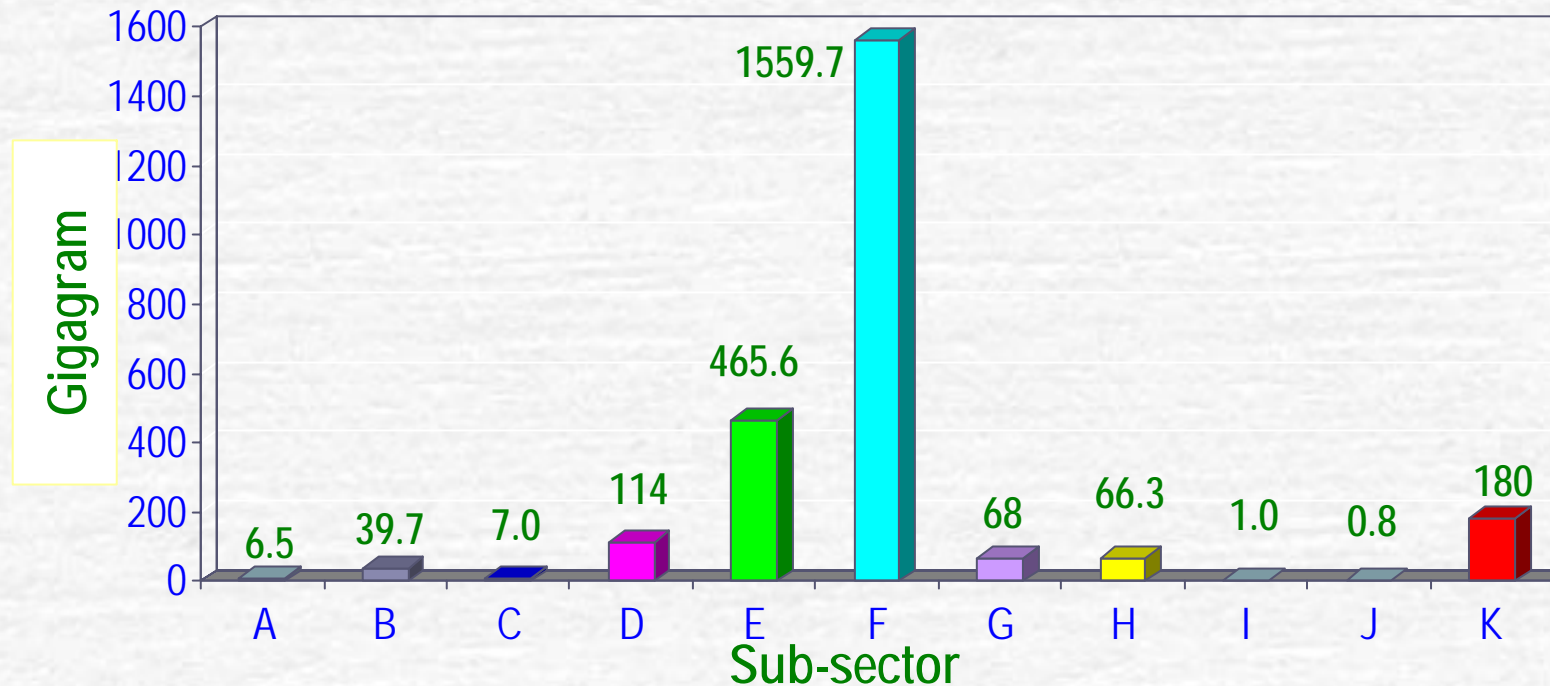


Figure 2: CH₄ Emissions from Various Sub-sector in 1994



- | | | | |
|---|--|---|---|
| A | Fuel combustion | F | Flooded rice fields |
| B | Fugitive emissions from coal mining | G | Burning of agricultural residues & savannas |
| C | Fugitive emissions from oil & gas systems | H | Landfills |
| D | Burning of traditional biomass fuels | I | Domestic & commercial wastewater treatment |
| E | Livestock enteric fermentation and manure management | K | On-site burning of forest |
| J | Industrial wastewater treatment | | |

