



THE NATIONAL HYDRO – METEOROLOGICAL SERVICE

Introduction of greenhouse gases in Vietnam

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- National Hydro-Meteorology Services of Vietnam
- Summary of National GHG Inventory in 2000
- Automatic air quality monitoring station
- CATCOS project
- PhaDin station
- Conclusion
- Acknowledgement

Introduction - National Circumstances

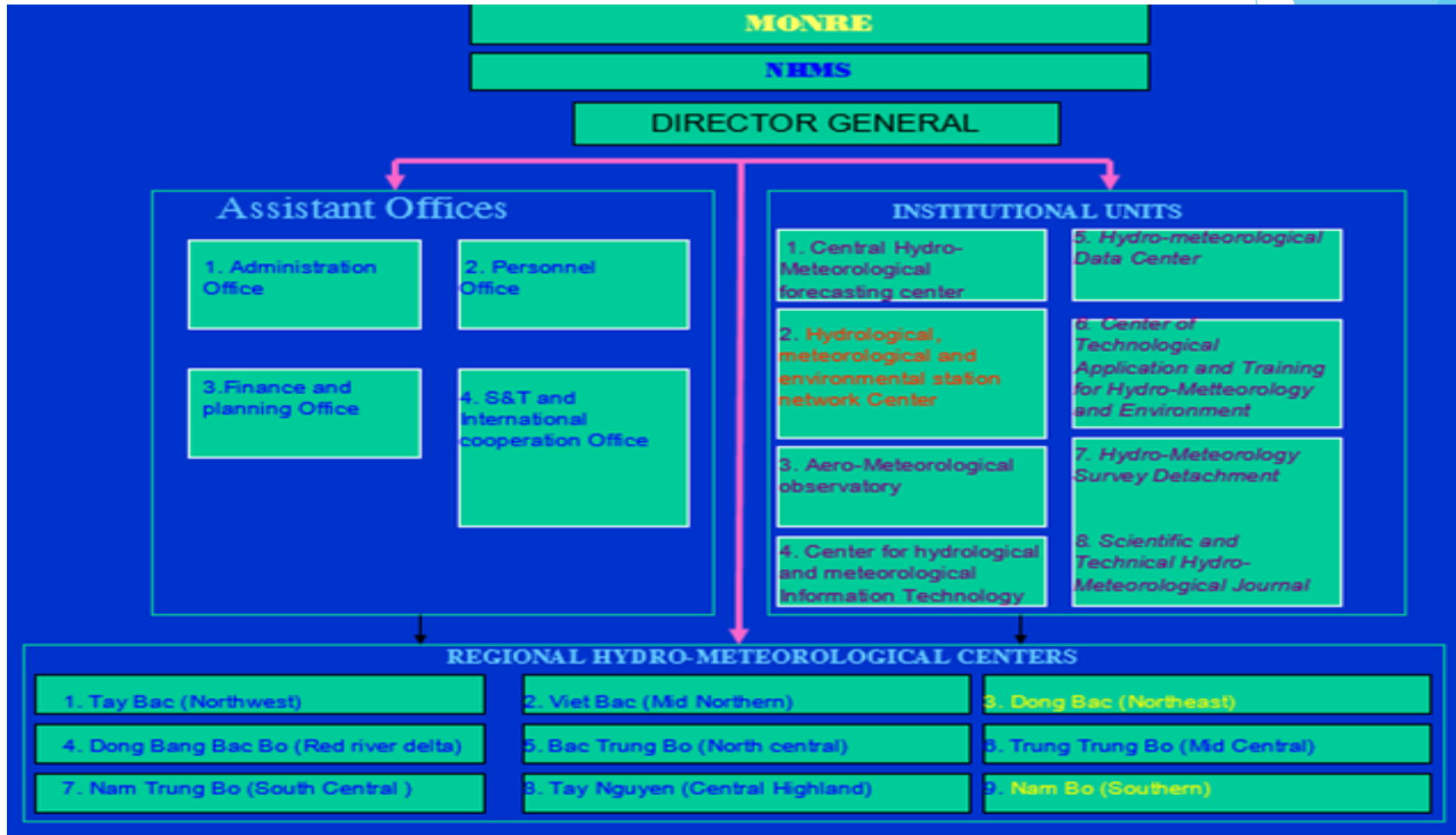
- **Geography:** Vietnam located in Southeast Asia, land area of 331.698 km² (hill and mountain: $\frac{3}{4}$, land: $\frac{1}{4}$ with 2 main delta: Red River Delta in the North and Mekong River Delta in the South), coastline is about 3.444 km.
- **Climate:**
The North: 4 seasons, whereas The South has 2.
Rainy season: April to October.
Storm and typhoon: June to December.
- **Water resources:** Nine major river systems
- **Population (2011)** 87. 84 mil
- Agriculture land is about 9.3 mil. ha
- Forest land (2000) is about 11.6 mil. ha
- Annual industrial growth is 10-15%
- Transportation: road transportation is the dominant mode of transport
- Energy: primary energy consumption in 2000 was 32.235 KTOE
- Economic growth: 7.5% per annum between 2000-2008



National Hydro-Meteorology Services of Vietnam

- In 1976, Hydro-Meteorological Services official established and was directly under the government of Vietnam.
- In 2002, National Hydro-Meteorological Services of Vietnam (NHMS) was under Ministry of Natural Resources and Environment (MONRE).

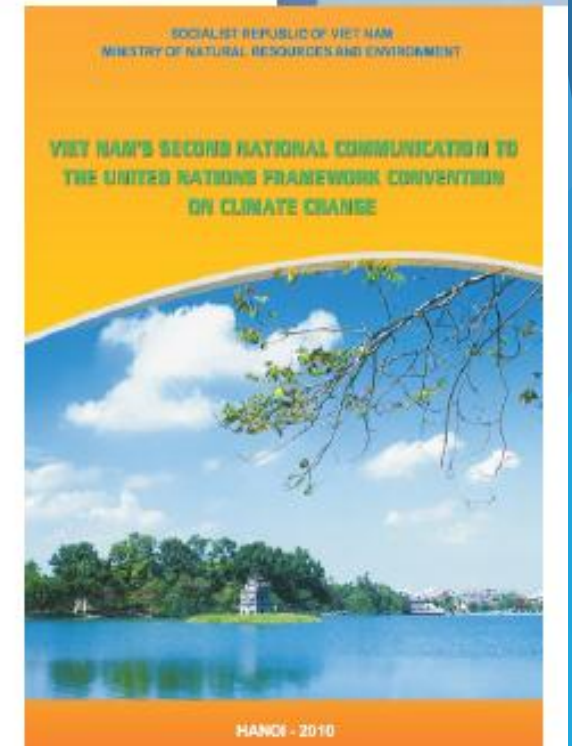
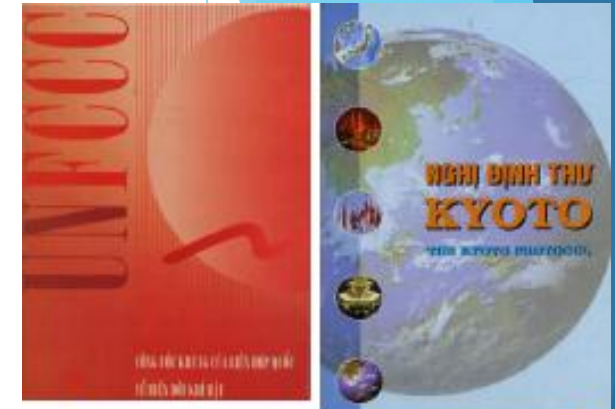
Structure of NHMS of Vietnam



