Vietnam
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Results of 1994 National GHG Inventory in Viet Nam and GHG emission projection

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A. Background

- Viet Nam is located in South East Asia
- The land area occupies 330,900 km^2
- The sea water territory under sovereignty and jurisdiction is more than 1 million km^2
- The coastline of 3,260 km covers the East and the South
- Viet Nam has a system of coast 3000 big and small islands with total area of more than 1600 km^2

A. Background (Cont.)

- The forest areas are 9.3 million ha
- The agricultural lands are 7.37 million ha
- The population of Viet Nam in 1994 was 70.8 million with average annual growth rate of 1.6%
- Viet Nam is an agricultural country with 70-80% of the population living in rural areas
- GDP (1994): 1.53 billion USD
- GDP per capita (1994): 215 USD
- The average annual GDP growth rate was 8.2% during 1991-1995

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A. Background (Cont.)

- Sectoral Contribution to GDP:
  - ✓ Industry: 29.6%
  - ✓ Services: 41.7%
  - ✓ Agriculture, Forestry, Fishing: 28.7%

B. 1994 National GHG Inventory

- 1994 National GHG Inventory was implemented by the Hydro-Meteorological Service (HMS), nowadays Ministry of Natural Resources and Environment of Viet Nam (MONRE)
- 1994 National GHG Inventory covers three major GHGs:
  - Carbon dioxide (CO_2)
  - Methane (CH_4)
  - Nitrous oxide (N_2O)
- 1994 National GHG Inventory includes GHG emission projection from main sources

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B. 1994 National GHG Inventory (Cont.)

- 1994 National GHG Inventory was carried out for five main sources of emission:
  - Energy
  - Industrial Processes
  - Forestry and land use change
  - Agriculture
  - Waste

The Methodology of Inventory follows the guidance of the IPCC revised version 1996

The data source was collected and processed from the General Statistical Office and other related Agencies of Viet Nam.

B. 1994 National GHG Inventory (Cont.)

1. Energy :

   GHGs emissions from energy sector including transportation are emissions from burning of fossil fuel (coal, oil, gases) for energy activities while fugitive emissions are from mining. GHGs emissions depend on characteristics and amount of fuel.

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B. 1994 National GHG Inventory (Cont.)

- 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 $C0_2$; 120.509 thousand tons of CH_4 and 1.756 thousand tons of N_20.

  - $C0_2$ is mainly emitted by coal and oil combustion, meanwhile CH_4 and N_20 from biomass burning.

  The total GHG emissions by fuel combustion are 24.655 million tons of $C0_2$ equivalent

B. 1994 National GHG Inventory (Cont.)

- GHG fugitive emission:

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

-CH_4 fugitive emission from coal exploitation in 1994 was 39.749 thousand tons.

-CH_4 fugitive emission from oil and gas exploitation in 1994 was 7.015 thousand tons.

The total CH_4 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 CO_2 equivalent

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B. 1994 National GHG Inventory (Cont.)

2. Industrial processes:

GHGs emissions from various types of industrial processes are non-energy use related emissions. These emissions are related to physical and chemical transforms of materials, in which GHGs such as CO_2, CH_4, N_20 and other gases are released. The methodology for estimation of emission from various industrial processes is based on the amount of gases emitted from a product unit (emission coefficient) and amount of used material

- Industrial processes and industrial products were manufactured or used in Viet Nam in 1994 relating to the emissions of CO_2, CH_4, NO_x, NMVOC, CO and SO_2
- The total CO_2 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.
- SO_2 emission was about 1.6 million tons, mainly from cement production.

B. 1994 National GHG Inventory (Cont.)

3. Forestry and land use change:

+Estimation of CO_2 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:

- CO_2 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. CO_2 being sequestered by forest is 39.272 million tons.

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B. 1994 National GHG Inventory (Cont.)

+ CO_2 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:

- CO_2 : 56.72 million tons
- CH_4 : 0.18 million tons
- N_2O : 0.00124 million tons
- CO : 1. 57 million tons
- NO_x : 0.0447 million tons

B. 1994 National GHG Inventory (Cont.)

CO_2 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 CO_2 absorbed amount is 11.05 million tons.

+ CO_2 emission in the Inventory year by soil from previous land use change and management.

Estimated CO_2 emission amount is 8.824 million tons.

The total GHGs emitted into the atmosphere by forest and land use change in 1994 are 19.38 million tons of CO_2 equivalent.

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B. 1994 National GHG Inventory (Cont.)

4. Agriculture:

+ Livestock :

CH_4 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 CH_4 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

B. 1994 National GHG 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 CH_4 , 417.5 thousand tons CO, 0.20 thousand tons N_20 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 CH_4 , 1086.07 thousand tons CO, 1.19 thousand tons N_2O and 43.17 thousand tons NO_x

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B. 1994 National GHG Inventory (Cont.)

+ Agricultural soil:

The total emission in this sub-sector is 26.02 thousand tons N_2O, including:

- N_2O emitted directly from soil: 16.63 thousand tons
- N_2O emitted directly from animals : 0.004 thousand tons
- Indirectly N_2O emission :9.39 thousand tons

The total GHG emissions from agricultural sector are 52.45 million tons of CO_2 equivalent

B. 1994 National GHG Inventory (Cont.)

5. Waste sector:

+ Municipal solid waste.

