No.

The Ministry of Environment and Sustainable Development (MESD)

The National Environmental Protection Agency (NEPA)

The Project
for
Strengthening the Air Quality Monitoring Capability
of
the National Reference Laboratory
of
the National Environmental Protection Agency
in
Romania

FINAL REPORT OF THE PROJECT

DECEMBER 2008

JAPAN INTERNATIONAL COOPERATION AGENCY

SUURI-KEIKAKU CO., LTD.

GREEN BLUE CORPORATION

GE
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08-108

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Appendix 1 Record of Discussion and Minutes of Meeting
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List of Abbreviations

Abbreviations	English, Romanian
<Organization>	
JICA	Japan International Cooperation Agency
JICE	Japan International Cooperation Center
LEPA	Local Environment Protection Authorities
MD	Monitoring Directorate
MESD	The Ministry of Environment and Sustainable Development
MEWM	The Ministry of Environment and Waters Management
MOE	The Ministry of the Environment
NEPA	The National Environment Protection Agency
NETI	National Environmental Research and Training Institute
NIES	National Institute for Environmental Studies
NRL	The National Reference Laboratory
POMG	Prefectural and Ordinance-designated Municipal Governments
REPA	Regional Environment Protection Authorities
TMG	Tokyo Metropolitan Government
<Name of Material>	
BTX	Benzene, Toluene, Xylene
CO	Carbon Monoxide
H2S	Hydrogen Sulfide
N2	Nitrogen
NH3	Ammonia
NMHC	Non-Methane Hydrocarbons
NO2	Nitrogen Dioxide
NOx	Nitrogen Oxides
O3	Ozone
Ox	Photochemical Oxidants
PM10	Particulate Matter less than 10 micrometers in diameter
PM2.5	Particulate Matter less than 2.5 micrometers in diameter
SO2	Sulfur Dioxide
SPM	Suspended Particulate Matter
VOC	Volatile Organic Compounds
<Others>	
AAS	Atomic Absorption Spectrometer
AEROS	Atmospheric Environmental Regional Observation System
AQS	Air Quality Standards
ATIS	Adsorbent Tube Injector System
CEN	European Committee for Standardization
DB	Data Base
EIONET	European Environment Information and Observation Network
EU	European Union

FID	Flame Ionization Detector
GC	Gas Chromatograph
GPT	Gas Phase Titration
IC	Ion Chromatograph
ISO	International Organization for Standardization
JCC	Joint Coordinating Committee
MFC	Mass Flow Controller
MRC	Certified Reference Materials
MW	Micro Wave
QA	Quality Assurance
QC	Quality Control
QM	Quality Manual
SOP	Standard Operation Procedure
STAS	Standard de Stat
UK	United Kingdom of Great Britain and Northern Ireland
US	United States of America
UV-VIS	Ultraviolet-visible Spectrophotometry

Chapter 1

Outline of the Project

1. Outline of the Project

1.1 Background of the Project

Romania has joined the EU in January of 2007. Before its accession, Chapter 22 (Environment) of "Acquis Communautaire" was pointed as one of the delayed parts in their improvement, and strengthening of environmental management capability is important issue for Romania.

Under such circumstances, the Romanian government decided to establish the National Reference Laboratory (NRL) to set up the nationwide air quality monitoring system and manage the monitoring system.

Finally, the National Environment Protection Agency (NEPA) was established under the Ministry of Environment and Waters Management (MEWM, the Ministry of Environment and Sustainable Development(MESD) at present), and Monitoring, Synthesis and Coordination General Department consist of NRL and Monitoring Directorate (MD) was established under the NEPA. The department becomes to manage the nationwide monitoring implemented by 42 local environment protection authorities (LEPA).

1.2 Project Purpose, Overall Goal and Outputs from the Project

Project purpose and overall goal of the project are as follows.

Overall Goal

Air quality monitoring system with reliable accuracy is introduced and disseminated to all LEPAs for monitoring the national air quality level.

Project Purpose

To strengthen the air quality monitoring capability of the Monitoring, Synthesis and Coordination General Directorate of NEPA (the National Reference Laboratory (NRL) and Monitoring Directorate), and supporting ability to LEPAs

The expected six outputs from the project are as follows.

The expected six outputs from the project

Output 1: Standard Operation Procedure (SOP) according to the EU and the Romanian standards relating air quality monitoring is developed and disseminated to LEPAs' laboratories

Output 2: NRL performs Air Quality Monitoring correctly according to SOP.

Output 3: NRL equipment is properly maintained and managed by laboratory staff themselves with aim of acquisition of accreditation of ISO17025.

Output 4: Air quality monitoring data is accumulated and properly managed in order to make use of environmental policy and to open to public etc.

Output 5: NRL and Monitoring Directorate of NEPA prepare guideline for air quality monitoring strategic plan of LEPAs.

Output 6: NRL staff is able to organize training programs for LEPA staff.

1.3 Target Area and Implementing Organization

Counterpart organizations are NRL and MD, and main project office is located at NRL in Bucharest and most of the activities were implemented at the laboratory of NRL.

Adding to these, neighboring LEPAs were invited to the three times of the technical seminars which were implemented during the project, and cross check program was conducted at the monitoring stations of Bucharest LEPA, and Giurgiu and Cluj Napoca LEPAs were visited for investigations.

Implementing organization of the project is shown in Figure 1.3-1.

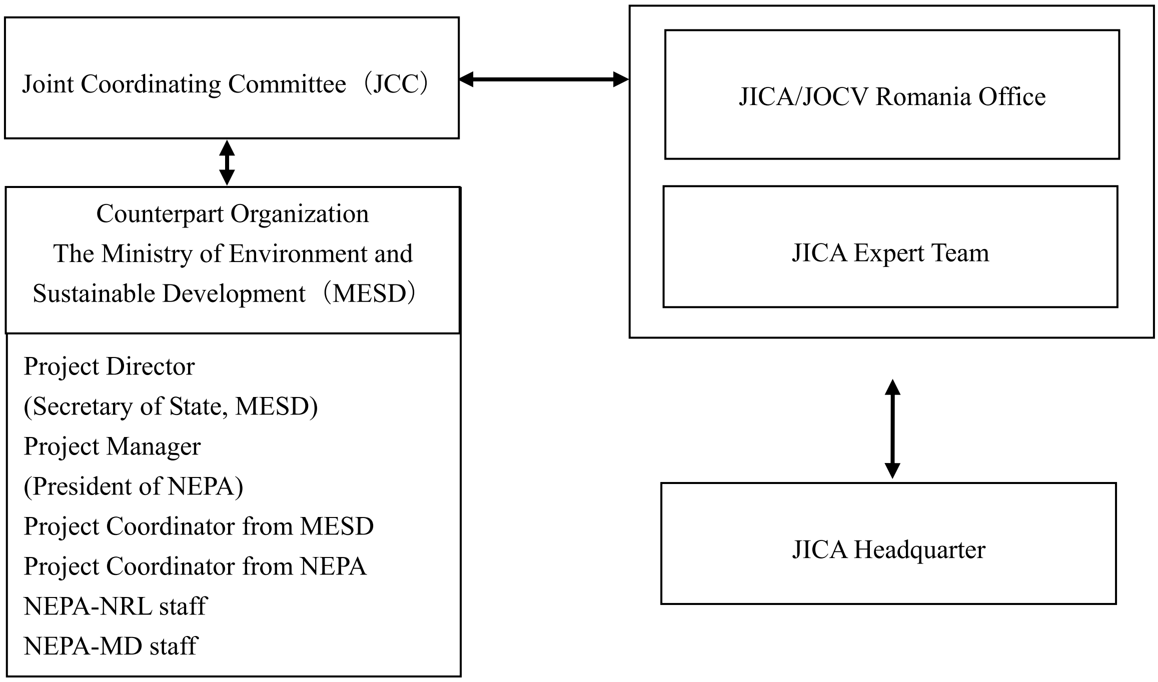


Figure 1.3-1 Implementing Organization of the Project

1.4 Project Period

The project was implemented for one year and eleven months from January, 2007 to November, 2008. The JICA expert team arrived at Romania on 21st January, 2007 as the first time, and left on 22nd November, 2008. The experts stayed in Romania and implemented technical cooperation activities for totally 39.09 men-months.

1.5 Project Administration

The experts had close communication with each counterpart and implemented technical cooperation during their stays in Romania. The MESD called the members to the Joint Coordinating Committee (JCC) meetings at appropriate timing. The expert team and the counterpart team reported the progresses of the project and the attendants of the meetings had discussions on necessary issues to be solved at each time aiming smooth promotion of the project.

Date and major issues discussed in the meetings of JCC are shown in Table 1.5-1.

Table 1.5-1 Holding Meetings of Joint Coordinating Committee

Meetings	Date	Major Issues to be Discussed
Discussions on The Project Documents	29th January, 2007	Explanation and discussions on the project document Assignments of the counterpart team members
The First JCC Meeting	30th May, 2007	Approval of the project document
The Second JCC Meeting	9th October, 2007	Explanation, discussion, and approval of the first progress report Change of equipment to be purchased
The Third JCC Meeting	22nd February, 2008	Explanation, discussion, and approval of the second progress report Agreement on the monitoring activity implementation plan
The Fourth JCC Meeting	14th July, 2008	Explanation, discussion, and approval of the third progress report Discussion on the end of the project
The Fifth JCC Meeting	18th November, 2008	Explanation and discussions on the draft final report of the project

1.6 The Experts and the Counterparts in Charge of Each Field

The names of the experts and the counterparts in charge of each field are shown in Table 1.6-1.

Table 1.6-1 The Experts and the Counterparts

Working Field	The Romanian Counterparts	The Japanese Experts
Team Leader/ Air Quality Monitoring	Ms. Crina HOTOIU Ms. Iulia NEACSU Ms. Corina RUGINA Ms. Patricia LUNGU Ms. Antonia DUMITRESCU (Jan.2007-Mar.2008) Mr. Vlad Ioan GHIUTA TARALUNGA (Jan.2007-Jly.2008)	Mr. Akeo FUKAYAMA
Monitoring Equipment	Ms. Violeta BALACEANU Ms. Elena TIGARIDIS	Mr. Toshiharu OCHI
Laboratory Management	Ms. Rodica MURESAN (Jan.2007-Mar.2008) Ms. Iulia NEACSU Ms. Adrian ZLATAN (Jly. 2008-)	Dr. Mitsuru FUJIMURA
Laboratory Equipment (AAS)	Ms. Cristina NEGULESCU (Jan.2007-Mar.2007) Ms. Mioara SERBAN Mr. Cristian CAPITANESC (Sep.2007-) Ms. Mirela TARBASANU (Sep.2007-Feb.2008)	Mr. Natsuji SAWAKI

	Ms.Cristina NEDESCU (Apr.2008-)	
Laboratory Equipment (UV-VIS)	Ms. Alina ILIE Ms.Adriana ZLATAN (Dec.2007-)	Mr. Natsuji SAWAKI
Laboratory Equipment (GC)	Ms. Luminita POPESCU	Ms. Naomi MAEDA
Laboratory Equipment (IC)	Ms. Alina ILIE	Ms. Naomi MAEDA
Monitoring Database	Ms. Corina CRISTEA Ms. Mihaela CALIN (Jan.2007-Feb.2007) Ms. Corina RUGINA Ms. Patricia LUNGU Ms. Antonia DUMITRESCU (Jan.2007-Mar.2008) Mr. Vlad Ioan GHIUTA TARALUNGA (Jan.2007-Jly.2008)	Mr. Fumihiko KUWAHARA
Coordinator	Ms. Rodica MURESAN (Jan.2007-Mar.2008)	Mr. Atsushi MURAI

Chapter 2

Achievement of the Project

2. Achievement of the Project

2.1 Overall Goal and Project Purpose

The overall goal is "Air quality monitoring system with reliable accuracy is introduced and disseminated to all LEPAs for monitoring the national air quality level." The achievement is evaluated by the following indicators.

1-1. All LEPAs perform air quality monitoring on regular basis according to the monitoring strategic plan formulated by themselves by 3 years after the completion of the project.

1-2. Results of the air quality monitoring is continuously issued and opened to public as an annual report by NEPA.

2. All the LEPAs are able to monitor/ analyze air quality under the quality control based on the EU standards by 3 years after the completion of the project.

The SOPs and the training programs of NRL are prepared and will be disseminated to all LEPAs and installation of the automated continuous monitoring stations will be accomplished within 3 years, and the regular air quality monitoring will become possible in all LEPAs.

The annual report will be amplified when the automated continuous air quality monitoring network becomes to be operated earnestly.

NRL will disseminate QA/QC based on the EU standards to LEPAs, and most of the LEPAs will be able to survey and monitor air quality based on QA/QC.

According the above indicators, the overall goal will be generally achieved.

The project purpose is "To strengthen the air quality monitoring capability of the Monitoring, Synthesis and Coordination General Directorate of NEPA (the National Reference Laboratory (NRL) and Monitoring Directorate), and supporting ability to LEPAs". The achievement is evaluated by the following indicators.

1. NRL's supporting mechanism for LEPAs is ready to work.

2. NRL can perform the air quality monitoring according to the EU and the Romanian standards.

3. NRL can conduct organized and authorized training program.

The SOPs and training programs for several samplings and analysis methods were made, the preparations for acquiring accreditation of ISO17025 were set forward, the technical seminars for LEPAs were held, and the supporting mechanisms for LEPAs are prepared.

The SOPs according the EU and the Romanian standards were made, and it was confirmed that NRL staff can implement air quality monitoring following the procedures in the SOPs.

The training programs for the analysis procedures following the EU standards were made and implemented.

According the above the indicators, the project purposes were generally achieved.

2.2 Outputs

The expected six outputs from the project are as follows.

Output 1: Standard Operation Procedure (SOP) according to the EU and the Romanian standards relating air quality monitoring is developed and disseminated to LEPAs' laboratories

Output 2: NRL performs Air Quality Monitoring correctly according to SOP.

Output 3: NRL equipment is properly maintained and managed by laboratory staff themselves with aim of acquisition of accreditation of ISO17025.

Output 4: Air quality monitoring data is accumulated and properly managed in order to make use of environmental policy and to open to public etc.

Output 5: NRL and Monitoring Directorate of NEPA prepare guideline for air quality monitoring strategic plan of LEPAs.

Output 6: NRL staff is able to organize training programs for LEPA staff.

The output 1 is evaluated by the following indicators.

1-1. SOPs according to the EU and the Romanian standards authorized by NEPA

1-2. Seminars/Workshops for LEPAs about Standard Operation Procedure are held by NRL.

Ten types of SOPs according the EU standards were made and NRL staff made explanations on the SOPs to LEPAs staff at the 2nd and 3rd technical seminars, and the output 1 is achieved.

The output 2 is evaluated by the following indicators.