Figure 3: N₂O Emissions from Various Sub-sector in 1994

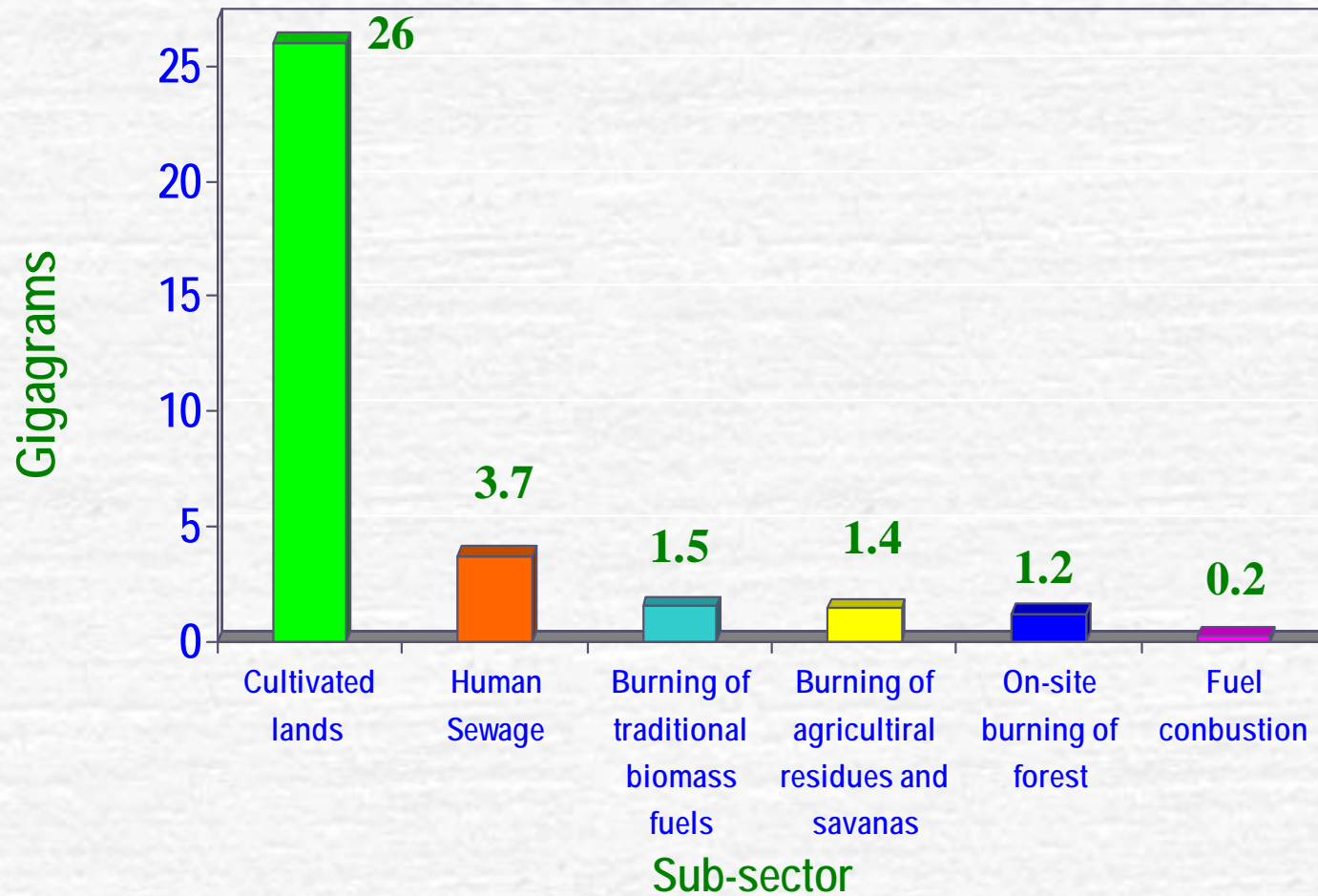
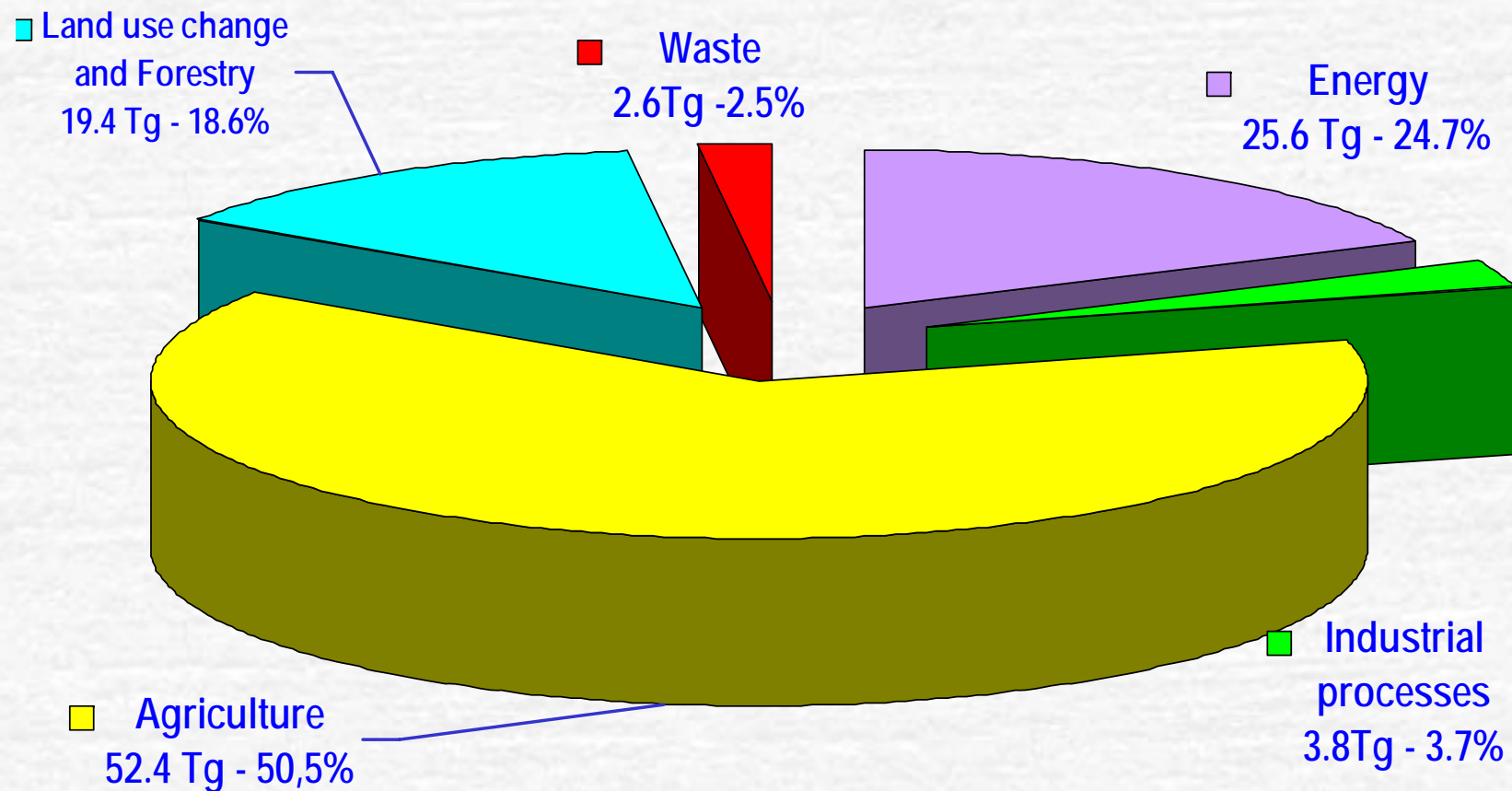