Estimated CH_4 emission from waste is 66.298 thousand tons, mainly from big cities.

+ CH_4 emission from domestic and commercial waste water is 1.027 thousand tons

+CH_4 emission from industrial waste water processing is 0.79 thousand tons

+ N_2O emission from human is 3.66 thousand tons.

The total GHGs emissions in waste sector are 68.115 thousand tons CH_4, 3.66 thousand tons N_2O equal to 2565.015 thousand tons of CO_2 equivalent

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B. 1994 National GHG Inventory (Cont.)

In conclusion:

- The total GHG emissions in 1994 in Viet Nam were 103.839 million tons of CO_2 equivalent and 1.4 tons CO_2 equivalent per capita.
- GHG emissions from energy sector was 25.637 million tons of CO_2 equivalent, accounted for 24.7% of total national emissions; forestry and land use change: 19.380 million tons of CO_2 equivalent, accounted for 18.7 %; agricultural sector : 52.450 million tons of CO_2 equivalent, accounted for 50.5 %; industrial processes and waste sector : 3.807 and 2.565 million tons of CO_2 equivalent , accounted for 3.7 % and 2.4 % respectively (table 1 and figure 1)

Table 1 : Results of 1994 National GHG Inventory in Viet Nam

Emission sector	*CO_2 equivalent (million ton)*	%
Energy	25.637	24.7
Industrial Processes	3.807	3.7
Agriculture	52.450	50.5
Forestry and Land Use Change	19.380	18.7
Waste	2.565	2.4
Total emissions	103.839	100

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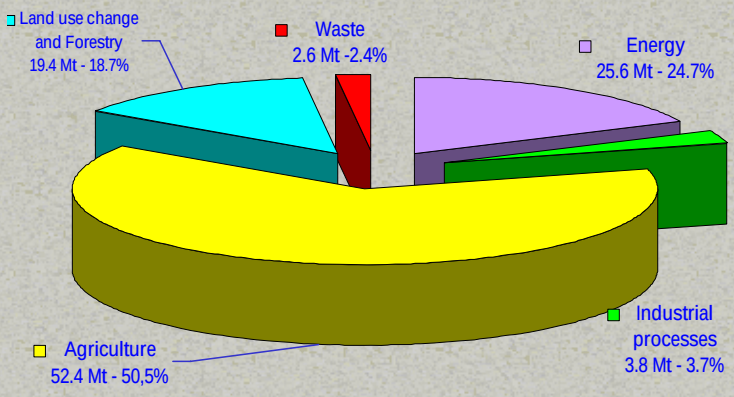
Figure 1: Results of 1994 National GHG Inventory in Viet Nam



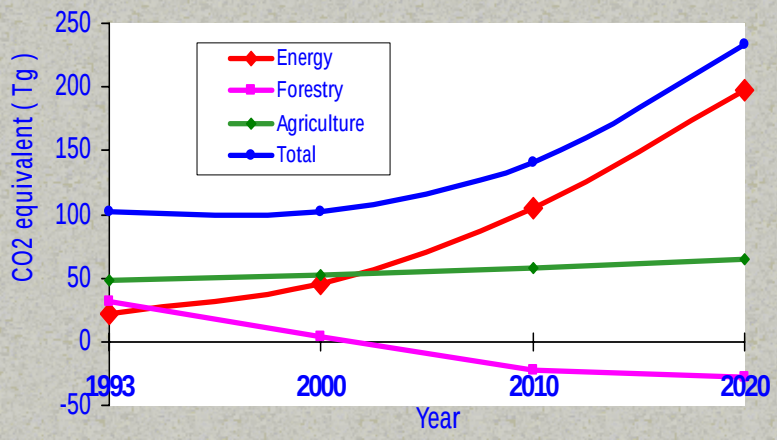
C. GHG emission projection in Viet Nam

- In the future, the major emission sectors will be energy, agriculture, forestry and land use change
- 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 in 2010 to 105 million tons of CO_2 equivalent and in 2020 to 197 million tons of CO_2 equivalent, it is about 8 time higher than 1994 emission level
- In agriculture sector, GHG emissions in CO_2 equivalent will reach from 52.4 million tons in 1994 to 57.2 million tons in 2010 and 64.7 million tons in 2020

C. GHG emission projection in Viet Nam (Cont.)

- In forestry and land use change sector, the amount of CO_2 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
- Generally, GHGs emissions from the three main sectors in Viet Nam were projected at more than 140 million tons and 233 million tons of CO_2 equivalent in 2010 and 2020 respectively (figure 2).

Figure 2: GHG Emission Projection in Vietnam



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D. Priorities of future research areas

- ✓ Developing and evaluating potential and feasible GHG mitigation options
- ✓ Researching on assessment of climate change impacts and developing measures to cope with and adapt to climate change based on scenario in the region.
- ✓ Developing a realistic portfolio of potential AIJ/CDM projects in Viet Nam
- ✓ Developing a strategy and action plan and appropriate institutional capacity to exploit opportunities presented by AIJ/CDM to achieve sustainable socio-economic development of the country and to contribute to global GHG emission reduction.

Thank you very much for your attention