2-1. Air quality samples are properly collected and analyzed based on SOP during the project implementation period.

2-2. Air quality parameters are properly analyzed and calibrated based on SOP during the project implementation period.

2-3. Cross checks for the basic parameters (ex. CO and O3) are introduced.

Implementing sampling, analysis and calibration procedures based on the SOPs were confirmed with operational procedure check sheets and cross check for CO and O3 was implemented at the monitoring station of Bucharest LEPA, and the output 2 is achieved.

The output 3 is evaluated by the following indicators.

3-1. All NRL staff maintains the equipment regularly.

3-2. Spare parts and consumable materials management system is established during the project implementation period.

3-3. Chemical reagents are properly stored and cared according to the o/m manual during the project implementation period.

3-4. Liquid and solid wastes from laboratory are properly treated according to the o/m manual during the project implementation period.

3-5. Safety and health control system is established.

3-6. Documentation system is established.

3-7. NRL prepares its budget plan for air quality monitoring.

Equipment list and the maintenance records of equipment (3-1.), spare parts and consumables records (3-2.), and stock management record of chemical reagents (3-3.) were made, and treatment procedures for waste (3-4.) and safety and health care points (3-5.) were written in each SOP. The quality document system was constructed aiming ISO17025 accreditation acquirement, and the documents are managed according documents control procedures (3-6.) and NRL made budget plan of air quality monitoring (3-7.), and the output 3 is achieved.

The output 4 is evaluated by the following indicators.

4-1. Data format and reporting format for air quality monitoring are improved.

4-2. Data management and analysis of air quality monitoring is improved.

Reporting format (station information is added) and analysis of air quality data (average analysis by wind speed classes) were improved, and the output 4 is mostly achieved.

The output 5 is evaluated by the following indicators.

5-1. Guideline for air quality monitoring strategic plan is prepared.

5-2. Explanation meeting of Guideline for air quality monitoring strategic plan is held.

The guideline for air quality monitoring was made and introduced in the seminars, and the output 5 is mostly achieved.

The output 6 is evaluated by the following indicators.

6-1. Training program is developed on needs assessment.

6-2. Training materials are prepared.

6-3. Training by NRL staff themselves is implemented.

Training programs and materials on automated monitor calibration, lead analysis by AAS, and benzene analysis by GC were made, and NRL staff implemented the training on AAS and GC analysis to LEPA staff based on needs assessment, and the output 6 is mostly achieved.

Chapter 3

Activity and Achievement

3. Activity and Achievement

3.1 Baseline Data Collection

3.1.1 Monitoring Equipment（Calibrator／Dilutor）

3.1.1.1 Capability of Counterpart

（Background of Monitoring Equipment）

Romania, with the assistance of the EU, has been engaged in a process of setting up automatic air quality monitoring stations in each major city in the country since 2007. By combining new stations with stations that already exist in several cities, the country plans to construct a national automatic air quality-monitoring network in one go.

Although the density of the network is not as great as that of advanced countries, it will form a comparable observation framework for accurate measurement.

The items to be measured have been specified by Romania, and they also match the items EU specifies.

Because the number of measuring stations in the country is to increase in one go, it is necessary to transfer the technology to the new personnel who will maintain the additional stations. To that end, measuring networks operated by local authorities are scheduled to receive technical guidance from the manufacturers before the start of full-scale operation. After the start of full-scale operation, each measuring station is to receive accuracy controls under the annual maintenance plan in accordance with the legislations and standards by the EU.

The outcome of the maintenance control for the measuring network depends to a great extent on the controlling local authority's budget or organizational system for maintenance. This means differences in operating capability will emerge over time, with attendant variances in the accuracy of air quality measurement between local authorities. One parameter for minimizing this difference is the need for legal clarification of the position of the upper organization of the local authorities and their accuracy assurance system in the traceability scheme.

Used in cooperation with Local Environmental Protection Agency (LEPA) of each local authority of county that runs the automatic air measuring network, equipment owned by NRL—affiliates of National Environmental Protection Agency (NEPA)—could potentially help in maintaining uniform, highly accurate measurement all over the country. It has therefore been decided that JICA should provide support in this technical category.

When the project started, the 2 Romanian counterparts, Ms. BALACEANU and Ms. TIGARIDIS, had the basic knowledge of chemistry with little practical experience in this category. They already had a basic operational knowledge of the Dilution / Calibration Equipment, because they translated the manuals into Romanian language, thus deepening their understanding of the analyzers. In spite of the limited information available in Romania, they have increased their technical knowledge by taking technical training courses in Romania and by inquiring technicians from the analyzer manufacturer who visit them from time to time.

3.1.1.2 Equipment

Table 3.1-1 through Table 3.1-3 show the lists of the NRL equipment that was provided by Phare project (that was supported by European Union) and JICA project for this technical category.

Table 3.1-1 Monitoring Equipment owned by NRL (Supplied by the EU)

No.	Equipment name	Model	Number	Usage
1	Diluting calibration system with zero gas generator and compressor	ORION EDA-2000 (AIR-2000)	1	This fixed diluting system dilutes the standard gases from cylinders with zero air, and provides the diluted gas to automatic analyzers for its calibration. This system is also used for the calibration of O3 analyzer and the efficiency test of NOx analyzer by producing the O3 standard gas.
2	Portable dilutor	ORION OGD-2000PT	1	Ditto (Portable model)
3	O3 generator	UNITEC OZON3000	1	This instrument is a transfer standard device for O3 analyzer, and used for its calibration by providing the known concentration of O3 standard gas.
4	Standard gas cylinder	LINDE, SIAD	>10	Standard gases for Air quality monitoring station

This equipment precisely provides the standard gases to the automatic air quality analyzers for their calibration.

This equipment enables us to verify the measurement accuracy of analyzers and is used as a reference gauge. It is the core device for NRL in controlling the measurement accuracy in air quality monitoring throughout the nationwide network.

Table 3.1-2 Monitoring Equipment that NRL can use (Supplied by the EU)

No.	Equipment	Model	Number	Usage
1	SO2 analyzer	ML 9850B	1	Concentration measurement in Air. (To check the Dilutor performance mostly at NRL)
2	NOx analyzer	ML 9841B	2	
3	CO analyzer	ML 9830B	1	
4	O3 analyzer	ML 9810B	2	

Although these automatic air quality analyzers in Table 3.1-2 that were supplied by the EU do not belong to NRL, they are usually stored at NRL as usable devices by NRL. They are indispensable for the performance check of the standard gas supply equipment that is shown in Table 3.1-1.

Table 3.1-3 Provision Equipment from JICA Project

No.	Equipment	Model	Number	Usage
1	Standard flow meter	BIOS ML-500	1	High level standard meter of flow rate
2	Chart recorder	CHINO EL3000	1	Recording of instantaneous analog output from analyzers

The equipment in Table 3.1-3 is mainly used to check the performance of analyzers mentioned above.

3.1.2 Atomic Absorption Spectrometer (AAS)

3.1.2.1 Capability of Counterpart

In the project, it was initially designed that we would have activity with the two counterparts, Ms. NEGULESCU and Ms. SERBAN, who were in charge of the AAS analyses on heavy metals in the air. First, the capability levels were assessed through discussions and AAS equipment was operated to plan the training schedule before the training started.

In the AAS analysis of the heavy metals first the particulate substances sampled (PM10/2.5) were measured and their ambient concentration was determined. Next, these samples were pre-treated and the density of heavy metals in the air was measured using AAS analyzing equipment. At the start of the project, there was an apparent difference in the technical level between the two parties. The main counterpart, Ms. NEGULESCU was a chemist with AAS operation experience while Ms. SERBAN had carried out environmental and chemical analysis in the past, so she had no experience of AAS operation. She had taken part in group trainings on the subject.

Under the situation, on March 1st, due to change of job, Ms. NEGULESCU who was the main person in charge of AAS shifted to the MESD and since June on the expert started the technical training for Ms. SERBAN, the counterpart in charge of AAS. On September 1st, a new NRL staff, Ms. TARBASANU was hired and also the other NRL staff, Mr. CAPITANESCU, who had just finished his long-term vacation and returned to work, were assigned to the project and so there have been three counterparts in October. First of all, the expert had to assess the technical level of the two counterparts in order to decide the purpose of instruction. A basic introduction of the equipment structure and measuring principles was necessary for Ms. TARBASANU, as she was a physical chemist with weights and measures experience, and had no previous experience of environment analysis of chemical analysis. Therefore, the counterpart was at the level at which she needed to learn about the basis of AAS apparatus such as its structure and the principle of its measurement. On the other hand, Mr. CAPITANESCU had taken part in a study trip to Japan by JICA training course and had done AAS analysis of heavy metals in the LEPA in Mehedinti.

However, Ms. TARBASANU was transferred to another position of in the wastes department of NRL at the end of February and two members were left. Then in April Ms. NEDESCU was transferred from another department (CECA) and was assigned to the project. She was a chemist with no previous experience of environment analysis. So there have been three counterparts again from April.

3.1.2.2 Equipment

The materials and equipment concerning AAS analysis are as follows. Most of the materials and equipment were donated by Phare Project of the EU in October 2005 except the chemical hoods. During this project, we purchased as supplementary materials and equipment: a temperature and pressure sensor for microwave; a hydride generation system; cathode lamps for AAS; D2 lamps; graphite tubes; a standard flow meter for the PM10 sampler, etc. The equipment to be used concerning the atomic absorption spectrometer is listed in Table 3.1-4 and Table 3.1-5 to be found below

Table 3.1-4 Equipment for AAS owned by NRL

No	Equipment	Model and Quantity	Object	Delivery Time
1	Water Purification System	SG Ultra Clear TWF	Preparation of Solution	Nov.2005
2	Analytical Balance Precision	Mettler Toledo AX205	Balance for Reagents and Samples	Oct.2005
3	Chemical hood	Asalair Carbo 1800 Combi	Treatment of sample	Jan.2007
4	Clean Bench	Activa Climatic Cabinet AQUARIA SH-2 Girasile	Balance for Filter	Oct.2005
5	PM10 (PM2.5) Sampler	TCR Tecora SentinelPM	Sampling	Nov.2005
6	Microwave(MW)	Milestone Ethos D	Treatment of sample	OCT.2005
7	Atomic Absorption Spectrometer (AAS)	Thermo AAS Solaar S series	Heavy metal Analysis	Oct.2005
8	Cathodes Lamp for AAS	For Cd, Cr, Cu, Pb, Mg, K, Na, Ni and Ca	Heavy metal Analysis	Oct.2005
9	Graphite Tube	2 type 8	Heavy metal Analysis	Oct.2005
10	Standard Solution	Same item of lamp	Heavy metal Analysis	Oct.2005
11	Filter 47mm for PM10	Millipore Approximately 1000sheet	Sampling	Nov.2005
12	Pipette	Eppendolf 2unit	Preparation of Solution	-
13	Volumetric Flask, Glass wear, etc		Preparation of Solution	-

Table 3.1-5 Provision of Equipments for AAS from JICA Project

No	Equipment	Model and Quantity	Object	Delivery Time
1	Temperature and Pressure Sensor for MW	Milestone Ethos D	Treatment of Sample	Mar.2007
2	Hydride Generation System for As	Thermo AAS Solaar VP100	Arsenic Analysis	Feb.2008
3	Cathodes Lamp for AAS	Pb and As	Heavy metal Analysis	Feb.2008
4	Deuterium Lamp for AAS	Thermo AAS Solaar VP100	Heavy metal Analysis	Feb.2008
5	Graphite Tube	3 type 10unit	Heavy metal Analysis	Feb.2008
6	Reagents	As standard, Magnesium per-chlorate etc	Heavy metal Analysis	Mar.2008
7	Standard Flow Meter for PM10 Sampler	TCR Tecora Delta Cal	Check the flow for PM10 sampler	Feb.2008

3.1.3 Ultra Violet Spectrophotometer(UV-VIS)

3.1.3.1 Capability of Counterpart

The counterpart for O3 and NH3 analyses by the UV-VIS is Ms. ILIE. In order to decide the training schedule and the training content of the instruction, the expert first grasped an overview of the real capability of each item in the current situation through meetings and device operations. Because its operation and maintenance were easy, the counterpart w as at the level at which she could conduct a series of operations by herself without looking at the user's manual prepared by the manufacturer.

The reference standard solution used for the analysis was prepared by dissolving the reagent after the weighing, and thereafter, the counterpart had done 5 gradual dilutions from reference standard solution and calibration. The calibration fit of the calibration curve was 0.990 or larger. The counterpart could conduct operation of the safety pipetter without any problem and understood the blank. On December 1st, a new NRL staff, Ms. ZLATAN was hired. So there have been two counterparts from December 2007.

At the start of the project, the analysis could not be conducted because materials and equipment such as the wet sampler for collecting samples, reagents, etc., were insufficient. However, those materials and equipment have now been procured and analysis of ammonia is conducted regularly.

3.1.3.2 Equipment

The materials and equipment concerning UV-VIS analysis are as follows. The main materials and equipment were introduced in October 2005 in the Phare Project of the EU except the UV-VIS equipment that NEPA purchased in December 2006. However, at the start of the project, though we had UV-VIS equipment, we had no sampling apparatus (wet sampler) or reagents. Therefore, we, as the project, purchased a pH and conductivity meter, a technical and an analytical balance, a stirrer, a hot plate, thermometers, Bunsen burners, and a dry oven, which are the sampling equipment and multi-purpose equipment for laboratories. The equipment used concerning UV-VIS is listed in Table 3.1-6 and Table 3.1-7 below.

Table 3.1-6 Equipment for UV-VIS owned by NRL

No	Equipment	Model and Quantity	Object	Delivery Time
1	Ultra Violet Spectrophotometer	Thermo Nicolet Evolution 100	Ammonia analysis	Dec.2006
2	Laboratory pH/Conductivity Meter	Thermo-Orion 720	Preparation of Solution	Mar.2007
3	Ultrapure Water Manufacturer	SG Ultra Clear TWF	Preparation of Solution	Nov.2005
4	Analytical Balance	Mettler Toledo AX205	Preparation of Solution	Oct.2005

Table 3.1-7 Provision of Equipments for UV-VIS from JICA Project

No	Equipment	Model and Quantity	Object	Delivery Time
1	Wet Sampler	Desaga GS312	Sampling	Aug.2007
2	Laboratory pH／Conductivity Meter	Thermo-Orion 720	Preparation of Solution	Mar.2007
3	Analytical Balance	KERN ABJ220-4M	Preparation of Solution	Mar.2007
4	Technical Balance	KERN EW1500-2M	Preparation of Solution	Mar.2007
5	Hotplate／Magnetic Stirrer (Single)	VELP Italia AREX	Preparation of Solution	Mar.2007
6	Hotplate	Gerhardt HT 43	Preparation of Solution	Aug.2007
7	Dry Oven	Memmert Universal Ovens UFE500	Drying of grass wear	Jun.2007
8	Thermometer	OMNILAB	Preparation of Solution	Mar.2007
9	Bunsen Burner	OMNILAB	Preparation of Solution	Mar.2007

3.1.4 Gas Chromatograph (GC)

3.1.4.1 Capability of Counterpart

The counterpart for gas chromatography (GC), Ms.POPESCU, generally has enough experience to implement series of operations such as basic start up and measurement of GC analyzer. At the beginning of the project, passive sampling (diffusive sampling) was tested by using adsorbent tube for thermal desorption due to the absence of sampling pumps for repair.