Figure 4: GHG Inventory Results in 1994



National GHG Inventory in 1994

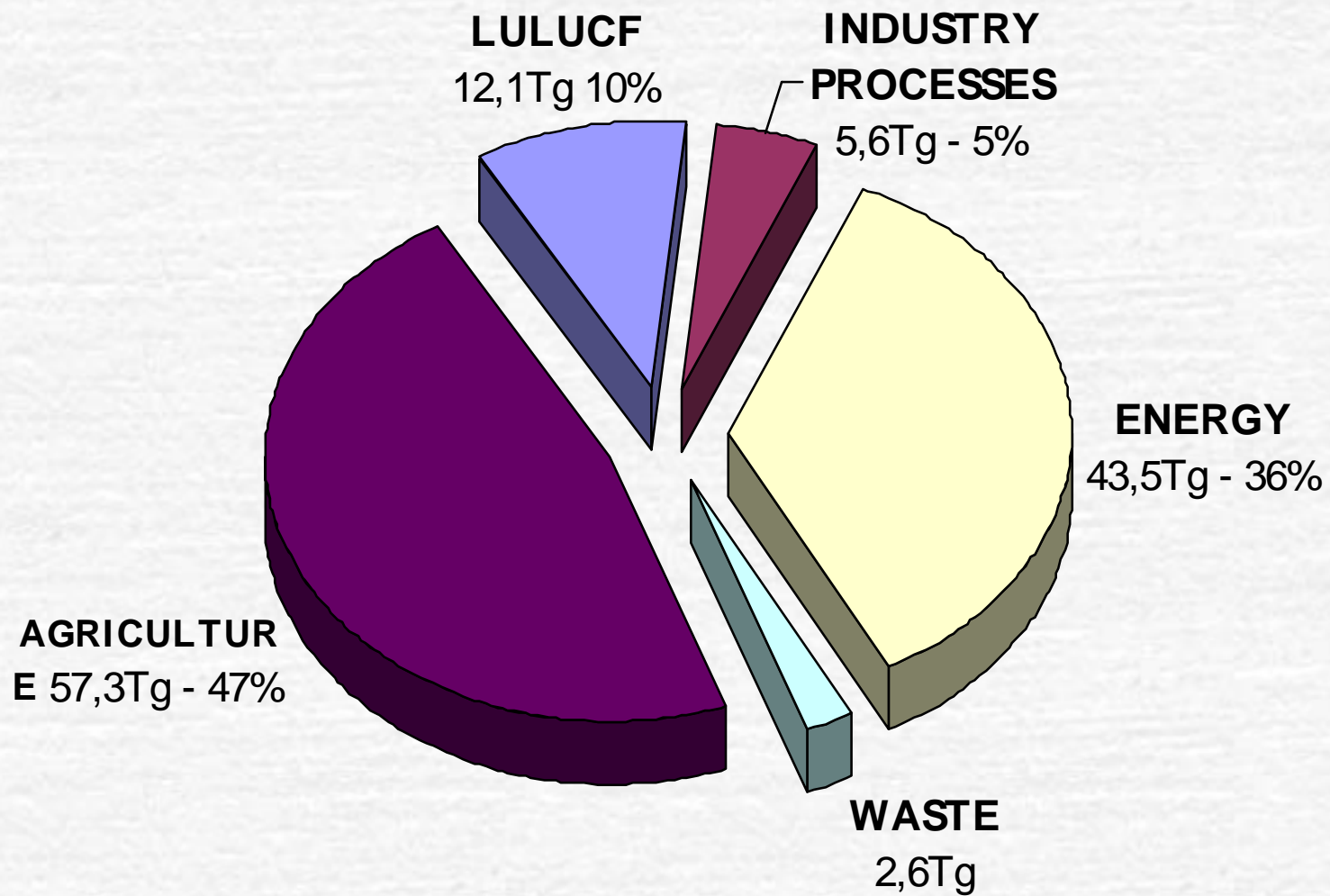
Sector	<i>CO₂ Equivalent (Tg)</i>	%
Energy	25.6	24.7
Industrial Processes	3.8	3.7
Agriculture	52.4	50.5
Land Use Change and Forestry	19.4	18.6
Waste	2.6	2.5
Total	103.8	100

2.2. 1998 National GHG emission inventory

Funding by MONRE through climate change annual operation financial sources.