Main functions

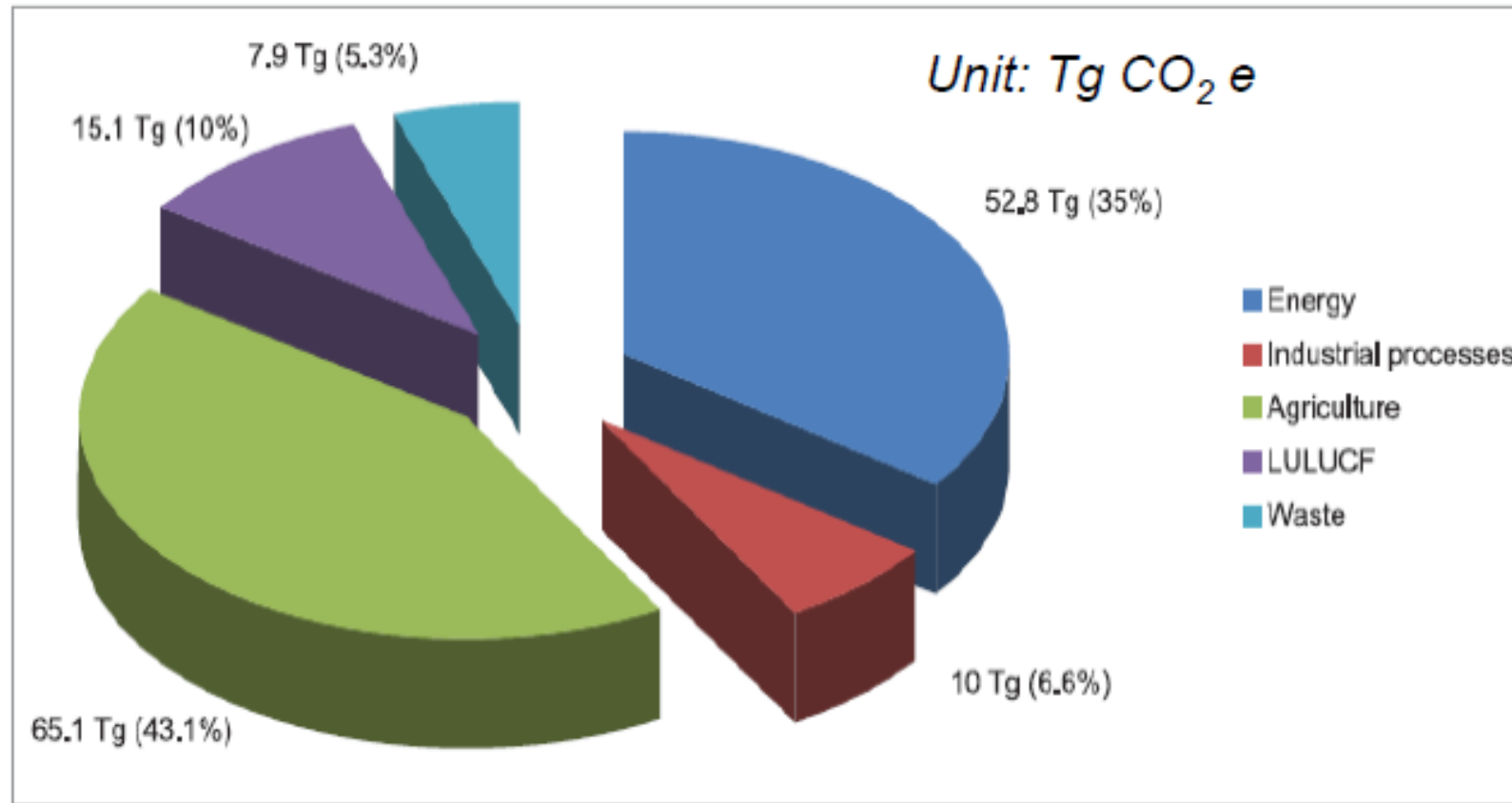
- ▶ Managing activities of observing station network, including meteorological, upper air meteorological, hydrological, oceanographically, agro meteorological and water and air quality monitoring stations.
- ▶ Servicing Hydro meteorological data and forecasting messages, particularly forecasting and warning on typhoon, flood and drought.
- ▶ Hydro meteorological Research.
- ▶ Training and human resource development for Hydro meteorological activities.

- Vietnam ratified the United Nations Framework Convention on Climate Change in 1994 and Kyoto Protocol in 2002;
- Vietnam: implement the obligation of development of National Communications as stated in Article 4.1 and 12.1 of UNFCCC;
- Vietnam submitted the Second National Communication (SNC) to the UNFCCC Secretariat at the COP 16, Cancun, Mexico, December 2010