NRL has only a few GC operations a month because NRL has no duty of routine analysis. Calibration curve was prepared by local agent personnel using the traceable standard material. Regarding the verification for benzene stock solution was tested by the counterpart.

The standard documents of analysis, from SR EN-14662-1 to 14662-5, were already available. Although passive sampling method of SR EN-14662-2 was mainly considered by the counterpart, active sampling method: SR EN14662-1:2005, "Ambient air quality - Standard method for measurement of benzene concentrations - Part 1: Pumped sampling followed by thermal desorption and gas chromatography" was suggested as the analysis standard by the expert. This proposal was agreed between the counterpart and the experts. The counterpart sufficiently had both knowledge about the standard method and the ability to calculate concentration.

NRL had already started the preparation for acquisition of ISO laboratory accreditation, but SOP drafting process was made during the early period of the project.

3.1.4.2 Equipment

The system of gas chromatography delivered in 2006 consisted only of the main unit and major accessories necessary for analyzer. There were not enough parts or consumables like Syringe or ferule. Table 3.1-8 indicates the equipments for GC analysis owned by NRL.

Table 3.1-8 Equipment for GC Analysis owned by NRL

No	Equipment	Manufacturer, model	Q'ty	Application
1	Thermal desorption system	Manufacturer, Thermal TD	1 unit	Sample induction from adsorbent tube to GC
2	Gas chromatograph	Agilent, 6890N	1 unit	Main unit
3	FID detector	Agilent, FID	1 unit	Detection
4	PID detector	Agilent, PID	1 unit	Detection
5	Auto sampler	Agilent, 7683ALS	1 unit	Liquid sample induction
6	Hydrogen generator	CLAIND, HG2200	1 unit	For FID
7	Nitrogen generator	CLAIND, HG2381	1 unit	Carrier gas
8	Tube conditioning system	WATLOW, Condition System	1 unit	Tube cleaning
9	Sampling pump	TCR TECORA, DELTA wireless Sampler	1 unit	Tube sampling
10	Thermal desorption tube	Markes, C-UN010	6 pcs.	Benzene sampling

Mainly, the spare parts for GC analyzer and adsorbent tubes for thermal desorption were considered to be purchased by the Japanese side for GC operation at the beginning of the project. However, the equipment owned by NRL was insufficient. As the procedure of NRL to obtain the budget took much time, other necessary equipment and materials such as nitrogen gas necessary for the operation were also purchased by the Japanese side, which is shown in Table 3.1-9.

As the sampling pump owned by NRL was not adequate to collect samples according to the qualification of EN14662-1, a new sampling pump with constant flow was also purchased by the Japanese side. In addition, the adsorbent tube injector system (ATIS) and other necessary equipments to obtain the calibration curve by more than 5 points were purchased. All the equipment purchased by the Japanese side was delivered one year after the start of the project.

Table 3.1-9 Provision Equipment for GC Analysis from JICA Project

No	Equipment	Description	I'd
	Purchased equipment in the 1st fiscal year		
1	GC capillary column	GC-column, DB-35ms	1
		GC-column, DB-5ms	2
		GC-column, DB-1ms	2
2	GC maintenance kit (Agilent)	Column cutter	4
		Ferule, graphite	1
		Column connector	2
		Column nut	2

		FID cleaning kit	1
		Flow meter	1
		Gas-tight syringe, 10 μl	2
		Syringe, 10 μl	2
		Syringe, 100 μl	1
		Gas-tight syringe, 500 μl	1
		Laboratory tool kit	1
	Purchased equipment in the 2nd fiscal year		
1	TENAX collection tube	Universal/TO-17/2 tubes, 3 beds C-UN010	30
		C-DLS10	80
		1/4 inch long-term caps	80
2	BTX standard	BTX on TENAX TA, 25 nag	1
3	Constant flow sampler	NPL sampling pump	1
4	Injector (ATIS)	Adsorbent tube injector system	1
4-2	Nitrogen gas	for injector	1
		Regulator	1
4-3	NIST standard solution	Benzene solution, NIST3000	1
		Toluene solution, NIST3000	1
5	GC accessories (1)		
	5-1 Thermometer	Mercury thermometer, 0 - 400 deg.	1
		Case	1
	5-2 Tubing parts	Teflon tube, 6 mm	2
		Teflon tube, 1/8 in.	8
		Seal tape, 10 m	5
		Cupper tube for ATIS, 2.5 m, 1/8 in.	1
		Reducer, 1/4 to 1/8 in.	1
		Union, 1/8 in.	2
		Nut, 1/8 in.	7
		Back front ferule, 1/8	20
		Ball valve, 1/8	1
	5-3 Tools	Mini tube cutter	1
		Spare edge for cutter	1
		Twin mouth wrench, 1/2 - 9/16	1
		Twin mouth wrench, 7/16 - 1/2	1
		Monkey wrench, 19 mm	1
		Hexagonal wrench, 3/16	1
6	GC accessories(2)		
	6-1 N2 gas	N2 gas cylinder	1
		Regulator	1
	6-2 Pure air	Pure air cylinder	1
		Regulator	1
	6-3 Desiccant	Magnesium per-chlorate	1

3.1.5 Ion Chromatograph (IC)

3.1.5.1 Capability of Counterpart

Ms. ILIE is the counterpart of ion chromatography (IC), and the counterpart is also in charge of UV-VIS. There are several ICs in the whole country of Romania, and the counterpart had ability to conduct a series of analysis.

At the beginning, the eluting solution was purchased from a reagent manufacturer, but at early stage, the counterpart started to make it from reagents by herself. The counterpart has also known the necessity of a degassing. The standard solution was prepared by 5-step dilution of concentrated standard stock solution which was purchased from Merck Co. Ltd. The counterpart was also familiar with how to use a safety pipetter, and had knowledge about blank tests. The coefficient of correlation of the calibration curve (regression) was about 0.90.

The counterpart measured nitrogen dioxide and sulfur dioxide in the air by using a diffusive sampler (passive sampler), and compared their results with the measured data by automatic analyzers. In Romania, a wet sampling and absorption photometric analysis is adapted, and IC method is not an official analysis method.

However, it was decided that the passive sampler continued to be used for data processing and quality control since the counterpart had already had ability to conduct basic operation of analysis with it.

3.1.5.2 Equipment

The equipment related to IC analysis is shown in Table 3.1-10 and Table 3.1-11.

Table 3.1-10 Equipment for IC Analysis owned by NRL

No	Equipment	Manufacturer, model	Q'ty	Application
1	Ion chromatograph	Metrohm, 761 Compact IC	1 unit	Main unit
2	IC separation column	Metrohm, Metrosep A Supp 4-250	1 pc.	
3	Auto-sampler	Metrohm, Auto-sampler 813	1 unit	Sample introducing device

Table 3.1-11 Provision Equipment for GC Analysis from JICA Project

No	Equipment	Description	Q'ty
Purchased equipment in the 1st fiscal year			
1	IC separation column	Metrohm, MetrosepA supp 4 250	1
2	Guard column	Metrohm, MetrosepA supp 4 4/5 Guard	1
Purchased equipment in the 2nd fiscal year			
1	Passive sampler (1)	Diffusive body, code120-1 Chemiadsorbing cartridge, code 166 Chemiadsorbing cartridge, code 172 Chemiadsorbing cartridge ,code 168	160 80 40 40
2	Passive sampler (2)	Ogawa type, Long-term sampler Impregnated filter, for NO2, for SO_2 SO_2 diffusion tube, 5 mm	12 1pc each 6
3	Passive sampler (3)	Handy SONOx Polyethylene bag, with fastener Polyethylene bottle	12 1 30
4	Glassware	Tweezer Volumetric flask, 50 ml Safety pipetter (silicon rubber) Beaker	2 1 1 2

3.1.6 Laboratory Management

3.1.6.1 Capability of Counterpart

An acquisition of the laboratory accreditation of ISO/IEC 17025 was emphasized by Mr. GHERHES, the former President of NEPA in the project document discussions held at the time of the project start, and thus was described into M/M. The theme to support "laboratory management" in this project was decided to advance in form to contribute to the acquisition of ISO accreditation in NRL through preparation support activities as well as to improve general laboratory management.

The person in charge of application preparations for ISO/IEC 17025 in NRL was Ms. MURESAN. Ms. HOTOIU, Director of NRL and Ms. NEACSU, Chief of Air Laboratory of NRL were also involved in this project from the standpoint of management of the whole laboratory. However, Ms. MURESAN resigned from her position suddenly in April, 2008 and moved to a LEPA. Therefore Ms. ZLATAN succeeded from July, 2008.

NRL already employed a consultant in December 2006, began preparations, and received some advices from the consultant such as an application procedure for obtaining the assessment and preparation of various documents. And the main documents which relate to the ISO quality management were almost prepared by June, 2007 to mention it later. Afterwards, the standard operating procedure (SOP) of each testing method was made, and a document review and preparation of starting the concrete management items were performed.

3.1.7 Monitoring Database

3.1.7.1 Capability of Counterpart

The counterparts completely understood the data format and reporting format determined in the EU.

The counterparts understood overall characteristics of air pollutants, and had fundamental knowledge about management and analysis of data. Furthermore, the counterparts wished to improve the criteria about the error check of data by introducing the related information based on Japanese experience.

3.1.8 Monitoring Guideline

3.1.8.1 Capability of Counterpart

The counterparts related to the guideline for air quality monitoring strategic plan were three staff members of MD, Ms. LUNGU, Ms. DUMITRESCU and Mr. TARALUNGA as well as Ms. RUGINA, director of MD.

Ms. RUGINA is very familiar with the monitoring plan, and instructed her staff and quickly provided the necessary materials to the expert when he requested, and had discussions with the expert.

More experience of model simulation will be preferable and useful for MD staff in the future to investigate the monitoring plan.

However, it was confirmed that model simulation itself and inventory were not included in the targets of the project at the first JCC meeting, and only the monitoring stations positioning using simulation model and evaluation methods of simulation model were included in the monitoring guideline.

3.2 Support for SOP Making (Output1)

3.2.1 Monitoring Equipment（Calibrator／Dilutor）

3.2.1.1 Activity

We accomplished the objective of the creation of SOPs for three instruments as planned. They are for Diluting calibration system, Portable dilutor, and O3 generator.

We began the technical instruction in September 2007 by demonstrating the performance and operation of these three instruments. After the Romanian counterparts understood the fundamentals, the expert started the technical training for them. Consequently, the Romanian SOPs (ver.1) for these three instruments were completed in June 2008 as a compilation of summarized information. The details of the activities and progress for each instrument are described in Section 3.3.1.1.

The created SOPs for three instruments included not only the vital operating procedures, but also the instructions and interpretations that the counterparts had learned throughout the trials and errors up to this point. Therefore, they resemble 'Operational Manual'. Thus, we made Version 2 of SOPs by collecting, editing and sorting the operation procedures out of Version 1 SOP in October 2008.

The format of the final SOPs was planned to conform to 'SR EN 14211/2005 and SR EN ISO/CEI 17025: 2005'. In May 2008, the Romanian counterparts had created a tentative SOP on NO gas calibration in the designated format, however incomplete it was due to the lack of technical details. The final SOPs should include the summarized contents of Version 2 SOPs.

3.2.1.2 Achievement

The attached document shows the Romanian SOPs (Version 1) of three instruments. Since only a few components require the periodical maintenance in any instruments, we integrated the description of operation and maintenance procedure into a single SOP document for each instrument.

The content structure of each of three SOPs can be the same, since they are commonly used for analyzer calibration or test. Table 3.2-1 shows the Table of Contents from Version 1 SOP on the left and that from Version 2 SOP on the right.

Table 3.2-1 Table of Contents of SOPs

No.	Ver.1	Ver.2
1	Usage	Purpose/Scope
2	Connections 2.1 Power line/Electric signals 2.2 Pneumatic line	Summary 2.1 Specification 2.2 Construction
3	Power-up	Flow of Operational Procedures
4	Construction/Function of each parts	Preparation 4.1 External Connections 4.2 Power-up
5	Operation	Operation Describes the operating procedure by using 'NO standard gas introduction' as a typical example. 5.1 Setting Calibration Conditions 5.2 Data Recording 5.3 Test procedures of analyzer performance (Linearity, Response time, Repeatability, and Drift)
6	Instructions	Data Reduction (Calculation/Data Rejection)
7	Test procedures of analyzer performance 7.1 Linearity 7.2 Response time 7.3 Repeatability 7.4 Drift	Maintenance 7.1 Periodical maintenance (Maintenance log book, Consumables list, Safety and health management) 7.2 Calibration by upper grade traceability
8	Periodical maintenance 8.1Replace the consumables /Maintenance/Waste treatment 8.2 Performance test	-

3.2.2 Atomic Absorption Spectrometer (AAS)

3.2.2.1 Activity

As for analysis of lead which is a heavy metal in the air, the expert provided their Romanian counterparts from PM10 sampling to AAS furnace method analysis technique. At the start of creation, the procedure was mostly occupied by details of the accessories that were used, as well as the performance and the specification of the apparatus, and the portion regarding operation was small. Therefore, the expert supported creation checking for each of the actual operation processes one after another. In addition, the expert produced technical references that could help with the creation of the SOP, handed them to the counterparts, and created the SOP in cooperation with each other. When the references were produced, the expert described the items of concern and the operations in detail so that the counterpart could operate following the references produced. The expert also produced the references to make them understandable by inserting photos for visual effect. The names of the technical references that were prepared while the expert was providing technical instruction are as follows.

- Operation manual of PM10 Analysis
- PM10 Analysis Field Book
- Microwave digestion and Operation Procedure
- Standard Solution Preparation Procedure
- Principle of the Atomic Absorption spectrophotometer
- Graphite Tube Replacement Procedure

As an example, the Operation manual of PM10 Analysis will be described below

3.2.2.2 Achievement

In late June 2007, the first version concerning the SOP for analysis of PM10 and PM2.5 by the gravimetric method and analysis of Pb in the air by AAS were completed, whereby achievement was obtained (Annex 1.6 and 1.7). From now on, the content of the operations will be improved as the technical level will be improved. Therefore, we are planning to continue revising and updating the SOP by reflecting the improved content in the SOP.

