



Department of Natural Resources and Environment (DONRE)
Ho Chi Minh City



NORAD

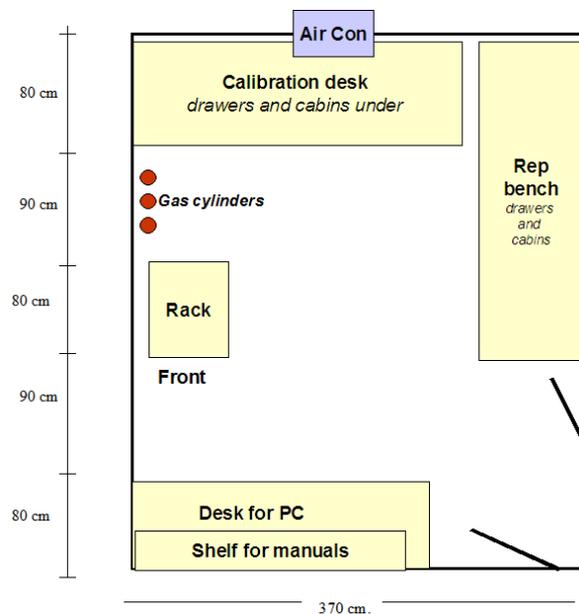
DIREKTORAT FOR
UTVIKLINGSSAMARBEID
NORWEGIAN AGENCY FOR
DEVELOPMENT COOPERATION

Ho Chi Minh City Environmental Improvement Project
Air Quality Monitoring and Reference Laboratory

MR-1

Reference laboratory; planning and design

Bjarne Sivertsen



Norwegian Institute for Air Research



Ho Chi Minh City
Environmental Improvement Project
Air Quality Monitoring Component

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1 Introduction

On 16 November 2004 an extension of the project **Ho Chi Minh City Environmental Improvement Project Air Quality Monitoring component (HEIA)** was signed between DONRE and NILU. The new project is named the **Ho Chi Minh City Environmental Improvement Project; Air Quality Monitoring Component, Reference Laboratory and Training (HEIA-R)**. NORAD shall make payment for supplies and services provided under the new Contract.

As part of the planning of this phase of the project several meetings were arranged at NILU. Discussions and correspondence with the local experts at HEPA in HCMC were continuously performed via E-mail, Fax and letters. During the first phase of the HEIA project HEPA experts have received training and is now operating the measurements as well as the air quality management system. However, experience has shown that much more training is needed to keep up an adequate quality in all parts of the programme. Training will be given as part of the installations of a calibrations, repair and reference laboratory and during upgrading of the operational procedures.

NILU will establish the necessary expertise to operate the whole system at DONRE/HEPA. Services to be provided by NILU are:

- Specify and approve the physical location and features of the laboratory
- Design the reference laboratory
- Procure equipment
- Test and verify equipment
- Shipping of equipment
- Install, verify and test the equipment in the laboratory
- Develop training programme for maintenance, repair and calibration
- Develop QA/QC programme related to Reference laboratory activities
- Perform audits and train the ref-lab personnel
- Update the database and collect input data
- Meteorological data, training and improve instruments
- Perform training in air quality assessment, seminar
- Improve modelling capacity
- Undertake impact evaluation
- Prepare HEPA for undertaking abatement planning
- Improve data dissemination and information

2 Procurement of instruments and equipment for Reference laboratory

During the meetings with HEPA at the end of 2004 we were informed about prices of instruments for the Reference Laboratory, which was given directly to HEPA from API. The prices were based on the specifications presented by NILU. The prices for deliveries of instruments directly to HEPA in HCMC seemed at that time to be cheaper than purchasing the equipment from via Norway.

NILU received a request from HEPA to purchase directly. The probability of receiving instruments, which may be defect, is very limited. HEPA will have to assure that the warranty will take care of this. At the beginning of 2005 the status concerning the instruments to be purchased is presented in Appendix A.

However, during the procurement period NILU negotiated with the Norwegian instrument provider, who could offer prices at least as good as from HCMC directly. The advantage was that NILU could check, test and verify that all equipment was according to the needs specified for the calibration and reference laboratory.

The warranty period should start at the delivery day, which should be specified by HEPA. Depending on the availability of the reference laboratory facilities we suggested that Mr. Rolf may arrive in HCMC from medio August to install and perform training.