- The IPCC 1996 revised guidelines for GHG inventories was used
- Based on 1998 GHG data, the largest emission source was agriculture with 57.3 Tg CO₂ equiv., representing 47% of the total emission, this was followed by the energy sector with 43.5 Tg CO₂ equiv. Or 36% of the total emission; LULUCF, with 12,1 Tg CO₂ equiv. Or 10% of the total; Industrial process, with 5.6Tg CO₂ equiv.
- Total emission in 1998 (121 Tg CO₂ equivalent) was 17 % higher than that in 1994 in which the emission from the energy sector had increased by 1.7 times.

Figure 5: GHG Inventory Results in 1998



National GHG Inventory in 1998

Sector	<i>CO₂ Equivalent (Tg)</i>	%
Energy	43.5	36
Industrial Processes	5.6	5
Agriculture	57.3	47
Land Use Change and Forestry	12.1	10
Waste	2.6	2
Total	121.1	100

2.3 GHG emission projection to 2020

For GHG emission projection to 2020, the major emission sectors: energy, agriculture and LULUCF were estimated.

- GHG emissions in the period of 2000-2020 will be increased mainly causing by the fossil fuel consumption to meet energy demand in the country. Thus, in the future, energy sector will be a main GHG emission source in Viet Nam
- Emissions from the energy sector are projected to 105 million tons of CO₂ equivalent (2010) and 197 million tons of CO₂ equivalent (2020)
- GHG emissions in agriculture sector will be 58.2 million tons CO₂ equivalent in 2010 and 64.7 million tons in 2020

2.3 GHG emission projection to 2020 (Cont.)

- In Land use and land use change and forestry sector, the amount of CO₂ is projected to decline from 19.4 million tons in 1994 to 4.2 million tons in 2000 and the net sequestration of 21.7 million tons in 2010 and 28.4 million tons in 2020
- In conclusion, total GHGs emissions from the three main sectors in Viet Nam were projected at more than 140 million tons and 233 million tons of CO₂ equivalent in 2010 and 2020 respectively (figure 6).