Operation Manual of PM10 Analysis

Figure.1 Filter Stable

1. Check the amount of water for humidity adjustment.
2. Turn the switch of the steady-temperature and humidity apparatus to the left, and turn on the power of the switch located at the lower portion of the apparatus.
3. When the apparatus becomes stable at a temperature of 20ºC and humidity of 50%, its alarm starts to sound. Then, stop the alarm.

Figure.2 Filter（Before Sampling）

4. Arrange the paper filters as shown in Figure.1, picking them up one after another each by its corner so that none of them overlaps with another.
5. After maintaining the paper filters for 48 hours or more in a state where the temperature is 20ºC and the humidity is 50%, turn on the electronic scale.
6. Weigh the paper filters and fill in the record form with the weight of the paper filters.

Figure.3 Putting the holders in cartridge

7. Pick up each paper filter by its corner and put it in the holder (Figure. 2).
8. Fix the paper filters by carefully putting the upper lid of the holder on them such that no hole is made in the paper filters
9. Set the paper filter holder to the cartridge for the PM10 automatic sampler (Figure. 3).

Figure.4 Seted the holders in cartridge

10. Set the holders for sampling and set three holders for travel blank to the cartridge (Figure. 4).

11. Set on the right cartridge for sampling and set on the left of the cartridge for reception after sampling (Figure. 5).

12. After setting, check again that the cartridge is set without air leakage.

Figure.5 Set the cartridge in PM10 automatic sampler

13. Connect the tube to the cartridge for sampling.

14. Set the flow (38.4 [L/min]) and the sampling program of the PM10 sampler.

15. Because the sampler starts sampling at 0:00, check next morning whether the apparatus is working normally or not.

16. After the sampling term has finished, operate the apparatus to move all the paper filter holders into the cartridge on the right.

17. Use the top two holders on the cartridge as the travel blank. Do not use the third holder for analysis because it stops during sampling.

18. Remove the cartridges from the sampling apparatus

Figure.6 Set the cartridge in PM10 automatic sampler

Figure.7 Remove the holders

Figure.8 Dring paper filters

Figure.9 Samples

19. Remove the holders one by one using the accessory to remove the holders (Figure. 7).

20. Remove carefully the paper filters from the holders. While doing this, take care not to break the paper filters and not to lose the samples.

21. Pick up the white portion of each paper filter one by one using the tips of the tweezers, and put the paper filters in the steady-temperature and humidity apparatus so that the paper filters do not overlap with each other (Figure. 8).

22. Turn the switch of the steady-temperature and humidity apparatus to the left and, next, turn on the switch located in the lower portion of the apparatus.

23. When the apparatus becomes stable at a temperature of 20ºC and humidity of 50%, its alarm starts to sound. Then, stop the alarm.

24. After maintaining the paper filters in a state of above 23. for 48 hours or more, turn on the switch of the electronic scales

25. Weigh the paper filters and fill in the record form with the weight of the paper filters.

26. Pick up the white portion of each of the paper filters with the tips of the tweezers and move the paper filters into the paper filter storage container (Figure. 9).

3.2.3 Ultra Violet Spectrophotometer(UV-VIS)

3.2.3.1 Activity

In January 2008, the expert purchased passive samplers for ozone and ammonia and, in February, started to provide instruction for analysis of ozone using the passive sampler testing method. In addition, based on the agreement in the JCC held in February 2008, the monitoring activity implementation plan was started in March 2008 and Ms. ILIE and Ms. ZLATAN started to conduct analysis of ammonia in the air.

3.2.3.2 Achievement

The person in charge was also in charge of IC analysis and conducted IC analysis with priority. The SOP for ammonia analysis using UV-VIS was completed at the end of September, whereby achievement was obtained (Annex 1.8). From now on, the content of the operations will be improved as the technical level will be improved. Therefore, the experts are planning to continue revising and updating the SOP by reflecting the improved content in the SOP. In addition, analysis of hydrogen sulfide (H_2S) is usually not conducted and H_2S will be measured only for emergency events; however, it has not been measured so far. Currently, the SOP for H_2S analysis using UV-VIS was completed in November 2008.

3.2.4 Gas Chromatograph

3.2.4.1 Activity

(1) Orientation of SOP drafting

Initially, the draft of SOP principally consisted of the details, performance and specification of the equipment used and there were few descriptions on GC operation and the sampling procedure. Therefore, each step of analysis operation was checked by the expert when drafting the SOP.

As two sampling methods (SR EN14662-1 and SR EN14662-2) were included together in the SOP draft elaborated by the counterparts, it was advised in July, 2007 by the expert that one of two methods should be chosen. The decision that GC SOP would be based on SR EN14662-1, was made by discussion between the counterparts and the expert.

(2) Decision for procedure of drafting

The pump was returned to NRL from repair service in September, 2007, and sampling by the pump started. However, the series of measurement began in November, 2008 just after equipment purchased by the Japanese side was delivered. Then preparing SOP started, but it took much time on the drafting process.

As learning routine operation was useful to draft SOP, first, the purchase and preparation of equipment necessary for measurement, from sampling to data arrangement was trained by the expert. Then, the preparation of glassware such as a pipette and a volumetric flask, weighing benzene, diluting procedure by methanol, adsorption method, GC measurement, data analysis, and arranging calculation sheet etc, were also transferred by the expert.

(3) Operations for GC software

There is no description on the operation of GC software in the operation manual written in Romanian by the manufacturer. Therefore, the operation of GC analysis software was also transferred by the expert so that the counterpart can operate it. It was advised by the expert that operating method of the software should be also included in the SOP and the document about data processing method was translated into Romanian.

(4) Quality control and record of the control

Quality control such as measurement of operational blank and field blank, was included in the technical assistance from the expert. It was advised by the expert that the method of the control should be included in SOP.

Usage record and maintenance record sheet were also prepared, which cover the number of GC measurement (sample, standard, blank), column used, maintenance by the local agent or analysts, the name of the operator, the date and the time of measurement etc. It was advised that the column used should be numbered and the column record sheets should be prepared, also that these records should be noted every day such as measurement period, parameter measured, the length of cutting, the name of analysts etc, need to be noted as well.

(5) Dissemination for SOP

For the purpose of dissemination of SOP drafted, two presentations were done in the technical seminars by the counterpart. The drafting method, contents included and points to be reminded for SOP were the main theme in the second seminar of February 2008 and the tasks to be solved were clarified. In the third seminar of July 2008, the main theme was the sampling and making a calibration curve.

3.2.4.2 Achievement

The first version of draft SOP was completed under the technical transfer from the expert in parallel with the technical assistance for analysis operation.

(1) Detailed procedure for SOP drafting

According to the (result of) discussions between the expert and the counterparts, the SOP for GC was based on SR EN14662-1. The SOP covered more specific operational procedure necessary for the counterparts to operate alone.

The analytical method is as follows: First, the sample air is aspirated with the pump into adsorbent tube, and the tube is put into the auto sampler of GC analyzer. The measured component is thermally desorbed and introduced through column into the FID detector.

The details of each process of the analysis were attached after main text of SOP as Annexes. The purpose of the technical assistance is not only drafting of SOP but also enhancing the analytical skills of the counterparts. The content of SOP for operation was divided mainly into sampling, preparation of tube, making of calibration curve, GC analysis, and data analysis. The description of GC software operation was added by the counterpart.

As a result of the training program in Japan, the counterparts recognized the importance of interference, sample storage, environment in laboratory, quality control, uncertainty, safety measures and waste management etc. However the way to incorporate these items into SOP was unclear. The seminars identified the problems remained and contributed greatly to develop the SOP.

(2) Record of quality assurance

Blank samples are measured in every sampling and a repeated test has been implemented monthly from March 2008. The method to obtain the standard deviation of the measurement data, and the criteria and method for the quality assurance should be also written in the SOP for the future.

Usage record was introduced after the counterpart acquired the analytical skill and the analysis logs have been kept. The column history sheet, the column exchange record and the analyzer dairy check sheet were prepared by the counterpart together with the expert. These descriptions were parts of completed SOP Version 1. The SOP can be improved more by reflecting amendments in SOP and by elaborating the contents with more detailed manner in order to obtain the same results by any analysis.

3.2.5 Ion Chromatograph(IC)

3.2.5.1 Activity

Regarding the ion chromatograph (IC), a passive sampler method had been used for measurement from the beginning of the project, and in the fall of 2007, a draft of the SOP was almost completed. The SOP, whose title was ‘Measurement Procedures for the Determination, through the Ion Chromatograph Method, of Nitrogen Dioxides and Sulfur Dioxide Concentrations in the Ambient Air’, was translated into English, and the content was reviewed by the expert. After the discussion about the details, the expert advised to prepare the list of consumables for maintenance of the IC and for the pretreatment, daily checklists for the IC system, calculation sheets, records of the use, and so on.

3.2.5.2 Achievement

In the fall of 2007, the counterpart had written more than 20 pages of SOP by herself. It included the preface, the specification and instruction of the equipment, sampling method, and the preparation of reagents. The latter half part also started to be prepared, which contained the condition of the analysis, operating procedure, data handling, accuracy check, and quality assurance. The counterpart originally included a way of checking of the concentration change and how to cope with the problem as a part of the quality control procedure. This indicates that the counterpart had understood that these items were important for ISO 17025.

At first, there were too many pages which described the specification of the IC machine and the devices in the SOP. The SOP it also contained details of the operation procedure along the actual operation flow, for example, the installation of sampling shelters and so on. In June 2008, the counterpart revised the whole of this draft document, and completed the Ver.1. Following the advice from the expert, several topics such as the maintenance method, consumables, dairy checklists, and annual check items were added. This improved the SOP and made it more solid in content. In the future, it is necessary to clarify the way of detecting the abnormal measurement data, and to add more items of analysis.

3.3 Supporting Capacity Development of Air Quality Monitoring (Output 2)

3.3.1 Monitoring Equipment（Calibrator／Dilutor）

3.3.1.1 Activity

The expert technical support in this category was provided over four separate occasions and 3.87 months in the total duration on site. Following the initial activities in the first dispatch in January 2007 that introduced some new instruments, actual technical support activities had started in September 2007.

The main activities in this category have been done in NRL instrument room to enhance the operating skill of the counterparts. Our supplemental activities included the presentation in a technical seminar and the Crosscheck test at a monitoring station in Bucharest LEPA.

Many troubles that persisted in some instruments using the EU funds, and our technical support progressed in the four stages shown in Figure 3.3-1.

Train Basics	→	Examine the components/ knobs and controllers/ function/operating procedure of instruments. Check the analyzer performance. Create the maintenance log books.	→	Identify the trouble points. Check the analyzer performance.	→	Repeat practice. Create SOPs

Figure 3.3-1 Activity Flow of Technical Transfer

Regarding project targets, acquisition of the technology by the counterparts for operating and maintaining the main holding equipment is virtually complete, as is the preparation of documents, SOP. In addition, the counterparts have become accustomed to the basic test procedures. Malfunctioning equipment has been identified and there is now an environment in which analyzers can be checked using only equipment in good condition. The existence of malfunctioning equipment was a factor that hindered progress, but it also increased the perceptiveness of Romanian counterparts as they figured out the problems. This problem thus had a favorable impact.

Concerning the repair of malfunctioning parts, the NRL's policy was that repairs should be carried out under the guarantee contract between NRL and the supplier—this being the representative in Romania. The expert helped to identify malfunctioning parts but dismantling to investigate the cause, adjusting, and repairing were not allowed. However, based on the identification, NRL took the necessary steps to repair the parts.

The following section describes the technical assistance that has progressed during periods when the experts have been dispatched, as well as the monitoring tests Romanian counterparts carried out in the expert's absence.

A number of devices listed in Table 3.1-1 to Table 3.1-3 were used and the progress and remaining problems for each device or theme are shown.

Crosschecks and seminars conducted outside NRL are shown in separate sections.

(1) Basic knowledge

Before handling equipment, expert explained the common basics (Table 3.3-1) for each instrument.

Table 3.3-1 Training Contents (Basic Knowledge)

Sep. 2007	From Jun. to Jul. 2008	Oct. 2008
<Lesson> Basics in electronic circuit, Unit conversion, Flow rate and Standard condition conversion, Traceability, Nature of toxicity/ Explosion/ Absorption of standard gases, Guaranteed period of standard gases , Material and Maximum length of pneumatic tube, Measured data analysis	<Lesson> Calculation of dilutor flow rate setting Linear regression expression <Exercise> Measurement of the instantaneous analog current of output channel	None

<September 2007>

Dilutors are fed standard gas and zero air, which they mix in a given proportion to generate diluted calibration gas. The relationship between the conditions at introduction, such as temperature, atmospheric pressure, flow rate, and generating concentration (including unit conversion) was explained using a standard condition conversion formula or dilution formula.

Because the standard gas to be handled is a highly-pure air-polluting gas, there is a danger of harmful effects on the operator's health if it is released into the atmosphere of the room. The expert showed the allowable limit for this gas, and while he familiarized the counterparts with the calculation by having them calculate it for the instrument room as an example, he cautioned them about safety management at the same time. He also explained the appropriateness of piping materials by the difference in the degree of adsorption or resolvability with the gaseous species and described the difference in the amount of time a concentration takes to stabilize during measurement.

In the future when NRL coordinates measurement accuracy control, it is highly likely that malfunctioning devices will need to be checked. In such case it will be necessary to make an admission decision after investigating the cause. Bearing this in mind, the fundamentals of electronic circuits, such as the basics of microcomputer and signal flow were explained.

<June to July 2008>

The proficiency of the counterparts has improved through the actual operation of equipment conducted in the former period, so during this period some supplementary points that had been lacking were explained. As explained later, a problem arose in that due to the poor performance of the portable dilutor the actual gas concentration generated differed from the calculated concentration. To deal with such cases, the counterparts were trained to generate the desired concentration by anticipating the abnormality when calculating the set value of the flow rate. Instruction and advice on a method for calculating a set value by transforming a diluting formula were provided.

Because it was not previously possible to measure the analyzer's analog electric current output using a digital volt meter, the accuracy of the measured values to be transferred to the diluting calibration system was discussed during this period. The counterparts learned how to use a digital volt meter and how to set output signals.

Some review was made to enhance comprehension in October 2008.

(2) Diluting calibration system (with zero air generator)

This equipment manufacturer won the contract for carrying out the field work for constructing the monitoring network with the assistance of the EU. This device, labeled "Dilutor" in the following diagram of the diluting calibration system, receives the zero air and standard gas, dilutes them to a given concentration, and supplies them to the automatic air analyzer.

This device also converts instantaneous analog concentration data from the analyzer to digital data and displays it on an external PC. However, it doesn't only function as the intermediary for the signals. Its built-in software can also automatically switch the kind of standard gas, the introduced concentration, and the interval of the introducing gas, and can organize the performance test data based on the response obtained from the analyzer and automatically write a report.