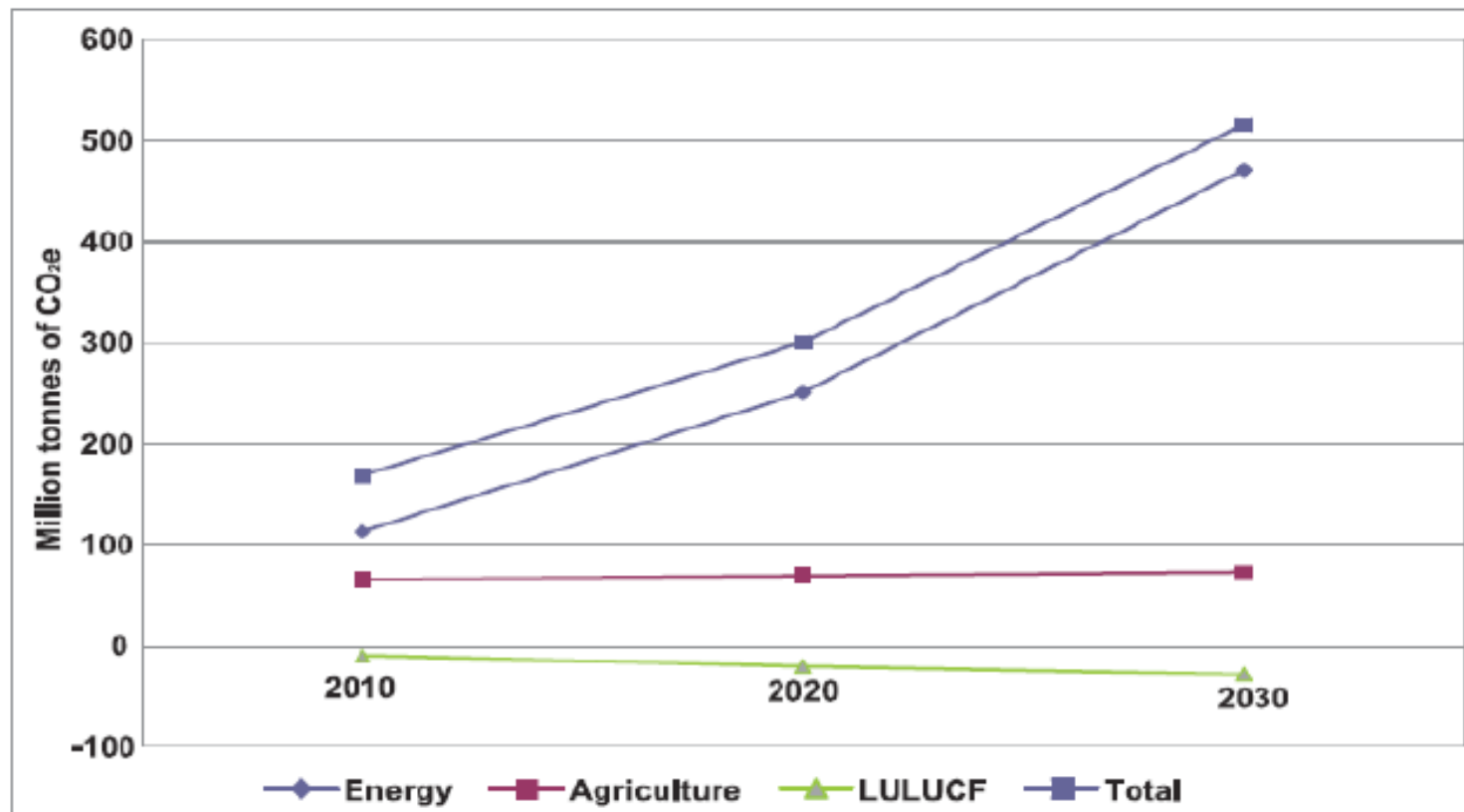
Summary of National GHG Inventory in 2000

The National GHG inventory for the year 2000 was conducted in accordance with the Revised IPCC Guidelines [SNC, 2010]

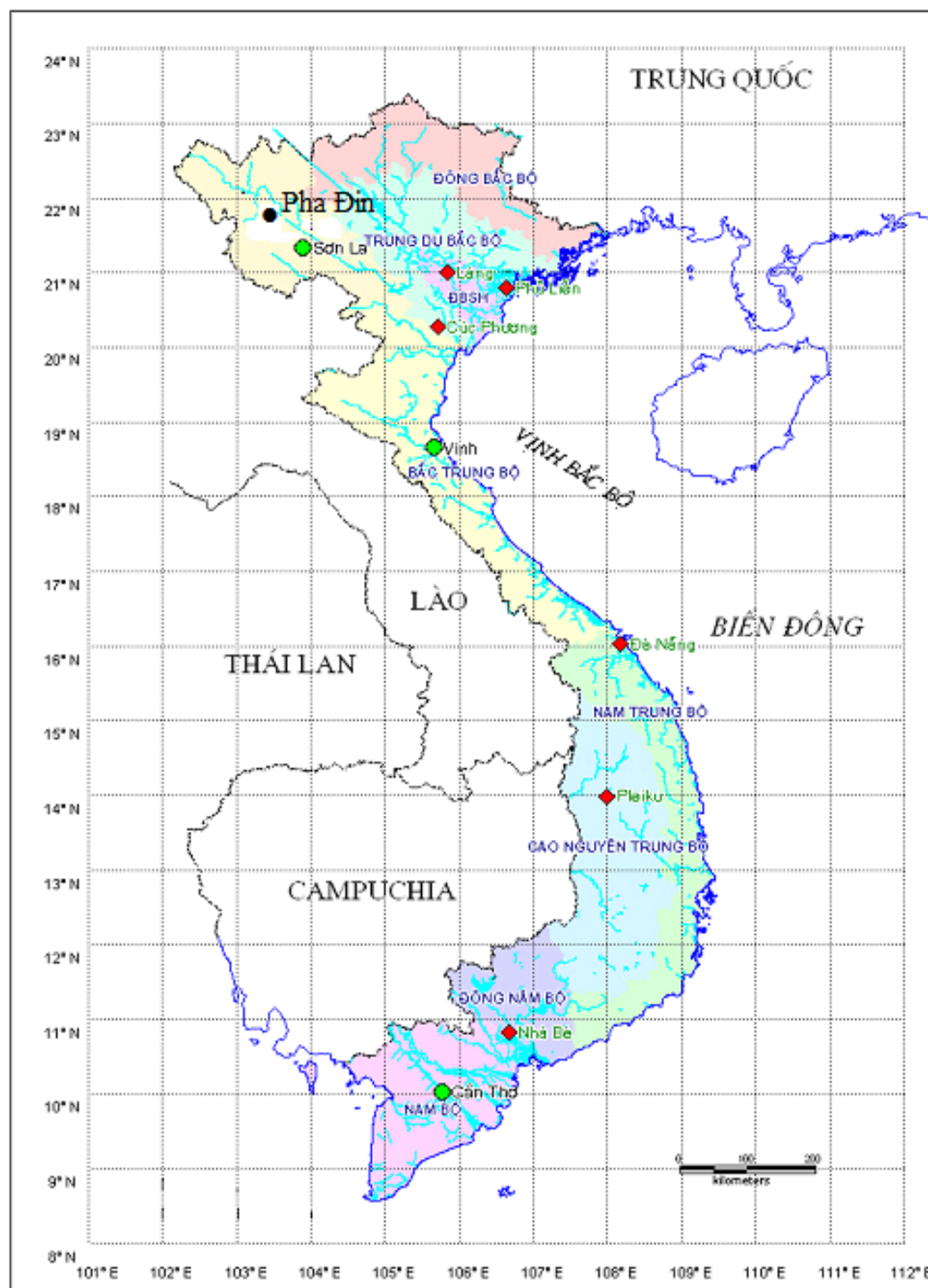


Summary of National GHG Inventory in 2000

Emissions from energy, agriculture and LULUCF sectors are projected to be 169.2, 300.4, and 515.8 Tg CO₂e in 2010, 2020, and 2030, respectively. Energy sector accounts for 91.3% of projected total emissions for 2030 [SNC,2010]



10 stations of the
National Hydro-
Meteorological Service
(NHMS) of Vietnam
and Pha Din station



Automatic Air Quality Monitoring Station



OBSERVATION/ANALYZED PARAMETERS

- At Automatic Air monitoring Stations:
 - Meteorological parameters: WS, WD, T, RH, P, R, SR, UV
 - Environment parameters: TSP, PM10, OBC, SO₂, NO_x, CO, O₃, HC (CH₄, NMHC, THC), NH₃, Chemical composition of Rain water and Dust)

