Training Workshop on Greenhouse Gases and Aerosol Emissions under Different Vegetation Land Use in the Mekong River Basin Sub-Region"

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Greenhouse Gases Inventory and Future Development in Cambodia

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History of GHGs Inventory in Cambodia (1)

- The Cambodian Ministry of Environment (MoE) is the National Focal Point for the UNFCCC and the Kyoto Protocol
- Cambodia ratified the UNFCCC on 18 December 1995. It entered into force on 17 March 1996
- Cambodia acceded to the Kyoto Protocol on 04 July 2002

History of GHGs Inventory in Cambodia (2)

- 1999-2001: started the first climate change project to help prepare the Initial National Communication which was submitted to the 8th Conference of the Parties (CoP) in 2002.
- The document presents the results of the national GHG inventory for year 1994, GHG mitigation options and an assessment of vulnerability and adaptation to climate change.

History of GHGs Inventory in Cambodia (3)

- The phase II project (2002-2003), has conducted for improving activity data and emission factor in the forestry sector in Cambodia with main objectives to develop database on emission factors, to improve activity data and develop local emission factors and to conduct uncertainty analysis for the GHG inventory.
- In 2005, the APN funded project under CAPaBLE program has been conducted in Cambodia with the main objective to improve the estimation of GHG emission and removal from LULUCF. The result of this study will contribute to the preparation of the Cambodia's Second National Communication.

Methodology (1)

- Cambodian National GHG inventory was developed using the base year of 1994 and revised IPCC 1996 and covered 5 sectors:(i) Energy, (ii) Industry, (iii) Agriculture, (iv) Waste, and (v) Land Use Change and Forestry.

- It is mandatory to cover 3 main GHGs: carbon dioxide (CO2),methane (CH4), and nitrous oxide (N2O), but the other gases such as carbon monoxide (CO), sulphur dioxide (SO2), nitrogen oxides (NOx), and nonmethane volatile organic compound (NMVOC) are also considered wherever data are available.

Methodology (2)

- The basic calculating emissions is based on the equation:

  Emission = Activity Data x Emission Factor
- In case if activity data were not available we used several assumptions based on studied and interviewed
- Local emission factors were also not available we used the IPCC default values or emission factors developed by regional countries such as Thailand, Philippines or Indonesia.

Methodology (3)

- Each GHG has different contributions to the total greenhouse effect, which can be expressed as global warming potential (GWP)
- GWP is expressed in tonnes (or units) of CO2 equivalent (CO2-eqv.) emissions per tonne (or unit) of GHG emissions
- CH4 has 21 tonnes of CO2-eqv. andN_2O has 310 tonnes of CO2-eqv. emitted.

Result of 1994 GHG inventory (1)

- In 1994, Cambodia emitted some 59,708 Gg and removed some **64,850 Gg** of CO2-eqv. Thus Cambodia was a net carbon sink country with a net total carbon removal of 5,142 Gg of CO2-eqv.
- Land use change and forestry accounted for most of the emissions and removals of greenhouse gases in 1994.
- LULUCF represented 81.2% of greenhouse gases emissions, followed by agriculture with 15.5% and energy with 2.8%.

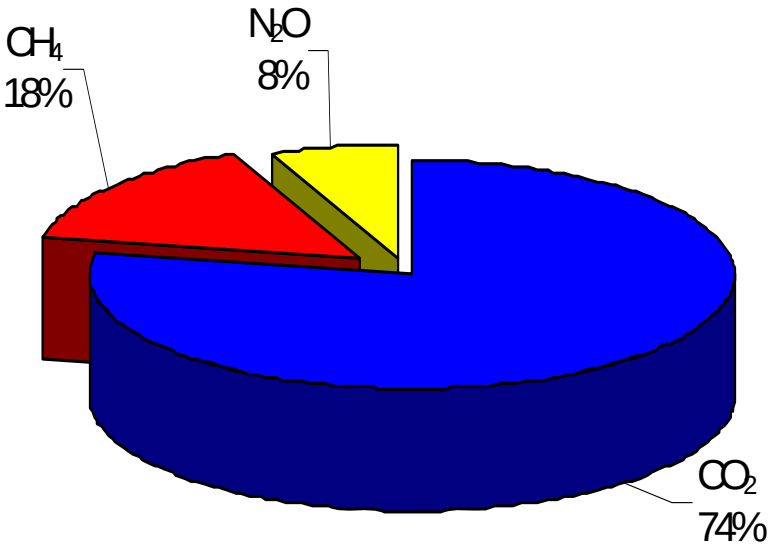
Result of 1994 GHG inventory (2)