The dilutor's height exceeds two meters, but its performance is not so different from the specifications of an ordinary dilutor when one looks at the grade of the mass flow controller used on the equipment or the total supplied flow rate. Automatic performance testing is viewed as an advantage of this device.

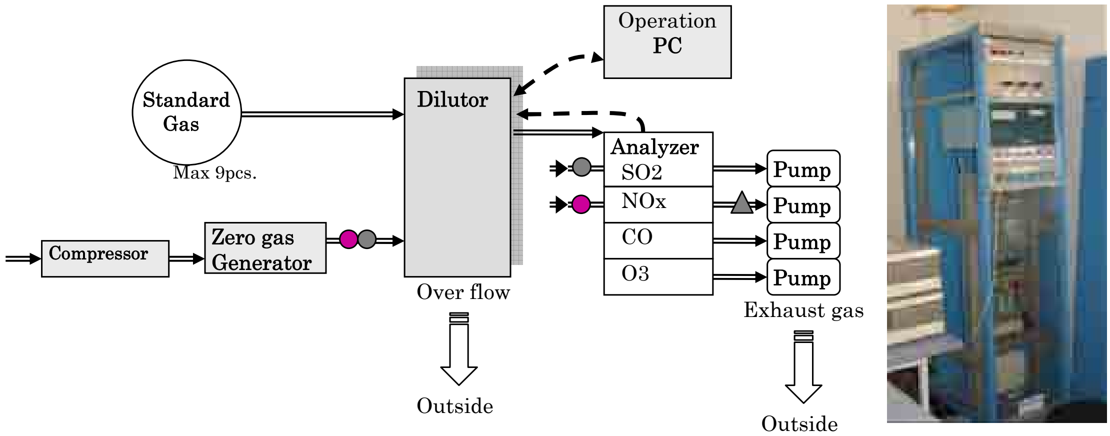


Figure 3.3-2 Block diagram of Diluting calibration System

The technical transfer has almost completed through the activities. The troubles existed in this system were fixed by the manufacturer.

Table 3.3-2 Training Contents (Diluting Calibration System)

Jun. and Sep. 2007	From Mar. to May 2008	From Jun. to Jul. 2008	Oct. 2008
<Lesson> Components, Function, Diluting calculation Performance and control of Mass flow controller, Maintenance points, Zero point calibration and deterioration of absorbent, Maintenance log book, Relative official law and test procedures of analyzer performances, GPT method, Revision of the Operating manual (Romanian version) <Exercise> Soft ware operation, Setting and Control, Auto/manual operation, Standard gas generation, Response comparison between higher/lower concentration standard gas, GPT operation Trouble shootings; Disagreement with expected value, O3 generator malfunction, etc.	Monitoring period Examination of the current performance and usable range of this system through the performance test of SO2 and NOx analyzers.	<Lesson> GPT operating procedure <Exercise> GPT operation, Confirming the maximum concentration of O3 generating, Readout adjustment of indicated concentration on PC screen. <Others> Create the version 1 SOPs	Creation of the performance test report and version 2 SOPs

<January 2007>

In past training by the manufacturer, Romanian counterparts gained an understanding of the procedures for operating the equipment in an automatic mode or for saving data files and so on. But presumably due to defective software, they did encounter some glitches or operating difficulties.

Because the model was not familiar even to the expert, one day was devoted to checking its construction, performance, and function together with the counterparts.

When for a practical purpose the standard gas was supplied to the NOx analyzer in an automatic mode, defects in stability and repeatability were observed. Because it had been confirmed that this system had a standard mechanical construction for a dilutor, the cause of the trouble seemed to be due to a design error if it was not a simple mechanical one. We invited a technician from the representative to look into it, but the trouble was not dealt with at that time.

Although we had a manufacturer's manual, it was very lengthy and was written in Italian. We had it translated into Romanian to make it available to the counterparts, but only in the middle of February after the expert had returned to Japan.

<September 2007>

This period was almost the point when the technical assistance was scheduled to begin. As an elementary training session, the mechanical construction, performance of the device, and the functions of the various parts were learned, comparing the device with the flow diagram. Owing to the translated manual, both the counterparts and the expert had made a considerable progress in understanding how to use the computer software.

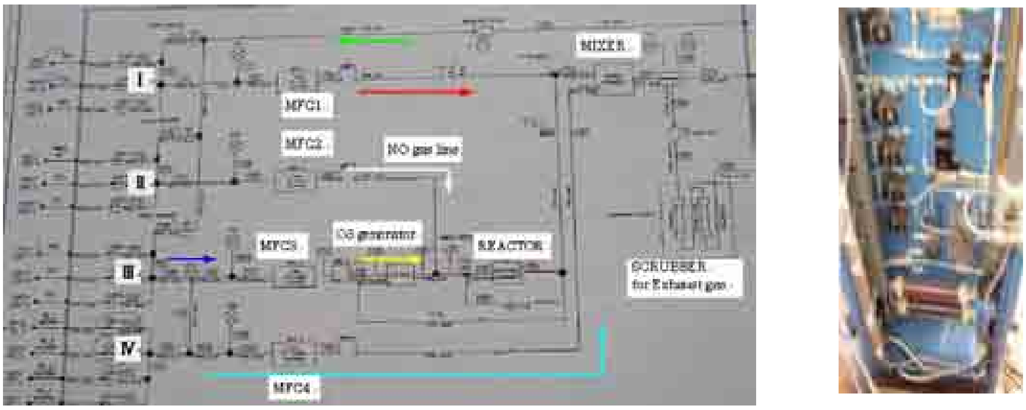


Figure 3.3-3 Flow-path of Diluting Calibration System

Probably due to the length of the piping from the dilutor, it took an abnormally long time for the concentration to stabilize (response time) when introducing the standard gas to the analyzer after generating the diluting gas. Because the time set for the performance test in automatic mode was short, the test ended automatically just when the response of the analyzer stabilized and we were ready to collect data. This meant that the test would end before any results could be obtained.

When this flaw was discovered, the expert switched to training the counterparts in manual operation. In automatic operation, a trainee tends to easily accept results obtained without much consideration. This is not desirable in training at an initial stage. The expert concluded that in manual operation, the operator must check each result against the instruction she issued to the dilutor to verify the operation. This will deepen understanding of the dilutor.

The procedure for setting conditions manually was discussed and confirmed on the PC display.

The permissible range of the pressure sensors and temperature sensors and the reason for their existence were also explained. Understanding of circuits and controls gradually deepened.

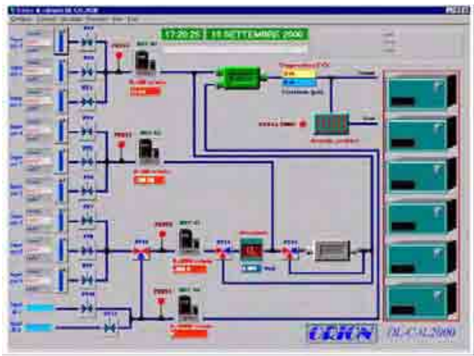


Figure 3.3-4 Parameter Setting Screen

We used to confirm the expected concentration of generated standard gas to see the result from an automatic calculation so far, but a manual calculation was necessary since we could not use the automatic calculation software under the manual mode at all. Thus, the expert introduced the diluting equation so that we could record the test conditions and test results in an Excel sheet when tests were performed under the manual mode.

$$Y = \frac{a}{a + b} \times X$$

where:

Y is the generated concentration (ppb)

X is the standard gas concentration indicated on the label of standard gas cylinder (ppb)

a is the flow rate of the standard gas that goes through the MFC1 (ml/min)

b is the flow rate of the zero air that goes through the MFC4 (ml/min)

The following is an example of the record sheet used for introducing the standard gas to a NOx analyzer manually.

NOx Analyzer Serial No. M2206-M905 Original setting Gain 2.359

The record of response under introducing NO standard gas 03-Sep-07 2.363

Span gas setting Ⅰ	
NO Cylinder Conc. (ppm)	75.9
MFC02 (St. gas flow rate) (ml/min)	32
MFC03 (Dil. air flow rate) (ml/min)	3000
Introducing time (min)	20

Response Ⅰ				
Date	25/09/07	26/09/07	27/09/07	28/09/07
Measured Conc. NO (ppb)	782	773	789	855
Measured Conc. NOx (ppb)	783	779	783	
Expected Conc. NO (ppb)	801			
Gain	2.103			
Offset NO	0.0001			
Offset NO2	0.0003			

Span gas setting Ⅱ	
NO Cylinder Conc. (ppm)	75.9
MFC02 (St. gas flow rate) (ml/min)	32
MFC03 (Dil. air flow rate) (ml/min)	100
MFC04 (Dil. air flow rate) (ml/min)	2900
Introducing time (min)	20

Response Ⅱ			
Date	25/09/07	26/09/07	27/09/07
Measured Conc. NO (ppb)	783	778	802
Measured Conc. NOx (ppb)	784	783	804
Expected Conc. NO (ppb)	801		
Gain	2.103		

Span gas setting Ⅲ	
NO Cylinder Conc. (ppm)	75.9
MFC02 (St. gas flow rate) (ml/min)	32
MFC03 (Dil. air flow rate) (ml/min)	1000
MFC04 (Dil. air flow rate) (ml/min)	2000
Introducing time (min)	20

pressure dropped at 2nd gauge

Response Ⅱ			
Date	25/09/07	26/09/07	27/09/07
Measured Conc. NO (ppb)	783	777	794
Measured Conc. NOx (ppb)	784	782	795
Expected Conc. NO (ppb)	801		
Gain	2.103		

	Span gas setting Ⅳ	Low concentration Cylinder			
	NO Cylinder Conc. (ppm)	540			
	Date	25/09/07	26/09/07	27/09/07	
Before pu	Measured Conc. NO (ppb)	329			
ditto	Measured Conc. NOx (ppb)	337			
After purg	Measured Conc. NO (ppb)	401	357	575	350
ditto	Measured Conc. NOx (ppb)	404			
		0.748148		573	2nd
					3rd
					4th

increased after removing the filter case

decreased even after purging again!

Figure 3.3-5 NOx Analyzer Response for NO standard Gas in Manual Introducing

The abnormality in Repeatability was rather a question, although there was some difference observed between the analyzer response and the expected value. We could not determine whether the cause of trouble is in the dilutor side that generated the calibration gas or in the NOx analyzer side that indicated the gas concentration at that time. Thus, we continued our equipment performance test by introducing the standard gases to another analyzer CO and SO2 one by one.

The following is the response record for introducing the CO standard gas.

CO Analyzer Serial No. M2230-M561 Original setting Gain 0.726

The record of response under introducing CO standard gas

Span gas setting Ⅰ		
CO Cylinder Conc.	(ppm)	1997
MFC01 (St. gas flow rate)	(ml/min	61.3
MFC04 (Dil. air flow rate)	(ml/min)	3000
Introducing time	(min)	20

Response Ⅰ			
Date	26/09/07	27/09/07	
Measured Conc. CO (ppm)	39.2	39.03	
Expected Conc. CO (ppm)	40.0		
Gain	0.738		

Span gas setting Ⅱ		
CO Cylinder Conc.	(ppm)	1997
MFC01 (St. gas flow rate)	(ml/min	61
MFC03 (Dil. air flow rate)	(ml/min)	100
MFC04 (Dil. air flow rate)	(ml/min)	2900
Introducing time	(min)	20

Response Ⅱ			
Date	26/09/07		
Measured Conc. CO (ppm)	39.5	41.2	
Expected Conc. CO (ppm)	40		
Gain	0.738		

Span gas setting Ⅱ		
CO Cylinder Conc.	(ppm)	1997
MFC01 (St. gas flow rate)	(ml/min	61
MFC03 (Dil. air flow rate)	(ml/min)	1000
MFC04 (Dil. air flow rate)	(ml/min)	2000
Introducing time	(min)	20

Response Ⅲ			
Date	26/09/07	27/09/07	
Measured Conc. CO (ppm)	40.23	40.6	
Expected Conc. CO (ppm)	40		
Gain	0.738		

Span gas setting Ⅳ	Low concentration Cylinder	
実施日	26/09/07	2007/9/27
CO Cylinder Conc. (ppm)	20.2	
Expected Conc. CO (ppm)	16.56	20.03
	17.06	17.95

Filter case set on analyzer

NO filter case

Figure 3.3-6 CO Analyzer Response for CO Standard Gas in Manual Introducing

Because the repeatability of the CO analyzer was good, the diluting performance of the dilutor was also good. Therefore, there was a high likelihood that the NOx analyzer was unstable. However, it was found that the filter case (a case installed immediately before the inlet of the analyzer for the filter that removes dust from the sampling gas) was also a contributing factor to the bad repeatability.

Unexpectedly, the expert found that if the standard gas was introduced through the case, the concentration would undoubtedly become unstable. Following this discovery, use of the filter case was terminated.

In the course of reaching this conclusion, various attempts were made to investigate the cause. For example, the possibility of a leak or clogging in the piping connections was investigated and a flow rate check was carried out to check whether the mass flow controllers were malfunctioning.

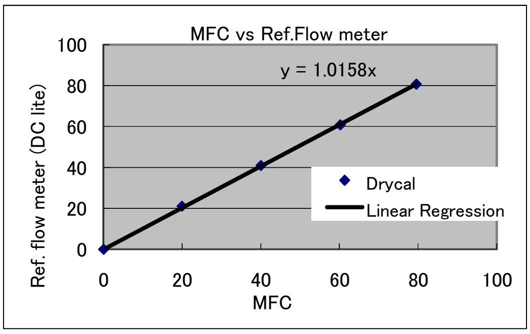
As a result, the controlling accuracy and linearity of the two mass flow controllers in the dilutor was found to be good and no problems were uncovered.

Through this test, Romanian counterparts were beginning to understand the procedure for the flow rate check. It was also understood that the mass flow controller of this device indicated the flow rate under the condition of "0°C and one atmospheric pressure."

The Figure below shows the test results for the flow rate control of the two mass flow controllers, one on the standard gas side and the other on the diluted gas side. For verification, a standard flow meter from JICA was used.