Model instrument of Automatic Air Quality Monitoring Station

<i>Instrument</i>	<i>Model</i>	<i>Measurement</i>
1. High Volume Air Sampler	120HL	Suspended particulate matter (<100 μ m) through glass fiber filter paper
2. Nitrogen Oxides Analyzer	NA-621	Chemiluminescence method
3. NH ₃ Analyzer	AA-626	Using a catalyst for NH ₃ oxidation and NO-O ₃ chemical luminescence method using NH ₃ removal
4. Sulfur Dioxide Analyzer	SA-631	Ultraviolet fluorescence method
5. Ozone Analyzer	OA-681	Ultraviolet absorption method
6. Hydrocarbon Analyzer	HA-675	Flame ionitation detection method
7. CO Analyzer	ZRF	Nondispersive infrared photometer
8. Suspended Particular Matter Monitor	SPM-312D	Reduce β -rays method
9. Acid Rain Sampler Data Process System	PID:2036	Sampling and direct measurement of pH, EC rainwater
10. Datalogger	PID:2061	Process and storage database

CATCOS

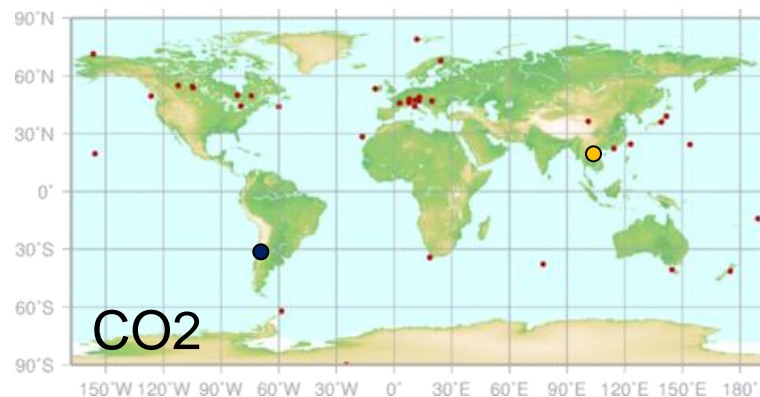
Capacity Building and Twinning for Climate Observing Systems



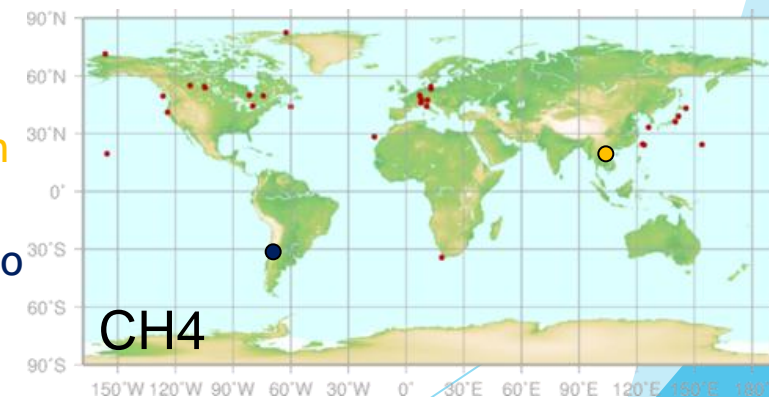
CATCOS – filling global gaps



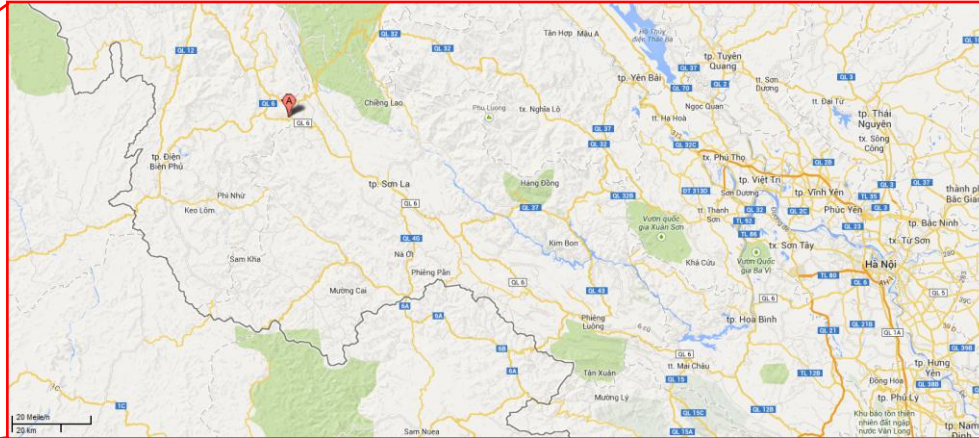
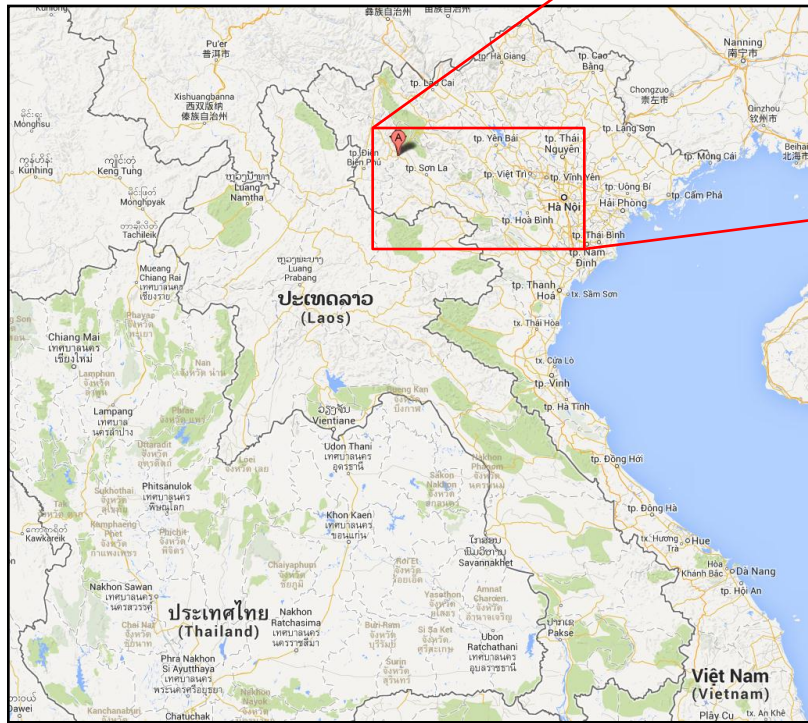
maps of available ground-based in-situ data in the World Data Center for Greenhouse Gases