Figure 6: GHG Emission Projection in Vietnam

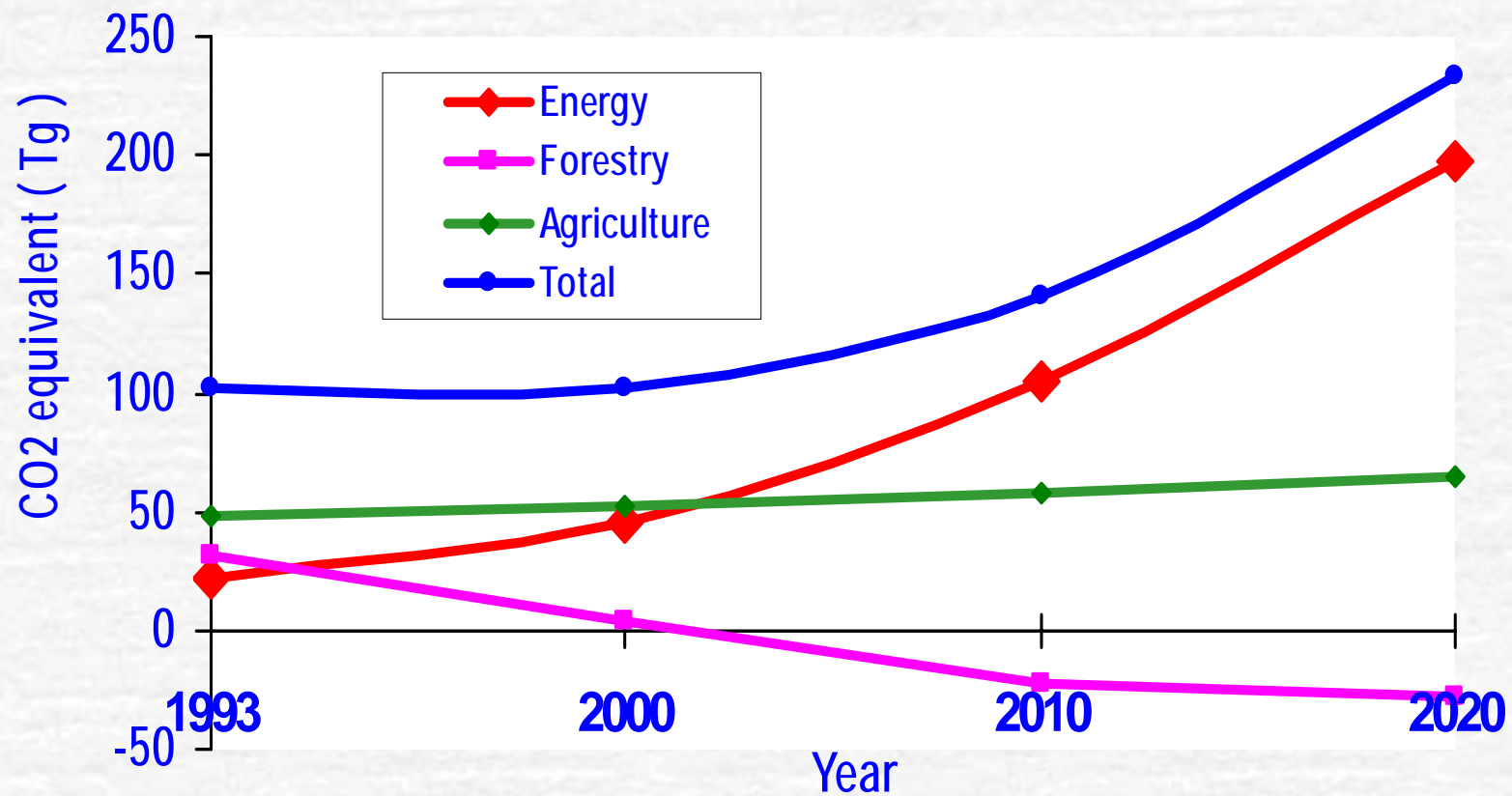
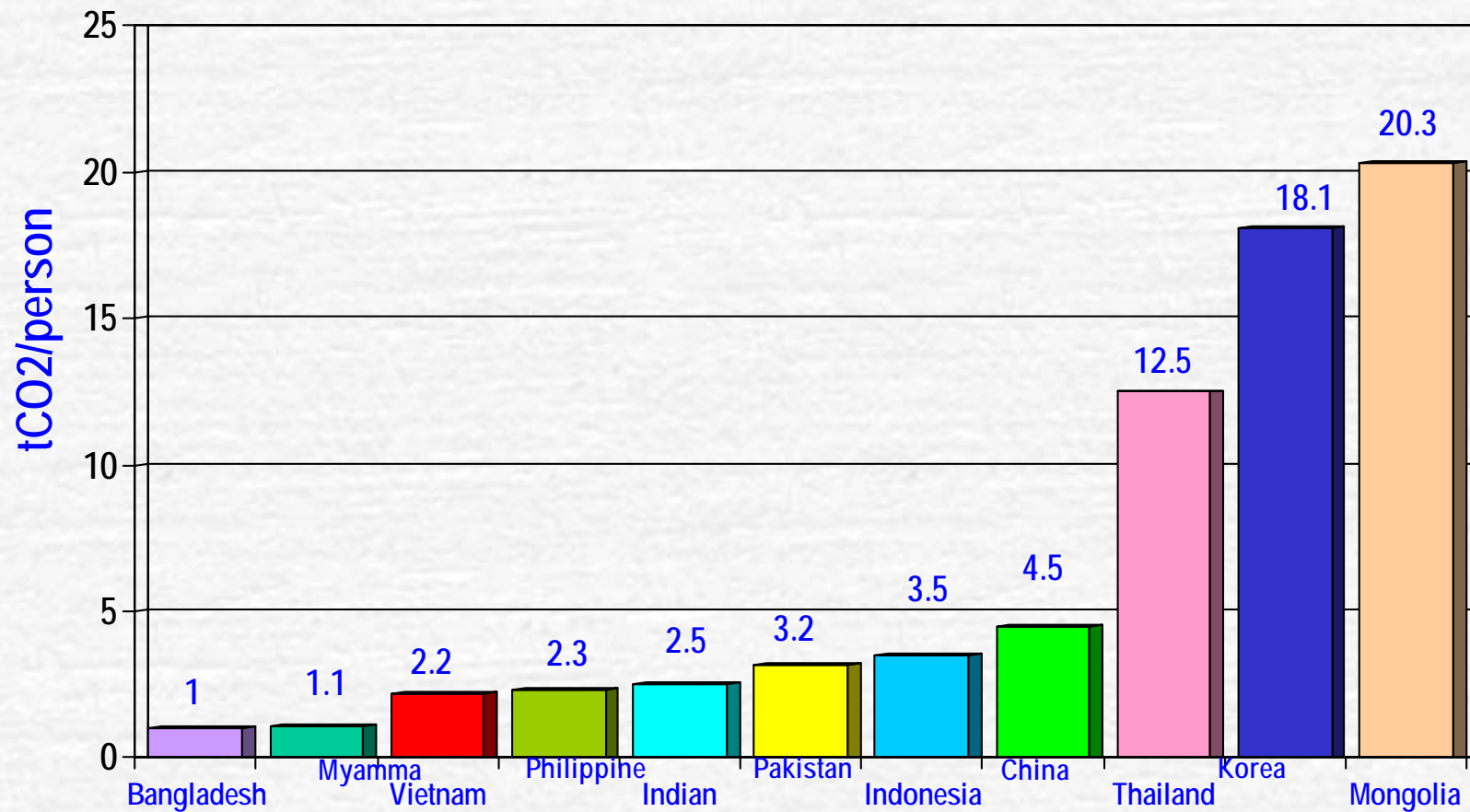