X Diluter MFC (1atm, 0 ℃)	St.Flowmeter	Y St. condition conversion (1atm, 0 ℃)	
MFC 02	Drycal	Drycal	
0	0	0	ml/min
19.92	23.1	21.0	
39.99	44.9	40.9	
60.16	66.7	60.8	
79.49	88.5	80.6	

Measuring condition P (psi) 0.02
T (℃) 27



X Diluter MFC (1atm, 0 ℃)	St.Flowmeter	Y St. condition conversion (1atm, 0 ℃)	
MFC 04	Drycal	Drycal	
0	0	0	ml/min
2007	2208	2012	
4009	4425	4032	
6006	6617	6030	
8003	8814	8032	

Measuring condition P (psi) 0.02
T (℃) 27

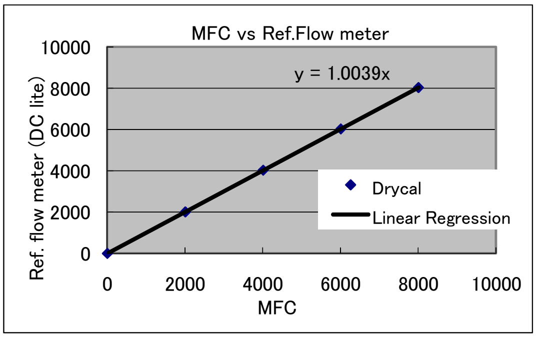


Figure 3.3-7 Flow Test Results for 2 Mass Flow Controllers

The main function of the dilutor is to dilute the standard gas in a cylinder. Another special operation is "GPT operation." By introducing NO standard gas to the dilutor and specially operating the built-in O3 generator, NO2 gas is generated via a chemical reaction of NO and O3. The purpose of GPT operation is to use this series of operating procedures to calibrate the O3 analyzer and establish the converter efficiency of the NOx analyzer.

The procedure for GPT operation was explained and actual operations were carried out. However, actual concentration of the generated O3 was at best 70 ppb, which is not sufficient for the usually required concentration of over 400ppb. The performance of the O3 generator was found to be insufficient.

At about this point, the representative attempted to repair the device but as of September 2007, the generator remained defective.

Between those performance confirmations or trouble shootings, transfer of the knowledge shown in Table 3.3-2 was carried out.

Major knowledge had been transferred and the remaining necessary tasks were proficiency enhancement and learning through trial and error via actual operation in the performance test of the automatic analyzer.

Meanwhile, a list of problems was presented to the representative through the chief of NRL and remedial actions were requested.

<March to May 2008>

Every month during the periods when the expert was absent, the counterparts carried out standard gas introduction tests for the SO2 analyzer and the NOx analyzer. These tests are called monitoring tests and their contents were proposed by the expert and aimed at the enhancing the proficiency of the counterparts' operation of the equipment.

A linearity fault was encountered, in which the indicator's value dropped at low concentration levels, and the expert offered advice by e-mail regarding methods for introducing standard gas or sampling. When tested again the results were the same. There were no problems in the operating procedure of Romanian counterparts. It was reconfirmed in June 2008 that the cause was the poor performance of the NOx analyzer. Throughout this period, Romanian counterparts showed progress in the areas of data reduction and analyzing the causes of problems. The results of the monitoring tests are shown in (6) automatic air quality analyzer, below. The linearity fault was reconfirmed in October 2008.

<June to July 2008>

During this dispatch period, the expert offered guidance in GTP operation and accuracy of transferred output, while the first version of the SOP was written.

Figure 3.3-8 Renovated System

The repair by the representative had been carried out during the expert's absence. This fixed defects in the operating software and the exchange of the O3 generator's circuit.

There had been a software problem in that when a certain set value was input manually on the display another set value was changed. That had been rectified. The defect in the driving circuit for the O3 generator that is used in GTP operation had also been repaired. This was tested and the GTP operation was successfully carried out. A satisfactory enough O3 concentration of up to approximately 400ppb was obtained.

This enabled calibration or sensitivity confirmation of the O3 analyzer. The NOx analyzer, on the other hand, was still in bad shape.

The monitoring result the counterparts carried out until last month had showed bad linearity in the NOx analyzer, but it was also reconfirmed that this device's repeatability was not good.

In order to calibrate the O3 analyzer using the GPT method, the first step is to calculate the O3 concentration using a normal NOx analyzer. At present, the dilutor's GPT function operates but cannot be used for calibration.

On the other hand, during this period a rack for the automatic analyzer, a suction pump, and additional adsorbent were installed on the NRL's budget. The external view has changed as shown in the photograph here.

Furthermore, piping has been completed to enable exhaust gas from the system or the analyzer to be discharged out of the room. Through this, the danger of tests using a highly concentrated standard gas causing bodily harm to the operator in the room has been greatly reduced.

Furthermore, an annual maintenance log book for this device has been drawn up by picking up maintenance points.

<October 2008>

A check-up of the linearity fault in the SO2 analyzer and preparation of the draft for the performance test were made. The working procedure for SOP was defined, and ver.2 of the document was also made.

（3） Portable Dilutor/O3 Generator

These two devices are needed when NRL conducts performance tests on equipment in the local monitoring network, but they are supplementary to the equipment intended for the training program.

Therefore, it was decided that the training for these devices would be carried out after the diluting calibration system, which is the main equipment, was understood significantly—i.e. from June 2008.

Because these two models were not familiar to the expert either, their construction, performance and functions of the various parts were checked together with the counterparts.

Through these activities, technology transfer has been completed. As for the performance deficiencies that existed on both devices, the defective points have been identified and now their repair or adjustment is anticipated.

Both sides discussed the rough plan of SOP Ver.2 with organized procedures.

This section provides some brief descriptions of the devices and a list of the technologies transferred.

Details of the activities are provided in 2) Equipment Preparation of (6) Crosscheck Test.

The crosscheck tests were carried out using both of these devices.

1） Portable dilutor

This equipment is provided by the same manufacturer with the diluting calibration system. It is a portable type dilutor with the same functions as the system.

It has the same design concept. It is easy to understand as it is compact with only one standard gas line.

Although it is small, it seemed that its diluting performance is almost the same as the diluting calibration system.

While existing dilutors in the marketplace introduce standard gas almost automatically once the various conditions and desired concentration is set, this is fully manual and requires more procedures.

Table 3.3-3 Training Contents (Portable Dilutor)

Sep. 2007	From Jun. to Jul. 2008	Oct. 2008
None	<Lesson> Components, Function, GPT operation, Examination about substance of operation manual <Exercise> Operation and Settings, Standard gas generation, Maintenance points Maintenance log book creation Trouble shootings; Disagreement with expected value, Flow measurement of mass flow controllers <Others> Crosscheck test, Version 1 SOPs creation	Version 2 SOPs creation


Figure 3.3-9 Portable Dilutor (Left)/O3 Generator (Right)

2) O_3 Generator

This is used for calibrating the O3 analyzer.

Its function is merely to generate O3 standard gas by irradiating zero air with ultraviolet rays. However, because the representative is providing the relationship between the ultraviolet intensity and generating concentration as the calibration chart, it functions not only as a generator, but as a calibrator.

There are differences between the description in the manual of the manufacturer and the description of the representative, who made the evaluation of the calibration chart, and operational discrepancies remain.

Table 3.3-4 Training Contents (O3 Generator)

Sep. 2007	From Jun. to Jul. 2008	Oct. 2008
None	<Lesson> Components, Function, Examination about substance of operation manual The significance of adjusting the line pressure <Exercise> Operation and Settings, Standard gas generation, Maintenance points Maintenance log book creation Trouble shootings; Misinformation about pressure setting values in calibration sheet <Others> Crosscheck test, Version 1 SOPs creation	Version 2 SOPs creation

(4) Automatic Air Quality Analyzers

These are analyzers that automatically and continuously measure the air components, for which air quality standards are set and continuous monitoring is required.

The performance of a dilutor can only be evaluated by measuring equipment, so these analyzers are indispensable for controlling the accuracy of the diluting equipment.

However, this program does not cover the detailed maintenance operation of the analyzers or preparation of SOP. In this project, technological assistance is limited to the technologies necessary for the work of the analyzers in checking the performance of the diluting equipment.

Technology transfer has been completed mostly through these activities and we were able to identify the defective analyzers. Defective analyzers are scheduled to be sent for repair one by one. The following table outlines the activities.

Table 3.3-5 Training Contents (SO_2 analyzer)

	Sep. 2007	From Mar. to May. 2008	Jun. 2008	Oct. 2008
SO2 Analyzer	<Lesson> Measurement method, Components, The kinds of interferences, Control parameters, Menu structure, Instructions, Maintenance points, The meaning of indicated information, The kinds of alarms, instantaneous and averaged data, Output reading adjustment, Calibration and the change of sensitivity, Maintenance log book creation, The necessity of recording the log book, the information obtained from measurement data, General explanation about maintenance work in monitoring station. <Exercise> Standard gas introducing, Repeatability test, Examination of influence from filter case, Response comparison between higher/lower concentration standard gases, Recording the values of parameters, Making the analog signal cable, Pins allocation on analog output connector.	Monitoring period Performance test	None	Checking the linearity trouble

Table 3.3-6 Training Contents (NO_x, CO, O_3 analyzer)

	Sep. 2007	From Mar. to May. 2008	From Jun. to Jul. 2008	Oct. 2008
NO_x Analyzer	<Lesson>Same contents as SO_2 analyzer The time lag based on the method of NO and NO_x alternating measurement. Converter efficiency and GPT method Periodical purging of standard gas cylinder <Exercise>Same contents as SO_2 analyzer	Monitoring Period Performance test	<Exercise> GPT operation Reconfirmation of trouble phenomenon	None
CO Analyzer	<Lesson> Same contents as SO_2 analyzer <Exercise> Same contents as SO_2 analyzer	None	<Exercise> Output reading adjustment and its necessity <Others> Crosscheck test	None
O_3 Analyzer	<Lesson> Same contents as SO_2 analyzer <Exercise> None (Some Troubles happened in diluting calibration system)	None	<Exercise>ditto GPT operation <Others> Crosscheck test	None

<September, 2007>

Because it was necessary to understand the analyzers from the ground up, the expert explained the principle, construction, and functions of various parts of each analyzer.

An understanding of the internal construction will facilitate later explanation and in addition will be helpful in the future when NRL investigates to find defective parts. For this reason, the counterparts observed the interior of the analyzer with the cover removed and compared the line connections against the drawings in the manual. At the same time, they identified parts that require maintenance.

The expert explained the operating parameters of the analyzer such as “temperature, pressure, flow rate, voltage, etc.” and gave a basic idea of the feedback and control of each sensor signal.

Learning points relating to information on the screen display were menu structures and procedures for viewing operating parameters or alarm information from the menu.

The expert explained the relationship between the output items and the pin configuration of the output connectors, the method for distinguishing between instantaneous values and averaged values, and the method for adjusting transferring current of output.

As of this point, Romanian counterparts have acquired a basic understanding of the analyzers.

These analyzers can only be used for a performance check of dilutor if maintained properly. Therefore, Romanian counterparts prepared a maintenance log book for each analyzer in cooperation with the expert. As an example, the table below shows a part of the maintenance log book for the SO2 analyzer.

Table 3.3-7 Portion of Maintenance Log Book for SO2 Analyzer

NRL **Analizor de masurare a aerului Registru de intretinere**			Analizor SO2 ML9
Frecventa de intretinere	**Intretinere**	**valori de referinta**	**Data**
de fiecare data	Meniu Instrument Status		
	Debit de gaz (SLPM)	0.4 – 0.7	0.65
	Presiune gaz (Torr) (Presiunea din interiorul celulei)	500 – 800	
	voltaj de referinta (V) (putere lampa UV)	1.0 – 4.0	
	Conc. Voltage (V) (output celula)		
	Ground Offset (diferenta de voltaj cu impamantare intre placi)	200 – 330	
	tensiune ridicata (PMT) (V)	690 – 710	
	curent alimentare lampa	34 – 40	
	Meniu Preprocessor Pots (valoare digitala)		
	zero de masurare (dur:electric zero)		
	zero de referinta		
	gain de masurare		
	gain de referinta		
	Valoare masurata de proba? (Test Measure)		
	Ajustare tensiune ridicata (PMT)		
	ajustare curent lampa UV		
	Meniu Temperatures (° C)		
	Temperatura celula	47 – 52	
	Temperatura analizor	15 – 55	
	Temperatura racitor	10	
	Calibrare zero (deviatie ±2ppb) Calibrare span (deviatie ±5%)		
	Factor zero NO2 (Zero Offset)		→
	Factor span(Instrument Gain)		→
1 luna	Schimbare filtre de proba (47 mm 5μm)		
	Timer		
	Noise (ppb)		
	Alimentare Analog (V)	12	
	Alimentare digitala (V)	5	
	Verificarea Pozitie zero cu cilindrul de aer zero		

The operating parameters for each analyzer were opened and recorded in the maintenance log book as the operating conditions at that moment.

Since then, Romanian counterparts have autonomously recorded the results whenever they operated the analyzer and it stabilized. They have checked the backlogs of consumables and spare parts and arranged them in a list.

Following this, they introduced standard gas into the analyzer, referring to the items of the basic performance test in the EU standard, and learned about satisfactory response performance. They have also gained an understanding of the meanings of calibration, zero coefficient, and gain coefficient.

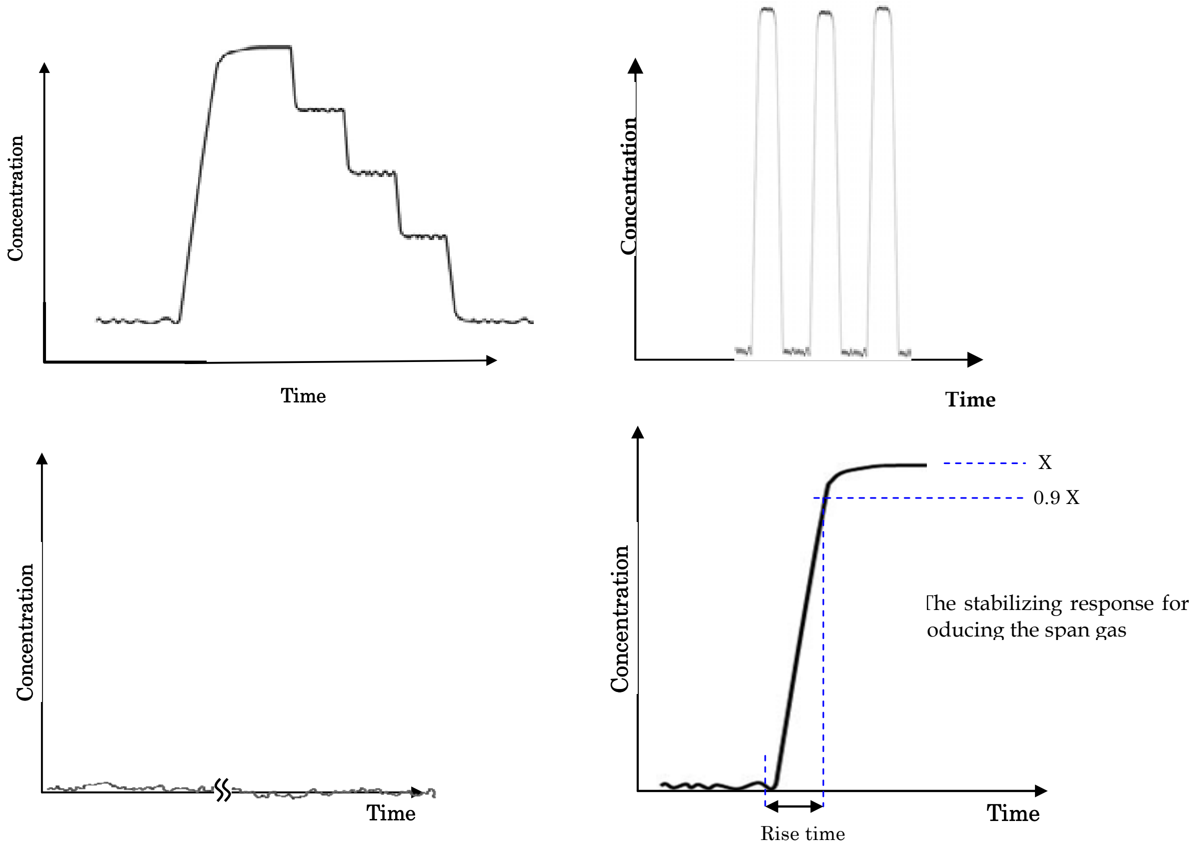


Figure 3.3-10 Performance Test (Linearity, Repeatability, Drift, Response Time)

While a device's display information is indispensable in deciding whether an analyzer's operation is right or wrong, the gained data will also bring important findings.