This installation period would critically depend upon the facilities and rooms made available for the laboratory and the monitoring center. It was thus decided that the facilities and rooms at HEPA would be inspected during a visit at the end of January 2005.

3 Planning installations and testing

Based on the decisions taken in project meetings at NILU we will prepare the installations to be undertaken directly in HCMC. Rolf will have to be present from the moment the instruments are unpacked.

To follow this procedures we will have to assure that the new Reflab laboratory has been checked and found okay, and that all benches, shelves and air condition etc is in place BEFORE the instruments are installed in the Laboratory.

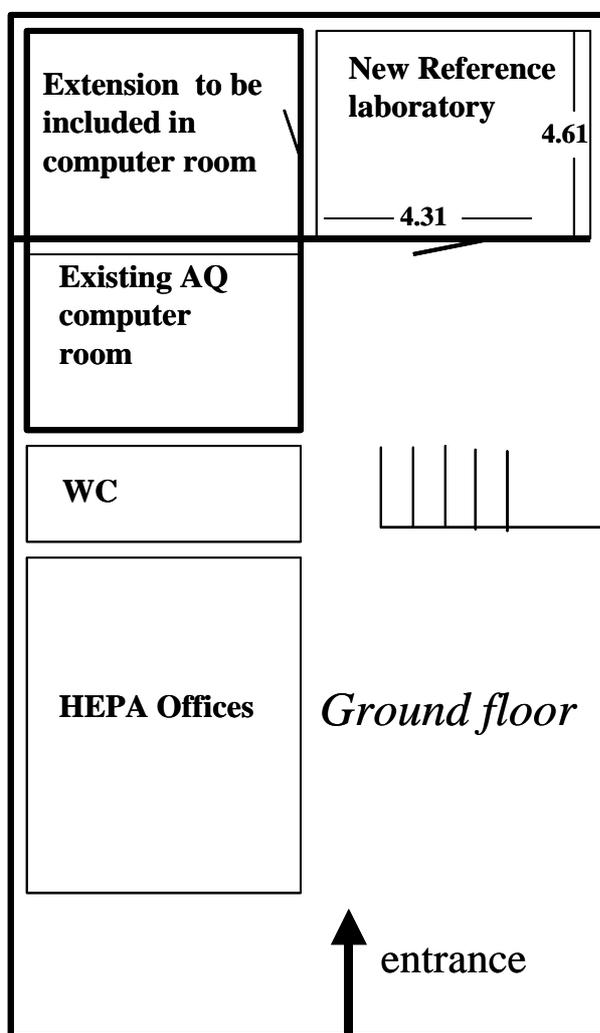
Rolf will then support the unpacking, installations and see that necessary testing and training will be undertaken.

A new meteorological station to be placed at DOSTE has been requested from Vaisiala OY in Finland. The existing weather station at DOSTE, installed during the DANIDA project, has never been operated adequately as stated in several Mission reports. Good quality meteorological data are necessary for performing air pollution modelling. HEPA and NILU have thus agreed to use money from the budget to procure and install a new weather station at DOSTE. Instruments for this station is now available at NILU and will be tested and prepared with the new NILU data logger and one additional temperature sensor for ground level measurements.

The instrument will be available for installation in HCMC during the installations of the Reference laboratory in October/November 2005.

4 Laboratory design

The Reference Laboratory including maintenance and repair capacity, plus additional training for calibrations as well as the application of the AirQUIS system for air quality planning in HCMC is all part of the HEIA-R project.



The main tasks to be undertaken in the project during 2005 are to specify and approve the physical location and features of the laboratory and to design the reference laboratory.

NILU will see that shipping of equipment will take place well in time before installations. Installations, including verifications and testing will take place as soon as necessary facilities are made available at HEPA

The space for the new Reference Laboratory was inspected in January. The location is in the first floor of the HEPA building. The size of the room is 4.60m x 4.31 m and the height is 2.15 at the lowest point and about 3.5 m at the highest point. The computer extension room is 3.8 x 4.6 m.

According to the time schedule agreed between NORAD, DONRE and NILU the installations of the Reference Laboratory must be undertaken in October to November 2005 depending upon rooms

available. Instruments were ordered in Norway during the Spring 2005. They will be ready for shipment in August- September.

The facilities available at HEPA as of January 2005 were not adequate for the air quality monitoring and management programme. This was also agreed between Mr Khoa and Vice Director Chien in a meeting on 6 May 2005.

Vice Director Chien also emphasized that HEPA would be located in 137 Nguyen Dinh Chinh Street for many years to come.