1994 GHG Emissions and Removals by Sectors ('000 ton)

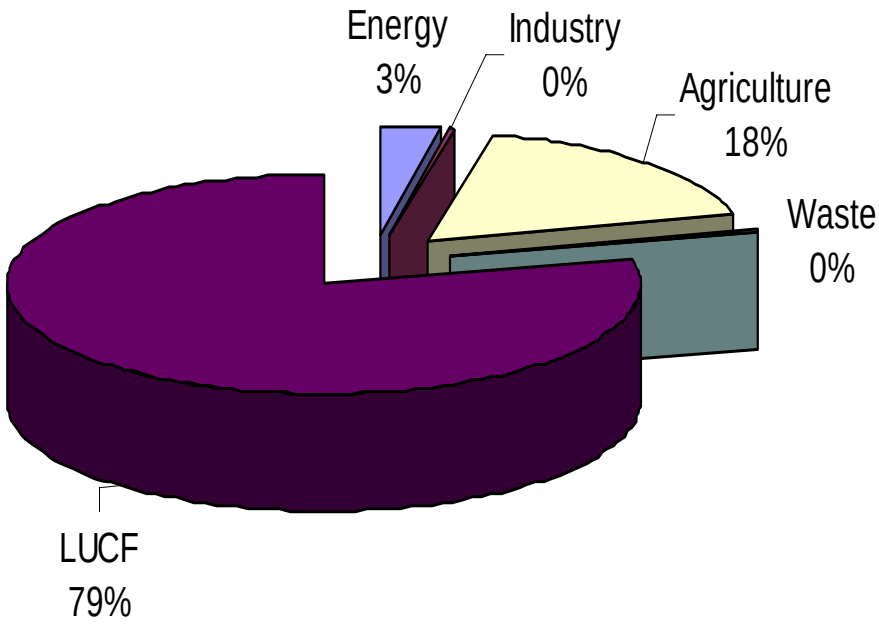
Source/Sink	1994*	
Emissions		
Energy	1,881	(2.8%)
Industrial Processes	50	
Agriculture	10,560	(15.5%)
Waste	273	(0.4%)
Land use change and forestry	55,216	(81.2%)
Total Emissions	**67,980**	**(100%)**
Removal by land use change and forestry	-73,122	
Net Emissions	**-5,142**	

Result of 1994 GHG inventory (3)

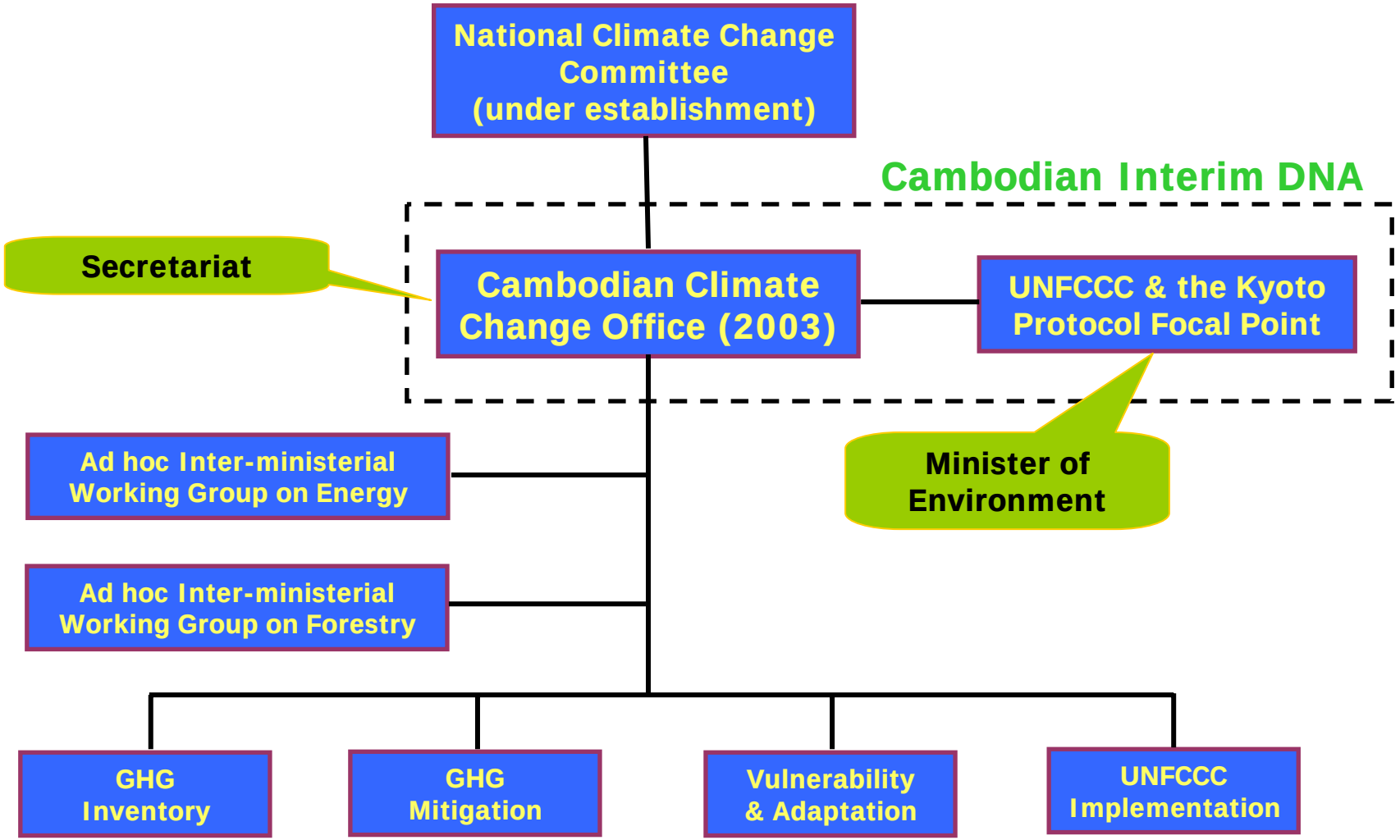
a. 1994 Percentage Share of the Three Main GHGs