Pha Din
El Tololo



Location of Pha Din





Pha Din station
21.57degN,
103.52degE,
1466m asl

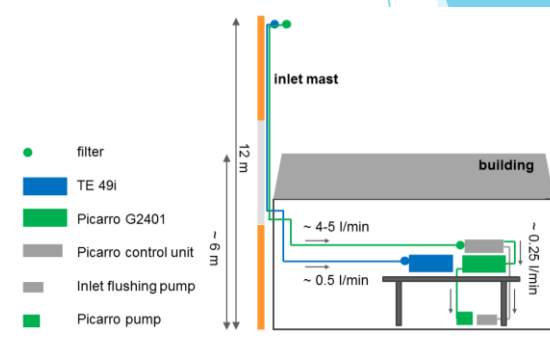
measurement station



laboratory building



schematic



inlet



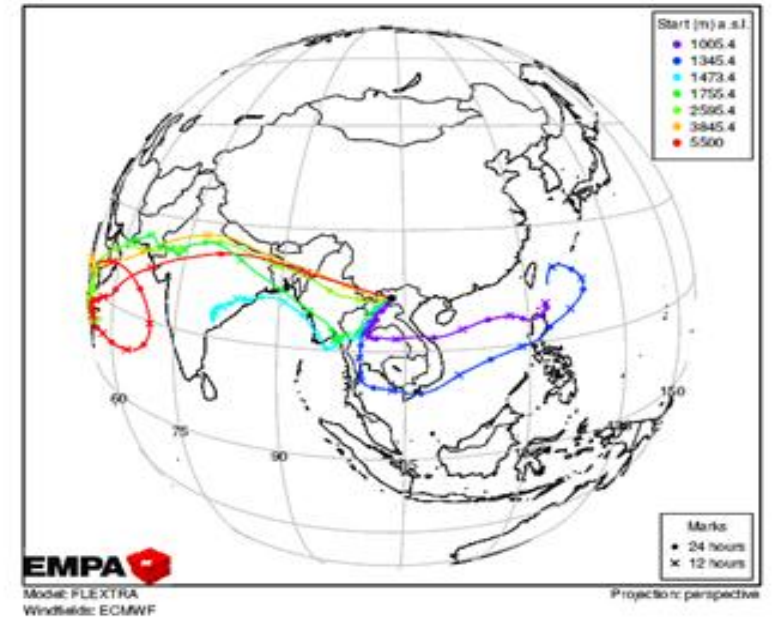
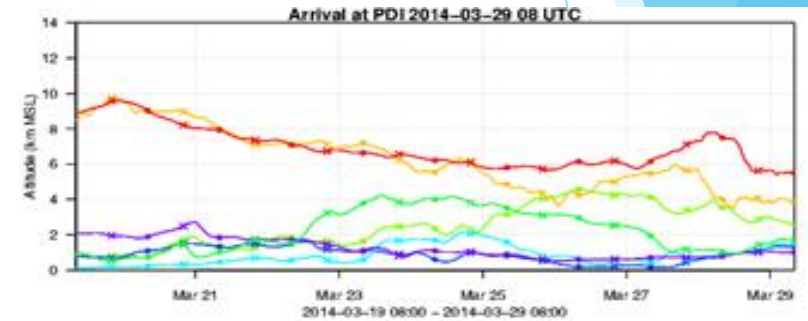
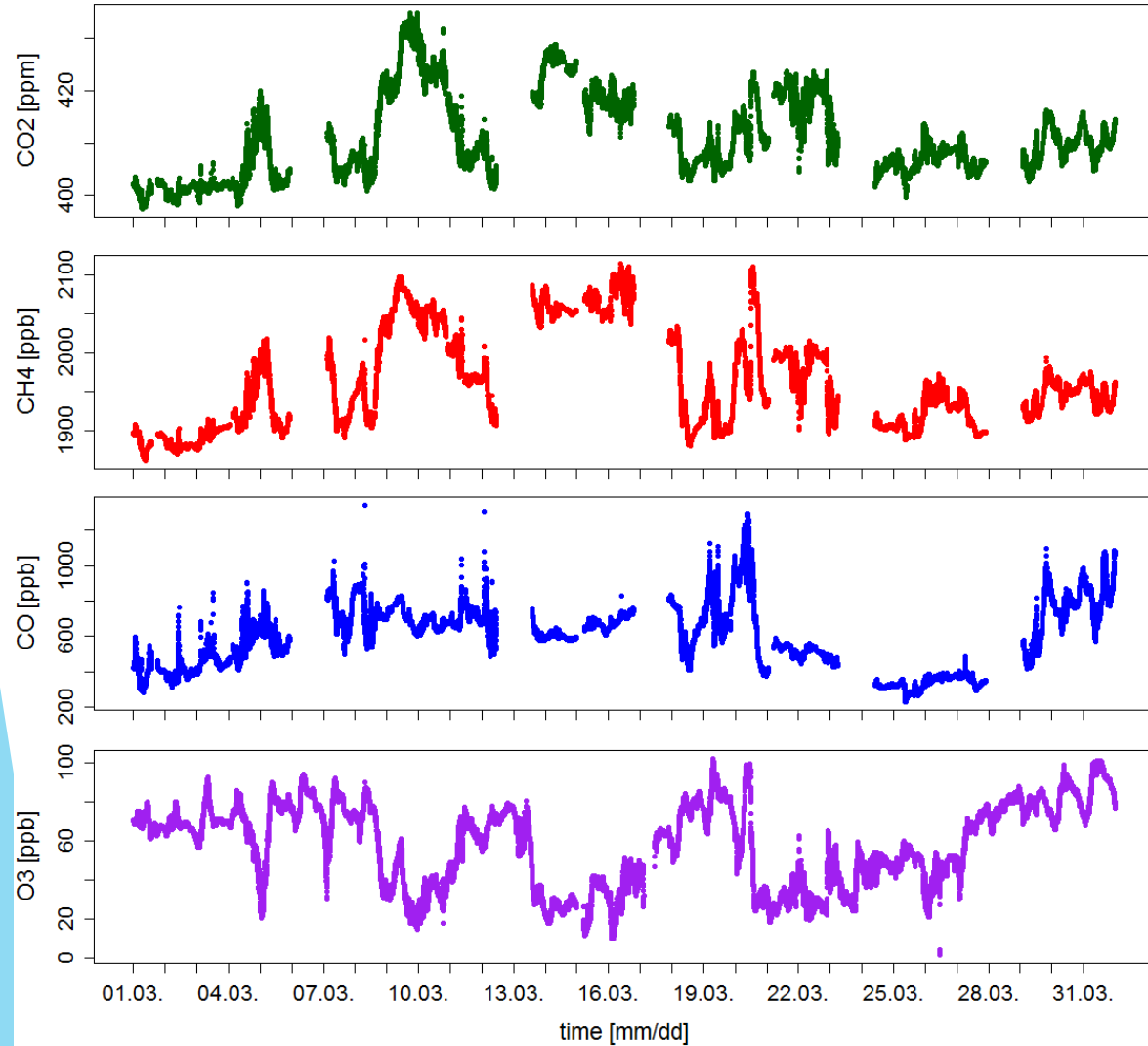
GHG Equipment at PhaDin

- Laser Spectrometer for measuring Carbon dioxide (CO₂), methane (CH₄), carbon monoxide (CO) (1)
- calibration unit for spectrometer (2)
- UV absorption analyzer for measuring ozone (O₃) (3) and O₃ zero air unit (4)
- computer with data acquisition software (5)
- six cylinders with calibration gases (6)
- two pumps (7)