The expert showed an example air quality measurement and referred to the data comparison between measurement items such as NO and O3, as well as a data comparison between a number of monitoring stations.

While this knowledge did not directly relate to the device's operation, these lectures were carried out in consideration of the fact that this eye for data would become necessary when NRL has to make a reliable decision during a performance test for a local monitoring network. These lectures were given during the actual operation of a device.

When the analyzers' performances were checked against the supplied standard gas from a diluting calibration system for the SO2 analyzers, CO analyzers, and O3 analyzers, one of each type of device was found to be functioning normally, as was noted in the section on the diluting calibration system.

The rest are scheduled to be sent for repair one at a time.

Concerning NOx analyzers, the GPT operating procedure and the time lag between NO data and NOx data that is attributed to the device mechanism were explained in particular.

By this point, the expert had finished transferring the basic knowledge necessary for operating the analyzer.

<March to May, 2008>

During the period when the expert was absent, the counterparts carried out introducing tests for the SO2 analyzer and NOx analyzer. These were called monitoring tests, and were aimed at improving the counterparts' skills.

They were carried out in accordance with the test contents proposed by the expert.

Through the tests that were conducted over these three months, Romanian counterparts got used to the equipment's operation and at the same time reconfirmed the procedure for the performance tests.

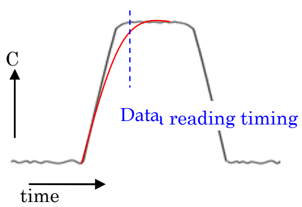
In the linearity calculation, they learned to calculate graphically.

Consequently, linearity faults were observed in the SO2 analyzers and NOx analyzers. In the NOx analyzers, a repeatability fault was also observed.

In addition, the parameters were recorded in the maintenance log book every month.

The contents of the expert's proposals and the test results sent by e-mail every month are listed in Table 3.3-8.

Table 3.3-8 Monitoring Test

<table>
<tr><td rowspan="2">Mar.</td><td colspan="2"><Expert proposal>
➢ Repeat the confirming of analyzer sensitivity by introducing the standard gases from diluting calibration system. Spend over 15 minutes when one concentration of standard gas is introducing.
➢ Record the values of parameters in maintenance log book.</td></tr>
<tr><td><Test result> performed at Auto mode
➢ SO2 analyzer (4 times)
Linearity; poor response appeared at the lowest concentration point
Repeatability; Good
➢ NOx analyzer (6 times)
Linearity; poor response appeared at the lowest concentration point
Repeatability; Good (Bad response observed at Sep. 2007)</td><td><Total number of test times>
32 points
Linearity; 6 times
One point repeatability; 4 times</td></tr>
<tr><td rowspan="2">Apr.</td><td colspan="2"><Expert proposal>
➢ Poor linearity was observed in the last month results of SO2 and NOx analyzer tests. Calculate the residual using the linear regression function.
➢ This trouble may be potentially caused by some malfunction in the diluting calibration system itself, or by the short time duration for introducing the standard gases. Try to make the introducing time longer.
➢ Observe the change of the instantaneous response on the PC screen as shown in next graph.

</td></tr>
<tr><td><Test result>
➢ Standard gas was simultaneously introduced to 2 NOx analyzers for 20 minutes.
Observed the same result with last month: poor linearity observed at the lowest concentration point in both analyzers. A wrong intercept was indicated in the linear regression calculation in Excel.
➢ Repeatability: Good results for both analyzers.</td><td><Total number of test times>
36 points
Linearity; 9 times</td></tr>
<tr><td rowspan="2">May</td><td colspan="2"><Expert proposal>
➢ The long sampling tube may have caused the poor linearity.
➢ Check the reading if they are linear when the 30% full scale concentration of standard gas is introduced.
➢ The expert informed how to make the linear regression graph and showed the correct result of the intercept.</td></tr>
<tr><td><Test result>
➢ Standard gas was simultaneously introduced to two NOx analyzers.
Observed the same result with last month: poor linearity observed at the lowest concentration point in both analyzers.
➢ Repeatability: Poor results for both analyzers.</td><td><Total number of test times>
24 points
Linearity; 6 times</td></tr>
</table>

For reference, an example of the linearity calculation sheets prepared by the counterparts is shown in Figure 3.3-11.

calcul abatere linearitate NO

M2206-M905 | 700 ppb

procent	Concentrație teoretică	Concentrații prima determinare	Concentrații a doua determinare	Valoarea medie,
0	0	0	0	0
20	192	152	152	152
60	577	567	567	567
95	914	947	947	947

B	1.048011
A	0.039752

Functia de regresie: y=B*x+A

Se calculează y utilizând valorile teoretice:

Concentrație teoretică	y= A+B*c teoretic	vm	dc=vm-y	dr=dc/c*100
0	0.039752311	0	-0.03975	
192	201.2578945	152	-49.2579	-25.6552
577	604.7421902	567	-37.7422	-6.54111
914	957.9219502	947	-10.922	-1.19496

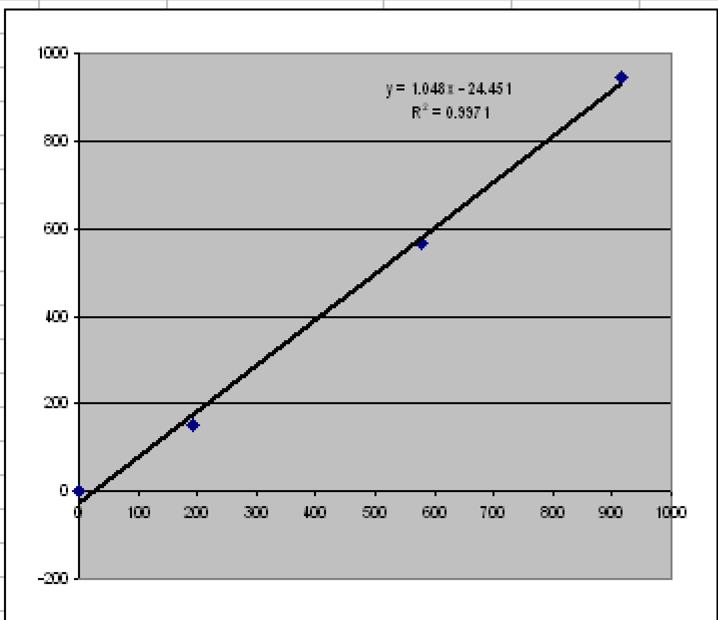


Figure 3.3-11 Linearity Calculation Sheet

<June to July 2008>

During this period, the expert reconfirmed the abnormal behavior of the NOx analyzer in a monitoring test.

He also used an Excel spreadsheet to correct the formula for intercept calculation in the linearity calculation.

Furthermore, he carried out a performance check of the analyzers through crosscheck testing. The contents are shown in 2) Preparation of equipment of （6） Crosscheck Test.

<October 2008>

There is a possibility that the SO2 analyzers show bad linearity on the low concentration side. In order to confirm whether the operation was appropriate, SO2 analyzer was checked again.

（5） Standard Flow Meter/Chart Recorder

JICA purchased one of each of these devices. Their performance is good. The expert explained how to operate and maintain them through actual operation.

The standard flow meter will have the highest precision in Romania.

This device was used to investigate the problems in this category shown in Table 3.3-9 and aided the counterparts in their understanding of conversion to standard temperature and pressure.

In other areas such as GC or UV/VIS, the flow meter was used for measuring the sampling equipment’s flow rate.

Table 3.3-9 Training Contents (Standard Flow Meter)

Sep. 2007	Jun. 2008	Oct. 2008
<Lesson> Menu structure, Operation, Settings, Maintenance <Exercise> Used for check the flow rate of mass flow controllers on the troubleshooting of Diluting calibration system.	<Lesson> The reason of disagreement between standard flow meter ML-500 and DC-lite. The difference of indicated value between volumetric and mass flow meter. Temperature-pressure conversion. <Exercise> Used for check the flow rate of mass flow controllers on the troubleshooting of Portable Dilutor. Also used for check the sampling flow rate of VOC collection tube and wet sampler.	None

The chart recorder was used to record the instantaneous value data produced by an automatic analyzer.

This was purchased to supplement the diluting calibration system, as this system could not save instantaneous value data.

This device can in fact preserve a detailed record from a performance test of an automatic analyzer, enabling past data to be referenced at any time.

Further, in a crosscheck test that was conducted outside NRL, the output from two analyzers could be recorded at the same time and their performances compared. This was extremely effective for verifying response stability.

Table 3.3-10 Training Contents (Chart Recorder)

Sep. 2007	From Jun. to Jul. 2008	Oct. 2008
None	<Lesson> Operation, Settings, Maintenance <Exercise> Used for performance test of O3 generator and Crosscheck test.	None

(6) Crosscheck Test

Crosscheck tests were carried out for CO and O3 in the atmospheric air.

Crosschecking means mutual comparison. Given that Romanian counterpart organization has to standardize the measuring accuracy of the monitoring network over the country, it is believed that a mutual comparison of the performance between the same automatic analyzers will serve the purpose of the project.

The crosscheck we decided to carry out at this time has been positioned as a "performance comparison between the same procedures of automatic analyzers."

Implementation of Crosscheck tests were approved in the Counterpart discussion, "The dilutors, analyzers, standard meter, etc.", for which performance was verified beforehand against existing equipment owned by NRL, were brought to the Lacul Morii monitoring station controlled by the Bucharest LEPA. They were operated at the same time for the performance comparison, with calibration gas introduced simultaneously.

Table 3.3-11 Itinerary of Crosscheck Test

Time	From Jul.8th(Tues.) to 9 th(Wed.), 2008
Place	Lacul Morii monitoring station in Bucharest city LEPA
Participantes	Romanian side; NRL; Ms. Hotoiu, Ms. Neacsu, Ms. Balaceanu, Ms. Tigaridis LEPA; Mr. Ciuiu Maintenance staff; Mr. Gheorghe, Mr. Eugen JICA side; Mr. Ochi
Substance	The Performance comparison between the NRL equipment and Fixed equipment in Lacul Morii Monitoring station: 'Dilutor, O3 generator, O3 analyzer, CO analyzer'

1) Purpose of the Exercise

This test will be the first experience for Romanian counterparts of carrying out a comparison test in outer area of NRL using the actual equipment, and it will be a valuable opportunity for them.

Although the existing equipment that NRL owns will be vastly insufficient for auditing the monitoring network, we felt that if exercised it has some value as a practical run of the audit, and that this would be a chance for NRL to think about the way NRL should function in future. The goals of the exercise are shown below.

Table 3.3-12 Itinerary of Crosscheck Test

1	To Examine the performance of NRL equipment in comparison against other well-operating external equipment.
2	To encourage the counterparts to be well acquainted with the smooth equipment operation through practical site exercises and to train them on the analyzer's normal and abnormal operations using actual phenomena and data.
3	To have counterparts become accustomed to the audit work that would be carried out by them locally in LEPA.

2) Preparation of equipment

Equipment brought from NRL to Lacul Morii Station is shown in Table 3.3-13.

Table 3.3-13 Test Equipment from NRL

1	Portable dilutor OGD-2000PT
2	O3 generator OZON3000
3	CO air quality analyzer
4	O3 air quality analyzer
5	Standard flow meter DryCal DC-Lite
6	Standard gas cylinder and pressure regulator ・CO ・N2 (High purity for zero sensitivity check)

7 8	Chart recorder and 2 signal cable Sampling tubes, connecting joints
9	Tools, Digital volt meter
10	Power cable for extension

Throughout past activities, it had been recognized that the O3 analyzer was operable, but that its performance was not clear.

In addition, the power of the portable dilutor and the O3 generator had not been turned on during the one and half years since the EU provided them and their operating procedures were not known.

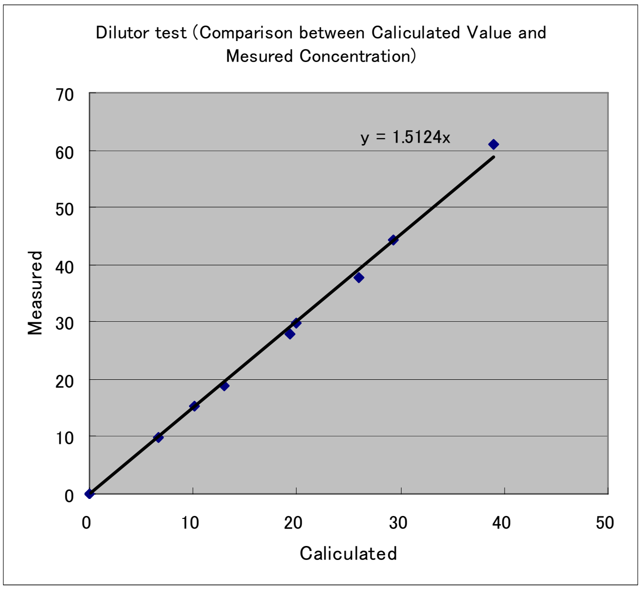
Therefore, before the crosscheck, a review of the operating method or performance was scheduled. This also served as operational training for the counterparts.

In the portable dilutor and O3 generator, malfunctions or maladjustments, which are considered to have arisen since the EU provided them, were discovered.

Although their theoretical performances were not obtained, the extent of the malfunctions was slight and it was found that they could be used for a temporary task such as operative training or conducting a crosscheck. A specific description is given below.