b. Total CO_2 Equivalent Emissions by Sectors



Climate Change Institutional Framework in Cambodia



Problems and constraints (1)

- The main problem for Cambodia for establishing its National GHG inventory are data availability and lack of local emission factors.
- Some non-available activity data were derived using assumptions.
- some uncertainties still exist due to the current weak data management in most line ministries.
- Most of emission factors used in the study was IPCC default values and some emission factors developed by neighboring countries such as Thailand, Philippines and Indonesia.

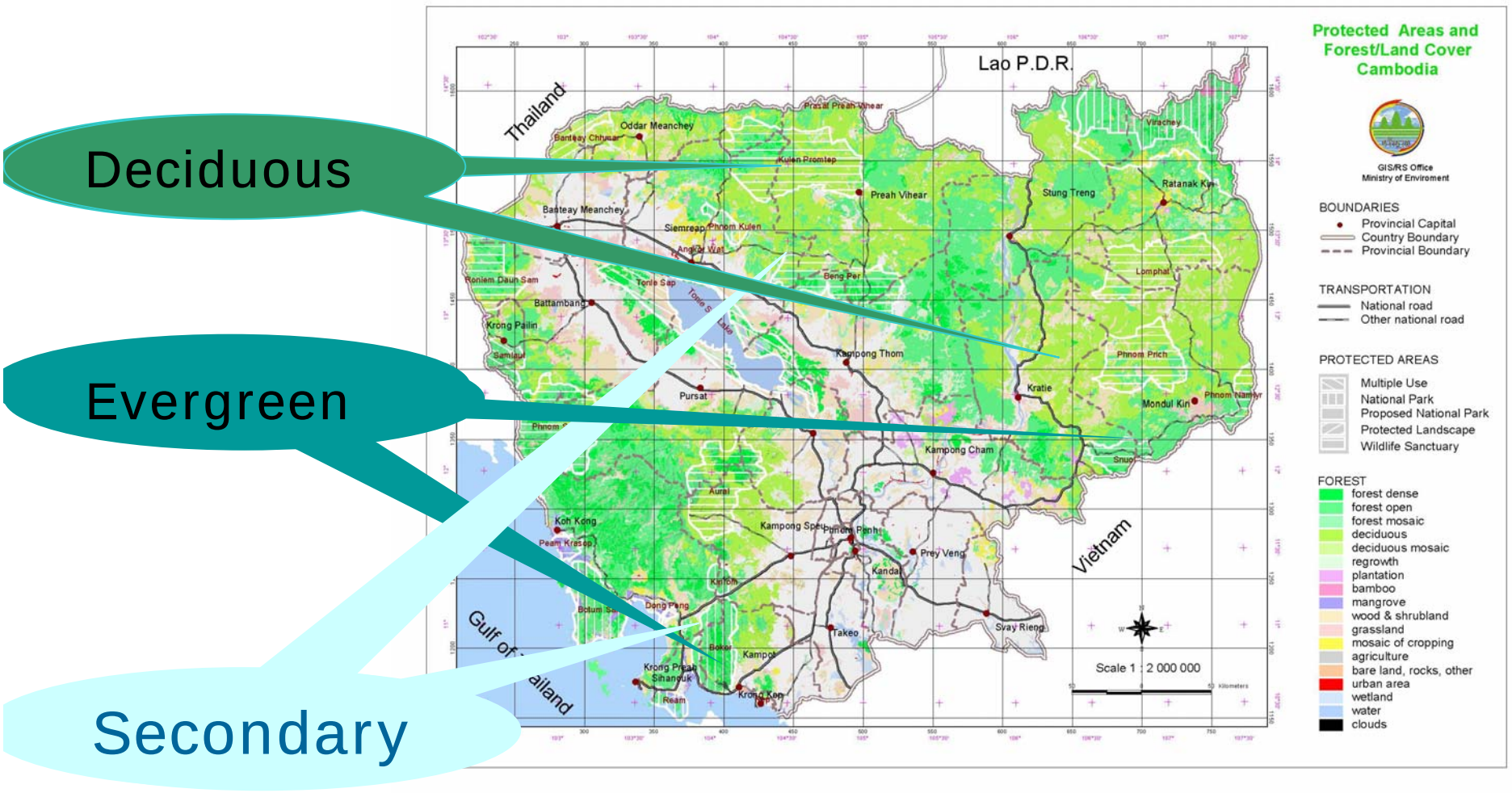
Problems and constraints (2)