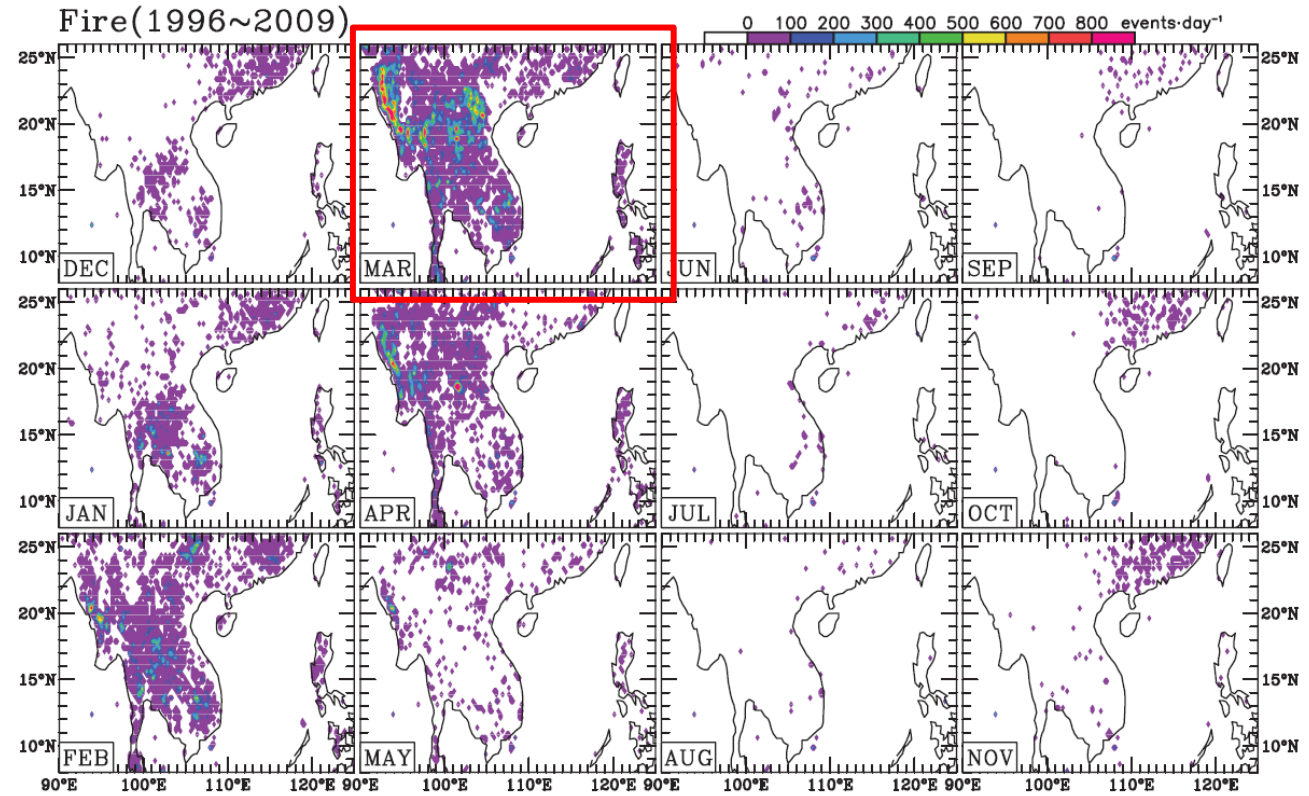
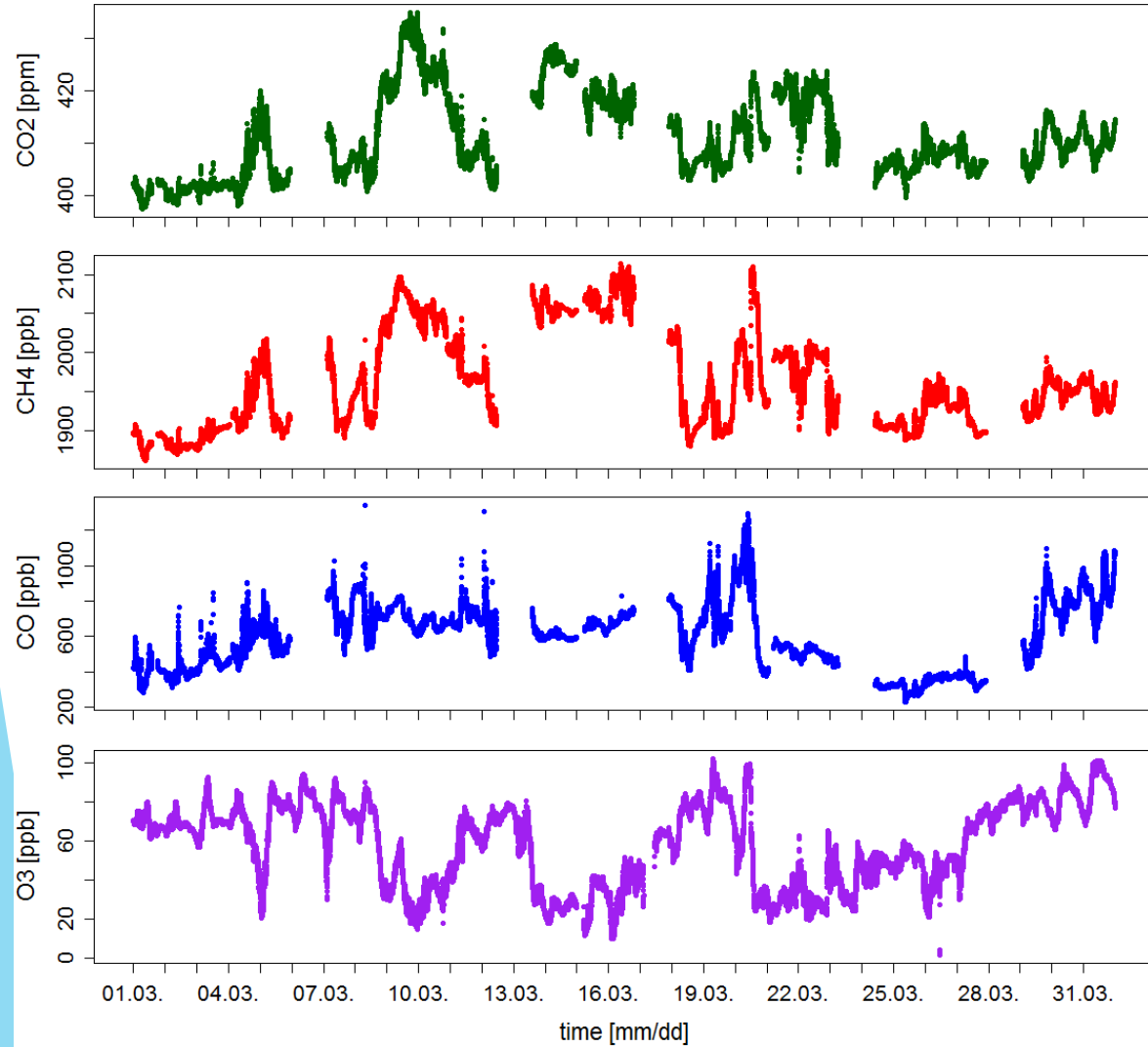
First observations, March 2014

- Observations will provide important information on the impact of the strongly developing industry and biomass burning in the eastern Asian region on air quality.
- Meteorological models will help to identify major source regions and to quantify emissions.