HEPA had already at that time applied to People Committee for financial support to undertake construction work necessary to facilitate the computer centre and the new Reference Laboratory.

5 Training needs assessment.

A training assessment programme was developed both for the Reference laboratory and for the additional input to the institutional building related to air quality assessment and management.

NILU instrument experts will perform the necessary training for the operation of the Reference laboratory included additional QA/QC procedures. Together with the HEPA field operators NILU will also follow up calibration procedures and maintenance. NILU experts will undertake hand-on training in instrument maintenance, field calibrations, multi-point calibrations and repairs. Additional workshop and seminars will be planned and undertaken as part of the establishment of the Reference laboratory.

5.1 Training specifications

During the Mission in May Mr Khoa together with Mr Bjarne will identify the specific needs for further training. NILU has indicated in the plans that the following topics will be covered:

1. Quality Assurance (QA) and Quality Control (QC) program, including updating existing standard operations procedures (SOP) and adding QA/QC as part of the Reference laboratory procedures (LM)
2. Air quality data control at the HEPA data centre, understanding concentration levels and correcting errors, prepare SOP for data control (BS),
3. Air Quality modelling and management, further on the application of the modelling tool (BS),
4. Training concerning maintenance and repair, mainly hands-on training (HW/LM)

The objectives are also to improve the capacity building and to assure that the HEPA personnel will be able to conduct air quality assessment studies and air quality planning.

Within the limited budget NILU can together with the client define the strategic objectives of an Air Quality Management and planning System (AQMS), and support the selection of tools, modules and components to be used in a specific situation and for a defined area of interest. Training in the application of AirQUIS as a basis for performing abatement strategy planning will be prepared, but the work itself will have to be undertaken locally. NILU may, if wanted, participate in the process as part of the on-the-job training programme.

If the ADB project on “Air quality and health impact among the poor” will be a reality, NILU will support HEPA in addition to perform the necessary exposure estimates needed for this project. Further training will thus be needed both in HCMC and at NILU.

5.2 Design QA/QC and documentation materials

Evaluation of data for the first years of measurements has indicated that some of quality routines will have to be updated. All routine operations and the use of standard operational procedures (SOP) and monitoring operations seem to have been followed up adequately. Additional training concerning quality assurance, calibrations, repair and maintenance will be performed as part of the establishment of the Calibration and Reference Laboratory at HEPA.

Good data quality and high data capture are essential if the monitoring network is to achieve its objectives. To ensure that data are sufficiently accurate, reliable and comparable, consistent data quality control procedures are to be applied throughout the network in HCMC.

Good QC practice covers most aspects of network operation, including equipment evaluation, site operation, maintenance and calibration, data review and ratification. The successful implementation of each component of the QC scheme is essential for the success of the programme.

The fundamental aims of a quality control programme are as follows:

- a. The data obtained from measurement systems should be representative of ambient concentrations existing in each urban area.
- b. Measurements must be accurate, precise and traceable.
- c. Data must be comparable and reproducible. Results from this geographically extended network must be internally consistent and comparable with international and other accepted standards.
- d. Results must be consistent over time.
- e. In order for seasonally or annually averaged measurements to be meaningful, an appropriate level of data capture is required throughout the year.

Essential requirements for conformity are the following quality assurance (QA) aspects

- Measurement methods used must be of known performance and defined scope of application;
- All calibrations must be traceable through an unbroken chain to international standards (the SI system);
- On a long term, measurements should be made within a documented quality system.

The Air Quality Monitoring programme fulfils the QA aspects regarding the measurement methods, as the instrument principles used are all in accordance with ISO, EN and US standards. Trace ability is ensured through the use of traceable gas calibration standards. For particulate matter, regular inter comparison between the PM10 measured by means of beta ray absorption and PM10 measured by means of gravimetric analysis can ensure a high data quality and comparability.

A documented quality system is an essential part of quality assurance. Documenting procedure is, in itself, insufficient to ensure good practice. Training should be given to the local site operators in QC procedures. This training must ensure that the site operators are experienced with the monitoring techniques involved and with the network procedures required to maintain a high standard of performance. Furthermore, audits should be performed from at least annually to ensure that QC procedures are followed in practice.

Before the training seminar and workshop, to be undertaken at HEPA in HCMC in November 2005, all documentation and background materials for performing a quality assured air quality monitoring network will be evaluated and prepared.