Figure 7: GHGs Emissions Rate in selected Asian Countries (2020)



Source: ALGAS Project, 1999

3. Major gaps on GHG inventory

- **CO₂, CH₄ and N₂O, NO_x, CO, NMVOC and SO₂ data in the 5 source categories need to be updated and extended based on the COP8 Guidelines and to be stored in the existing GHG database;**
- **Inventory was not extensive and comprehensive due to the lack of data or poor data quality in certain source categories (e.g., not all industries and industrial processes were considered; data quality in agriculture and forestry sectors are not as good as those in fuel combustion sector);**

3. Major gaps on GHG inventory (Cont.)

- **The role of savannas and abandonment lands in CO₂ uptake needs to be studied;**
- **Activity data for solvent and other product use sector have not been collected and hence emission from this sector was not estimated;**
- **Lack of country-specific emission factors (e.g., coal, gas, and mining, soils, etc);**
- **Uncertainties for sources and sinks were not estimated;**
- **Capacity-building in IPCC methodologies for GHG inventory is still very much needed.**

4. Proposed activities in the National GHG Inventory in Viet Nam

- With the financial and technical support from UNEP/GEF, Viet Nam have been implementing project for the preparation of SNC to UNFCCC
- A national inventory for CO₂, CH₄, N₂O, CO, NO_x, NMVOC and SO₂ will be undertaken for the year 2000 in 5 source categories: energy, industrial processes, agriculture, land-use and land use change and forestry and waste

4. Proposed activities in the National GHG Inventory in Viet Nam (Cont.)

- **Appropriate national or regional emission/sink factors will be used to estimate GHG emissions/sinks where available;**
- **The database for CO₂, CH₄, N₂O, NO_x, CO, NMVOC and SO₂ will be updated and improved. New inventory data for HFCs, PFCs, SF₆ (where available) for the year 2000 will be established and used as a basis for assessment and selection of mitigation options;**
- **The COP8 Guidelines will be used for reporting the National GHG Inventory;**

4. Proposed activities in the National GHG Inventory in Viet Nam (Cont.)

- **New emission factors for specific activities will be applied;**
- **All concerned data will be collected, analysed and managed;**
- **The GHG inventory team based on the INC project will be reconstituted;**
- **A long-term programme on the improvement of future GHG inventories will be developed.**

Conclusions

- **A National GHG Inventory in Viet Nam for the year 2000 is an important component of Viet Nam SNC to UNFCCC, as it forms the basis for mitigation measures**
- **A reliable and accurate GHG inventory would also be very useful for the formulation of any projects**
- **Viet Nam hope to receive the technical and financial assistance from other International organizations and countries in carrying out a National GHG Inventories for the future and for the year 2000.**

Thank you for your attention !