- Limited financial resources: funding for climate change activities depends on donors and their priorities
- Lack of climate change research/training institutions in the country;
- Relatively low technical capacity of local staff;
- Limited incentives for qualified government staff;
- Inter-agency cooperation and coordination issue;
- Lack of qualified national experts in the country;
- Non-comprehensive national climate change policies/strategy.

The Estimation of Biomass Growth Rate under the APN-CAPaBLE Project (1)

- The field survey focused on the main forest types which play an important role as the key source/sink categories:
  - Evergreen forest;
  - Deciduous forest; and
  - Secondary forest;
- Two different locations of field measurements were conducted for each forest type;
- The objectives of field surveys are to: (i) identify type, species and number of trees in three selected forest types; (ii) estimate the aboveground biomass of tress in these selected forest types; and (iii) estimate the annual biomass increment of the selected forest types.

Location of Studied



The Estimation of Biomass Growth Rate under the APN-CAPaBLE Project (3)

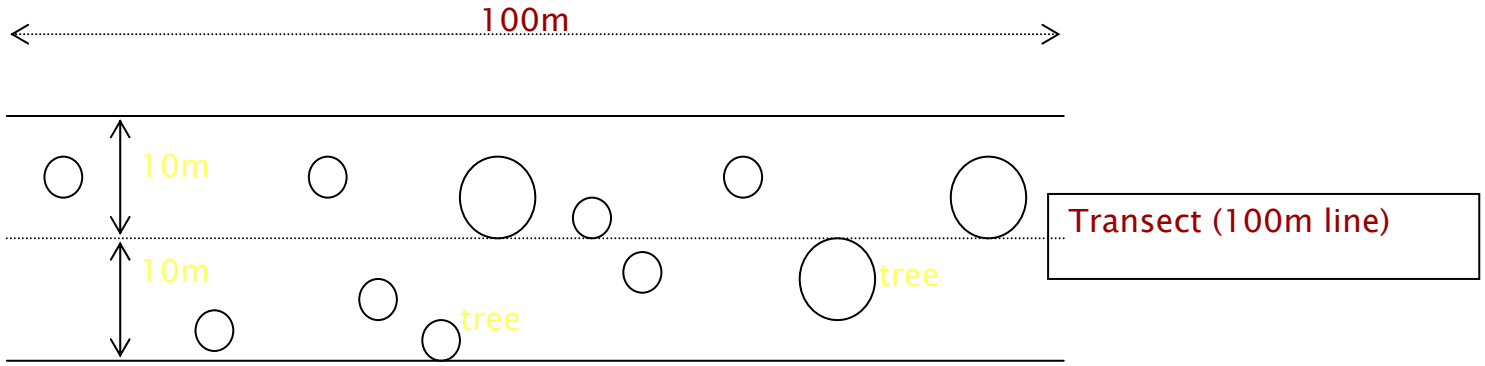
- The methodology for field survey followed by *Hairiah K. et al. (2001): Methods for sampling carbon stocks above and below ground* and the final report of the Cambodia Climate Change Enabling Activity Project's Phase 2 (2003).
- The measurement consists of two parts:

  (i) non-destructive sampling for the trees, including diameter and height of living tress and necromass;

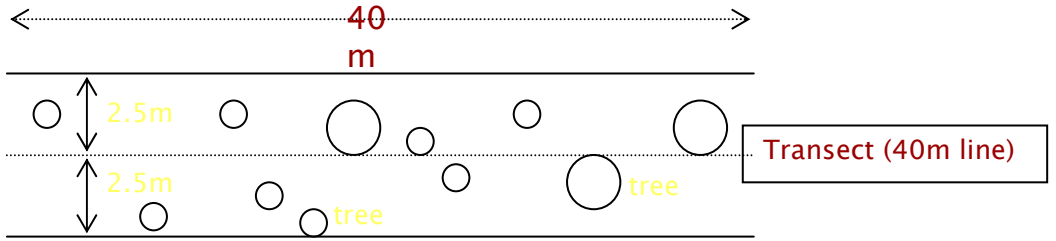
  (ii) destructive sampling for the understorey, necromass, and living tree biomass.

The Estimation of Biomass Growth Rate under the APN-CAPaBLE Project (4)

- Sampling protocol for living tree biomass and tree necromass (Diameter >30 cm): Sample area: 20m x 100 m = 2000 m^2 ;

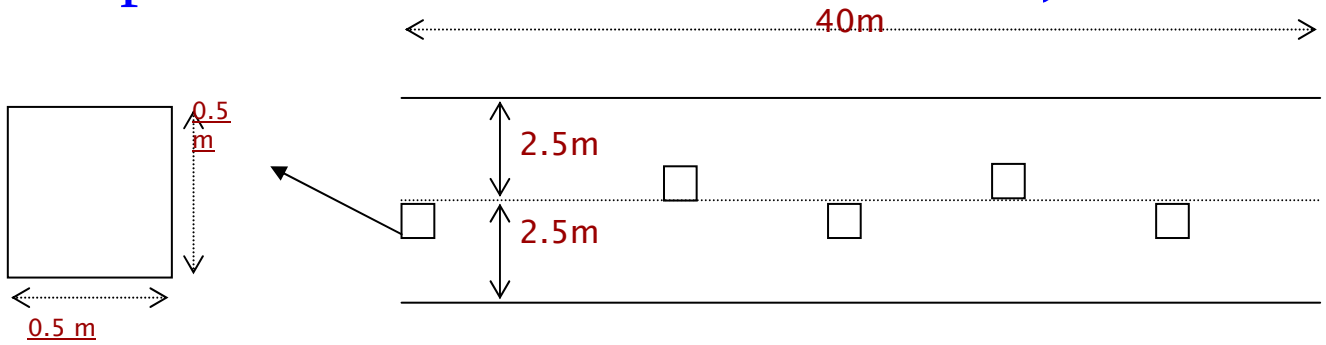


- Sampling protocol for living tree biomass and tree necromass (Diameter from 5-30 cm): Sample area: 5m x 40 m = 200 m^2 within in the sample size Diameter >30cm



The Estimation of Biomass Growth Rate under the APN-CAPaBLE Project (5)

- Sampling protocol for destructive sampling in 1 m^2: Sample area: 5m x 40 m = 200 m^2 ;



- *Living tree biomass:* set up randomly a sampling frame of 0.5m x 0.5m in each quadrate with trees less than 5 cm DBH, i.e. seedling or saplings, are harvested within the 1m x 1m quadrate;
- *Coarse litter:* crop residues, all unburned leaves and branches;
- *Fine litter:* dark litter, including all woody roots which partly decomposed;
- *Sun dry:* living tree biomass, coarse litter and fine litter are dried using sun-light.

Future Development

- Climate change education and awareness raising;
- Climate change national institutional strengthening;
- CCCO managerial and technical capacity strengthening;
- UNFCCC and the Kyoto Protocol implementation;
- Prepare the Second National Communication including:
  - Greenhouse gas (GHG) inventory development for 2000;
  - Vulnerability and adaptation assessment;
  - GHG mitigation analysis;
  - Technology transfer; research and systematic observation; capacity building; education, training & public awareness.
- Improve international cooperation and networking.

Thanks for Your Attention!