6 Time schedules and further work.

A total of 4 Missions have been planned during HEIA-R project. The two main Missions to HCMC will be undertaken in May 2005 and in October/November 2005 depending upon the infrastructure and availability of laboratory in HCMC.

A short visits will also be paid to HCMC at the beginning of the project to design, prepare and identify the needs. At the end of the project there will be a summary workshop and discussions of results of the air quality assessment and planning work.

HEPA and Mr Dam will be notified about the decisions and asked to start the process of procuring instruments from NILU, and the transport and installation needs.

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Appendix A

Instruments for the new Reference Laboratory

Instruments to be procured for the Reference Laboratory

There are two options for the procurement and installations of instruments for the new Reference Laboratory.

1. To purchase all instruments in Norway, from Furevik and install and test at NILU
2. To purchase directly from API to HEPA in HCMC. They seem to have received some favorable prices. (see below)

Ref lab deliveries

Inventory List

Reference laboratory

Items	Model (Example)	Cost	Cost		Comments
		1000	Nilu	US	
		NOK	USD	USD	
SO ₂ monitor	API100	100	15 385	10 286	
NO _x monitor	API200	100	15 385	10 712	
O ₃ monitor	API400	90	13 846	7 780	Travelling standard
CO monitor	API300	80	12 308	10 263	
Zero air generator	API701	30	4 615	4 509	
Zero air gen. compressor	1hae-11t-m104x				Cost incl. in Zero air generator
Multigas multpoint calibrator	API700	130	20 000	14 399	
SO ₂ cal. gas, 100 ppm, ref std.	NIST	14	2 154	1 815	Incl. regulator
NO cal. gas, 100 ppm, ref std.	NIST	14	2 154	1 815	Incl. regulator
CO cal. gas, 5000 ppm, ref std.	NIST	14	2 154	1 815	Incl. regulator
Flow calibrator	BIOS DryCal	25	3 846	6 347	
PC with monitor	GW P5-133	10	1 538	2 000	Can be locally supply
PC Software	MS Office 95	5	769		
PC printer	HP 682C DJ	2	308		
Lab. env., Rel. Hum.+Temp.	Va HMP 231	80	12 308	12 308	
Lab. env., Air Pressure	Va PTB 201AD				Incl. in Lab. env., Rel Hum.+Temp.
Lab. env., CO detector	SA 3000 SI				Incl. in Lab. env., Rel Hum.+Temp.
Rack for monitors (2 pcs)	EDR20086	10	1 538	1 538	
Aircon+ furnitures etc		110	16 923	10 000	Can be locally supply
Repair tools	BACO	4	615	615	
Laboratory items	Fittings, filters etc.	5	769	769	
	Total	823	126 615	96 971	

29 645

The NILU prices are the ones we indicated in the proposal. We may manage a better deal?

We will have to discuss procedures, security, insurance and other factors influencing the two alternatives, before we make a decision – in the meeting!

Appendix B
Tasks specified for NILU
personnel as of November 2004

Various tasks for NILU personnel

Title	Tasks after Mission 5
Purpose	List of tasks that have to be performed after Mission 5 to HCMC.
Distribution	The Nguyen Thanh (TNT), Rolf Dreiem (RD), Leif Marsteen (LM)
Author	BS
Date	November 2004
Reference No	O-101143

No	Task	Responsible
1	Ref. Lab room specifications	BS (done)
1a	Discuss and specify intake and exhaust gas/air to Reflab	RD/LM
2	Specify instruments etc for Reflab (procurement)	LM/RD
3	Support emission data collection (confirm economic support)	BS
4	Check emission factors from other projects	BS/TNT
5	Check existing 2-point calibration, and available gas	RD/BS
6	Finalise Internet development.	TNT
7	Evaluate new PM ₁₀ wedding instrument for DOSTE station	BS/LM
8	Specify costs for new AWS	BS
9	Check if stack co-ordinates in AirQUIS have been corrected	TNT
10	Further NORAD support for national air quality programme	TNT/BS
11	Prepare QA/QC programme connected to Reflab development	LM/BS
12	Elaborate on future co-operation, request feedback on joint venture vs. other models	TNT/BS
13	Check if satellite pictures can be used to identify sources in HCMC	BS
14	Estimate area source emissions from traffic and import results into AirQUIS	BS/TNT/VTD
15	Specify statistics to be prepared for monthly summary report	BS
	Prepare newsletter	