First observations, March 2014

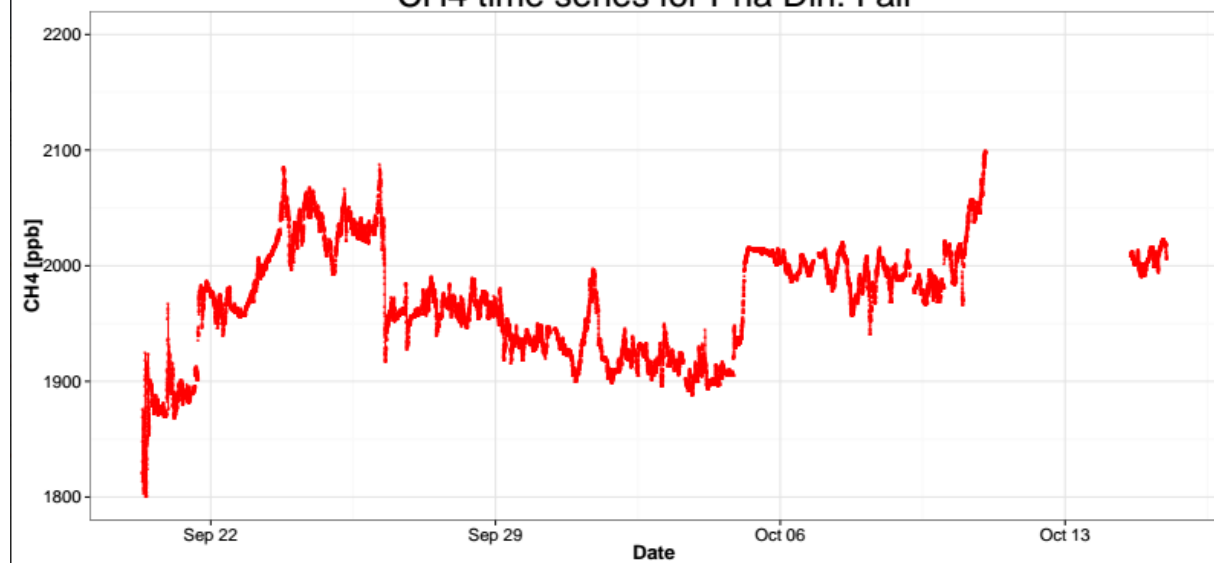
hourly averages



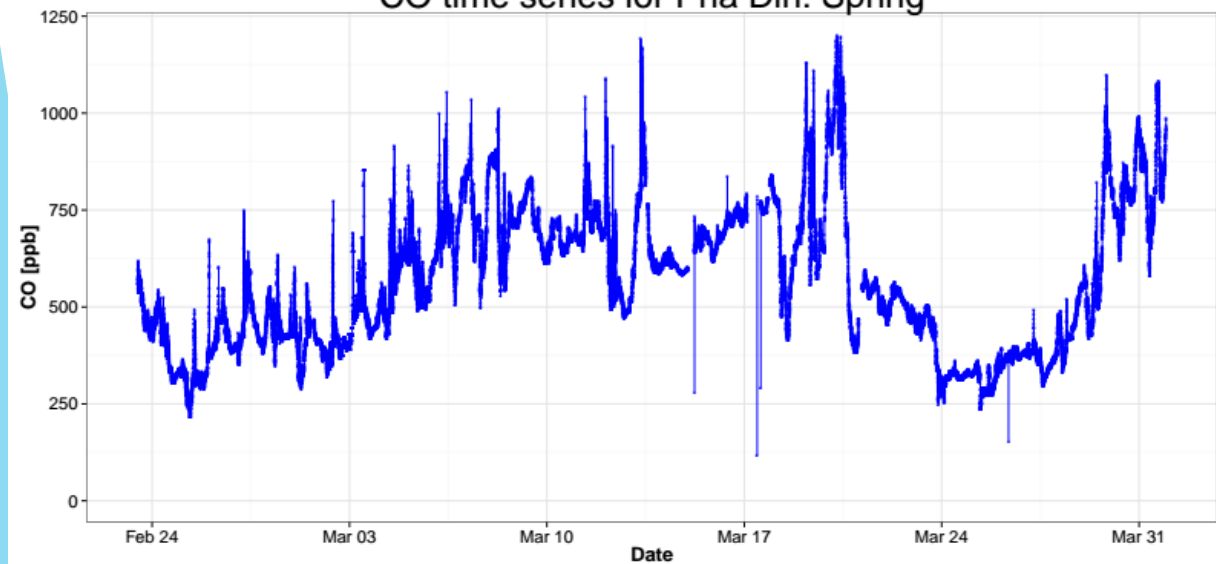
CH4 time series for Pha Din: Spring



CH4 time series for Pha Din: Fall



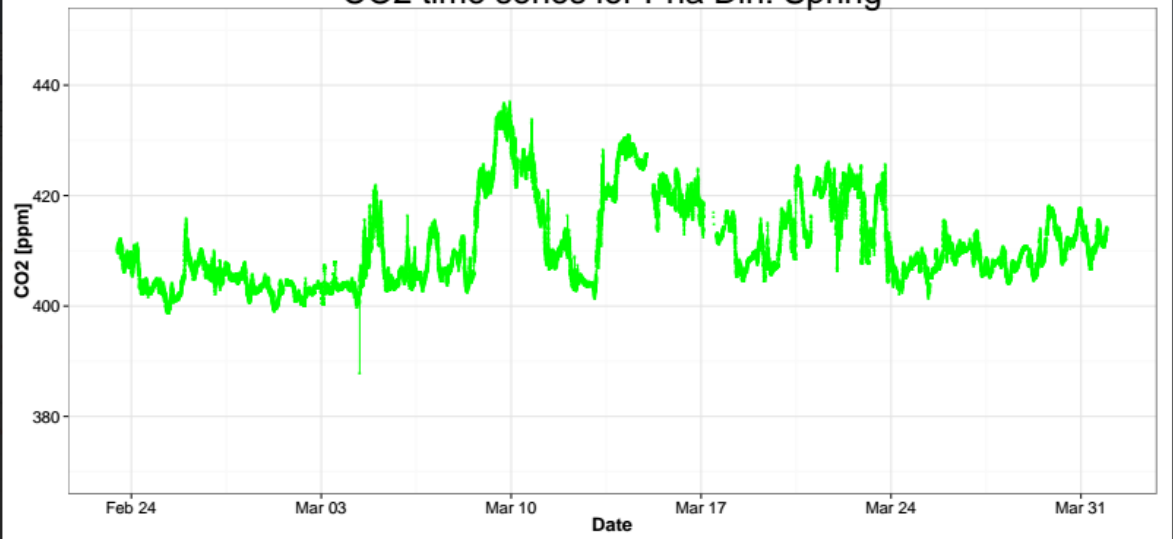
CO time series for Pha Din: Spring



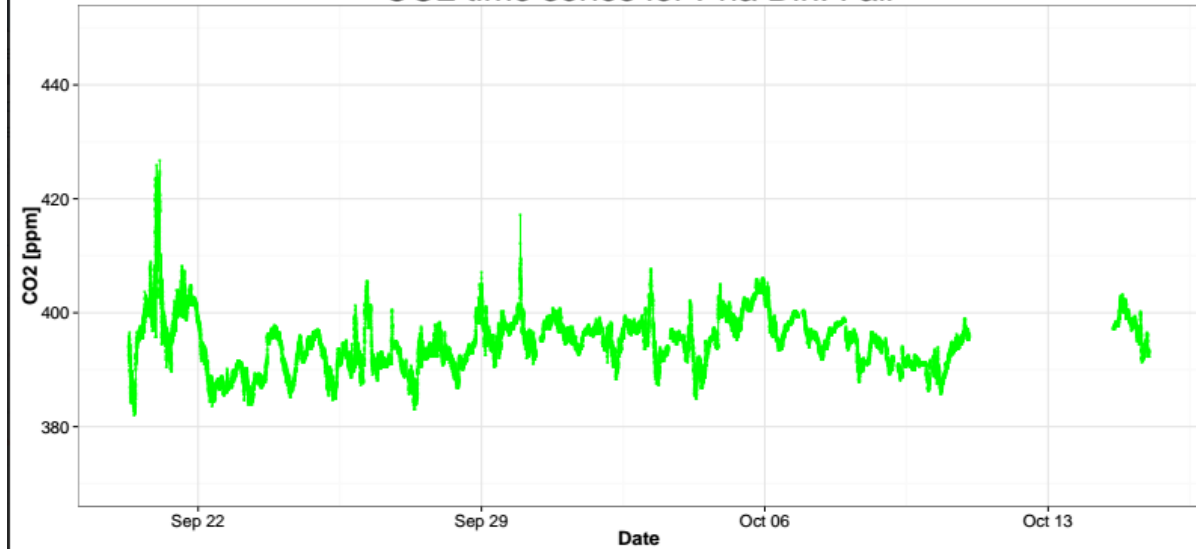
CO time series for Pha Din: Fall



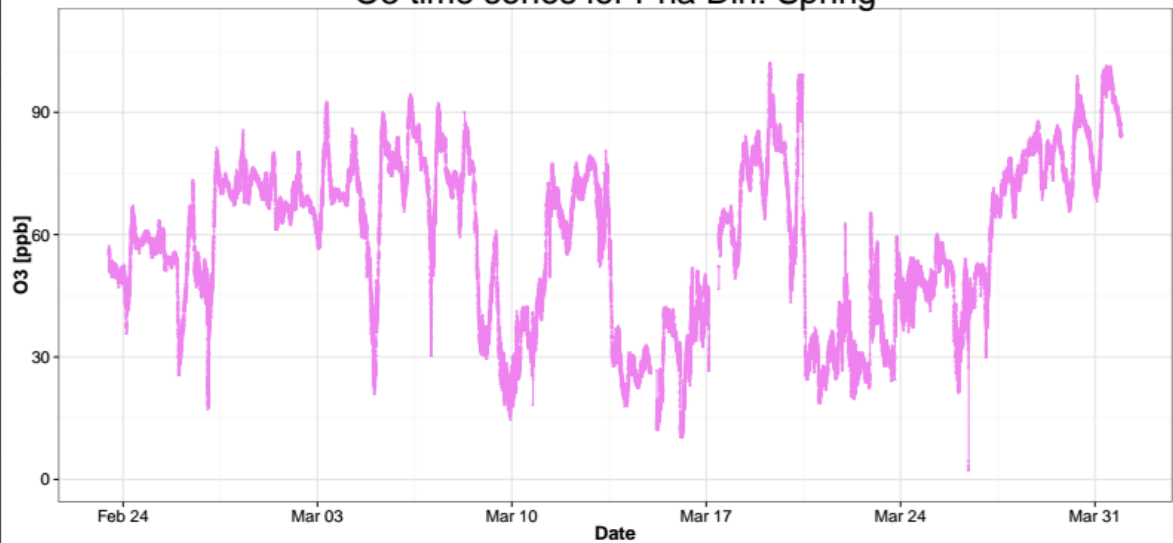
CO2 time series for Pha Din: Spring



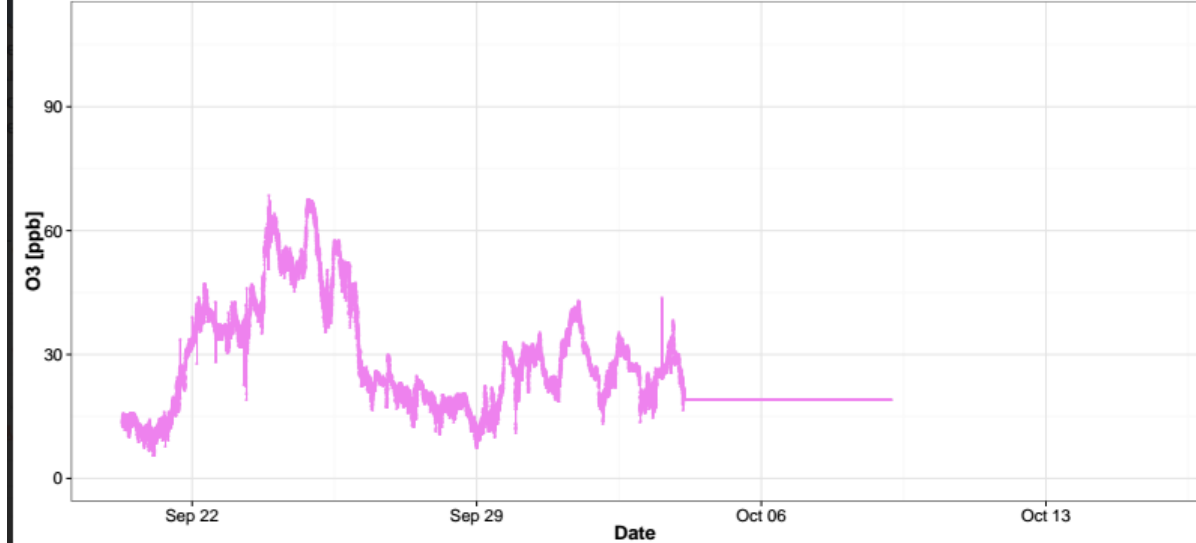
CO2 time series for Pha Din: Fall



O3 time series for Pha Din: Spring



O3 time series for Pha Din: Fall



Strategies and plan for the future

- Expanding automatic monitoring stations network.
- Improving the quantity and quality of products from automatic air quality monitoring stations data.
- Investing in human resource development, establishing training courses on the use of GHG related data in NHMS of Vietnam.
- Maintaining collaboration with WMO, other NHMSs and international cooperation.

Acknowledgements

- We acknowledge the support of the Pha Din observations through the project Capacity Building and Twinning for Climate Observing Systems (CATCOS) funded by the Swiss Agency for Development and Cooperation (SDC) and coordinated by the Federal Office of Meteorology and Climatology, MeteoSwiss. The greenhouse gas measurements capabilities at Pha Din were implemented by Empa.

Thank you for your attention!