1	Portable Dilutor

Because this had not been used since the EU provided it, its performance and operating procedure were also unknown and it needed to be checked to see if it could be used. During the visit in September 2007, the CO analyzer's performance and operating procedure were known. Therefore, the CO analyzer was used to examine the performance of the dilutor.
Checking the manual and the dilutor's internal mechanism, we found the device to be a standard dilutor using two mass flow controllers, while its operating method was also quickly understood.
The result of the performance test showed that the dilutor's performance was defective. The measured concentration was approximately 1.5 times the calculated concentration. The difference was about 50% but this percentage also varied with the generating concentration. Several pairings of flow rate settings that had the same diluting rate were tried but they did not match. The dilutor was found to be unusable as it was. The data obtained from the test is shown on the left hand side of the figure below.
To identify the cause, a standard flow meter was used to measure the flow rates of the two mass flow controllers. This was done on the presumption that the abnormal performance was due to the flow rate the dilutor regulated.
According to the result, the flow rate of the mass flow controller on the air side had been 10% to 50% less than the set value. The test data is shown on the right hand side of the figure below. A leak of zero air due to the loose pipe joints was suspected. This presumption was passed on, but because the NRL's attitude from the beginning was that the repair was to be done by the manufacturer, the expert could not check and fix it. However, the expert presumed that if the flow rate was set at a higher value foreseeing the extent of the flow drop, this could be used in the crosscheck, and resumed the test, eventually working out the suitable set of flow rates to generate the required CO concentration. Although there was no conviction that the setting could be repeated, it was decided that in the crosscheck test this setting condition be used.



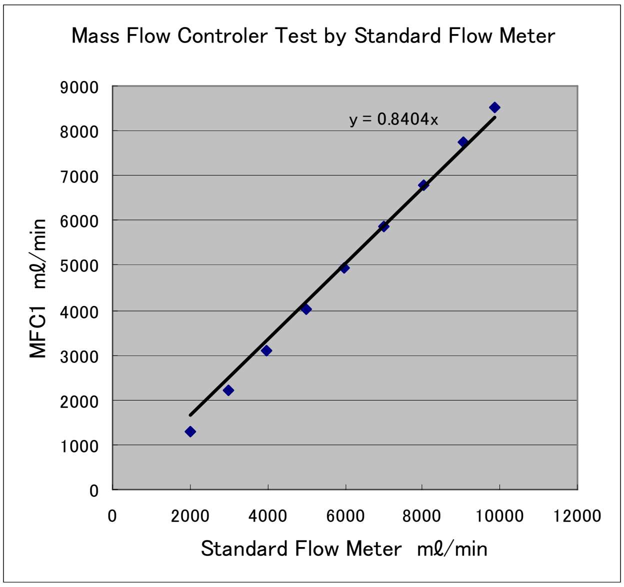


Figure 3.3-12 Test Results of Diluting Performance (left) and Flow Rate of Mass Flow Controller (right)

2	O3 Generator
	This had not been used since the EU provided it. Its performance and operating procedure were unknown and it needed to be checked to see if it could be used. It was supposed to generate a guaranteed concentration when a setting condition was selected in accordance with the calibration table supplied by the manufacturer. A test was carried out by introducing generated O3 gas from this generator into the O3 analyzer, and a malfunction was discovered. The test data is shown in the table below. The measurement was slightly low, though the sensitivity had no problem. However, repeatability was not good. Generated concentration varied with the same settings. A defect in the thermal regulator was suspected. Further, even when a constant concentration was being generated, an abnormality appeared whereby the indication of the O3 analyzer rose gradually on high concentration side. But at this moment it is unclear whether the abnormality is in the O3 generator or in the O3 analyzer. As reference materials, there were a calibration table issued by the representative and the manufacturer's manual, but a problem was discovered in the descriptions. The set values for both materials differ significantly, and it was quite impossible to say which was right. Furthermore, the set values for "pressure and flow rate" that a technician of the representative gave at the time of delivery are different from either of the above. Though the reference materials were obscure, the expert examined the internal mechanism together with the counterparts with the goal of deepening their understanding of this device. They found that the mechanism was simple and the zero air flow rate passing the ultraviolet lamp was the first controlling factor in deciding the concentration of O3 generated by this device. When the expert visited the representative's office and asked about the above, they confirmed that the above understanding was correct and that the description in the calibration table was insufficient. When he returned to NRL, he advised Romanian counterparts to readjust flow rate by manipulating the pressure regulating valve inside, but because of the policy that the manufacturer should repair the device, this advice could not be followed. Eventually the setting in the calibration table "Setting by ultraviolet lamp vs. generating concentration" was ascertained to be right and the decision was made to use it for the crosscheck.

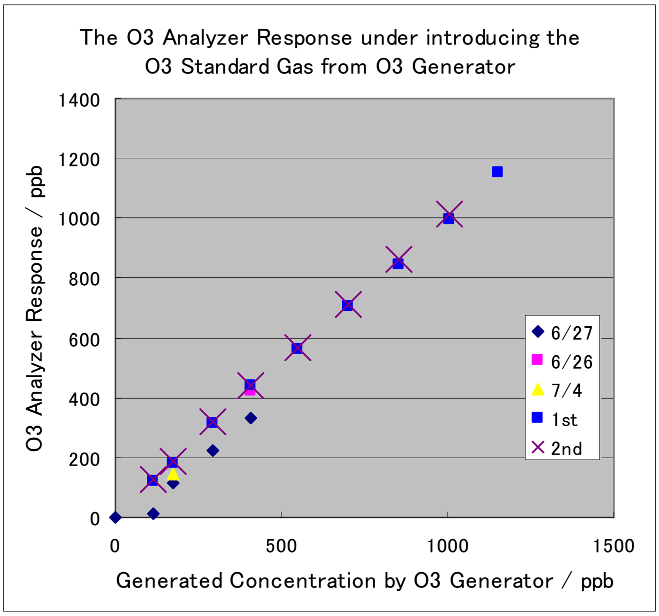


Figure 3.3-13 Performance Test for O3 Generator

3	O3 analyzer
	There was a possibility that O3 analyzer was defective based on the experience in the test of the O3 generator, but it had a very stable response for concentrations of less than 300 ppb. It was decided to use this analyzer as it was seemingly worth testing in a crosscheck. The chart recorder, which was used for observing these responses in detail, worked successfully. Because past response records could be looked up any time, technical explanation became much easier.

4	DC-Lite Standard Flow Meter
	This meter was not the one introduced by JICA and was of much lower quality. However, it was chosen to be carried because it was simple and suitable for field use. In the tests, Romanian counterparts operated this meter and JICA supplied meter at the same time and compared the data, observing a considerable difference in the display. The cause of this was due to temperature conversion, and the calculation showed that the difference was actually slight. By this stage, Romanian counterparts understood the difference between a volumetric flow meter and a mass flow meter, and how to use them.

The counterparts advanced in their operating technique as a result of the technical assistance. Furthermore, owing to the malfunction, which was a precious opportunity, their understanding of the equipment was deepened.

3) Crosscheck Test

Bucharest City’s air monitoring network consists of eight air monitoring stations.

The analyzers are in operation full-time and monitor the gas components and PM concentrations in the atmosphere that are specified for continuous monitoring.

This is not the network that was introduced recently under the EU assistance. It already has longstanding operating results.

Lacul Morii Monitoring Station where the test was carried out this time is in the premises of Bucharest LEPA, next to a building that is under repair, and only ten minutes drive from NRL.

It looks out over one of the city’s artificial lake and the air quality is good. Before the test, some of the existing data were checked and it seemed that it reflected the ambient environment. It was highly possible that the working analyzers were operating normally.

Figure 3.3-14 Lacul Morii Monitoring Station

Crosscheck tests were carried out with the NRL equipment brought to the station. Including travel time, it was possible to carry out a CO test on the first day and an O3 test on the second day.

As a result, the operation for the comparison test in the station was completed safely and in accordance with the specified procedure. Comparison between the results using NRL analyzer and with the monitoring station's analyzer showed a disagreement in sensitivity but the difference was relatively small. It was known that the cause of the difference was the use of the defective portable dilutor or O3 generator and this was within the scope of the assumption. The following section gives the details.

a. CO Crosscheck (DAY 1)

After the NRL equipment was brought into the station and warmed up, standard gas was simultaneously introduced into both the permanently-installed CO analyzer in the Lacul Morii Monitoring Station and the NRL CO analyzer, decreasing the gas concentration in decrement steps. Data on the stability and linearity in the response of both analyzers was gathered (see Figure 3.3-15). Using this data, the performances of the NRL's brought-in equipment and the station's equipment were compared.

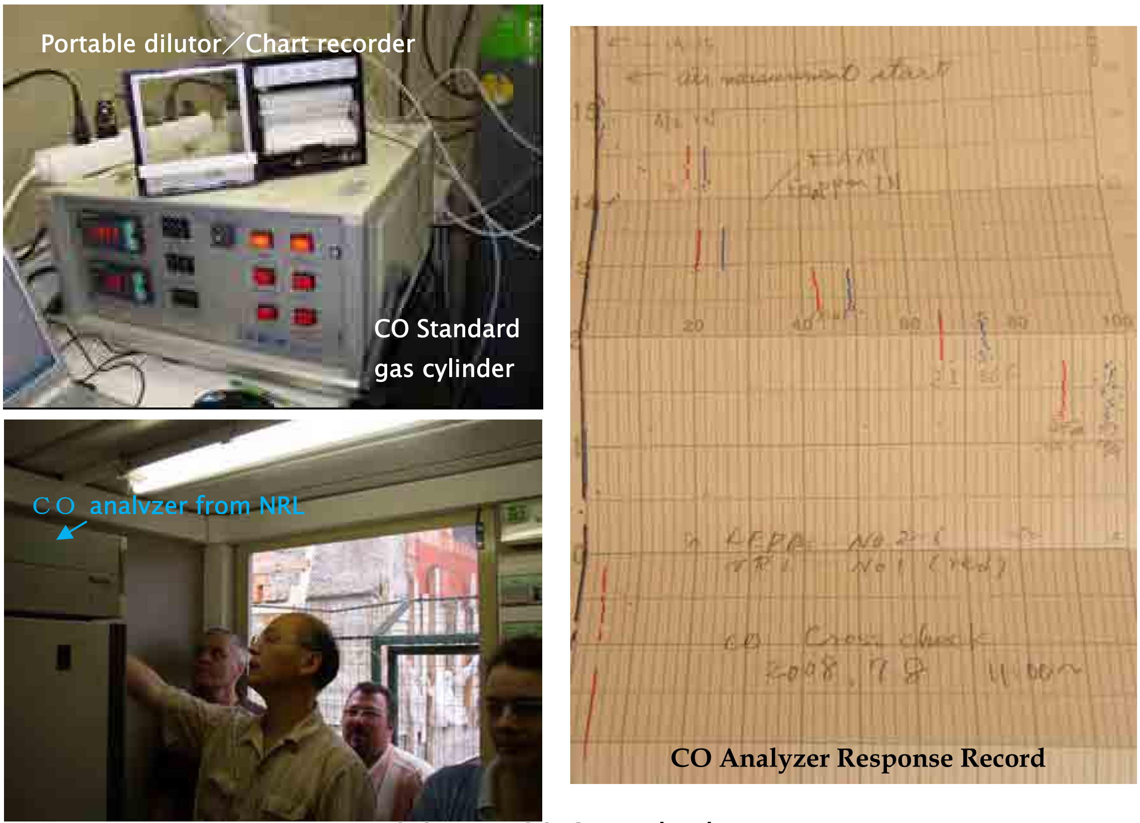
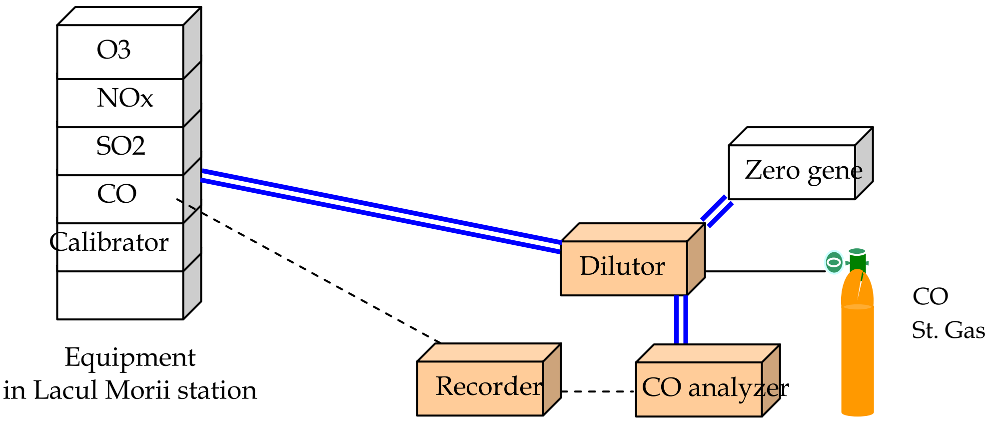


Figure 3.3-15　CO Crosscheck Test

Figure 3.3-16 shows the connection between NRL equipment and station installed equipment.



Brown colored･･･NRL equipment　　White･･･Equipment in Lacul Morii station

═ Pneumatic line　　------ Signal cable

Figure 3.3-16　Equipment Connections for CO Crosscheck Test

As a result of the test, the following estimates were made for the performance of the equipment used.

Table 3.3-14 Performance of CO Crosscheck Equipment

Name of crosscheck equipment		Present estimated performance
NRL equipment	Portable dilutor	Diluting ratio was defective, as found in the preliminary check. However, this changed from the preliminary reading. Possibly due to the vibration during transportation to the station, the extent of leakage from the internal piping had changed.
	CO analyzer	Correlativity with the station's CO analyzer was good (Coefficient of correlation R2≅1). Response time, stability, and linearity were all normal. Compared with the station's CO analyzer, span sensitivity was observed to be approximately 5% lower (this calibration difference is due to the performance difference between the NRL diluting system and station's diluting system, and was not due to a defect in the CO analyzer).
Station equipment	CO analyzer	Response time and linearity were good. There was a little variation on the high concentration side. Span sensitivity was observed to be approximately 5% higher than the NRL CO analyzer (this calibration difference is due to the performance difference between the NRL diluting system and station's diluting system, and was not due to a defect in the CO analyzer).
	Dilutor	Because the sensitivity of the NRL CO analyzer was observed to be lower, the diluting performance of this dilutor is possibly approximately 5% higher.
	Zero air generator	The catalyst used did not deteriorate and the purity of the zero air generated was good (as a result of introducing highly-pure N2 gas).

The performance of the portable dilutor had been unclear until tests using the equipment within NRL. Through this test using outside equipment, the defects in its performance were able to be reconfirmed. It was confirmed that the sensitivity of the CO analyzer owned by NRL was not so different from that of the one used in the monitoring station.

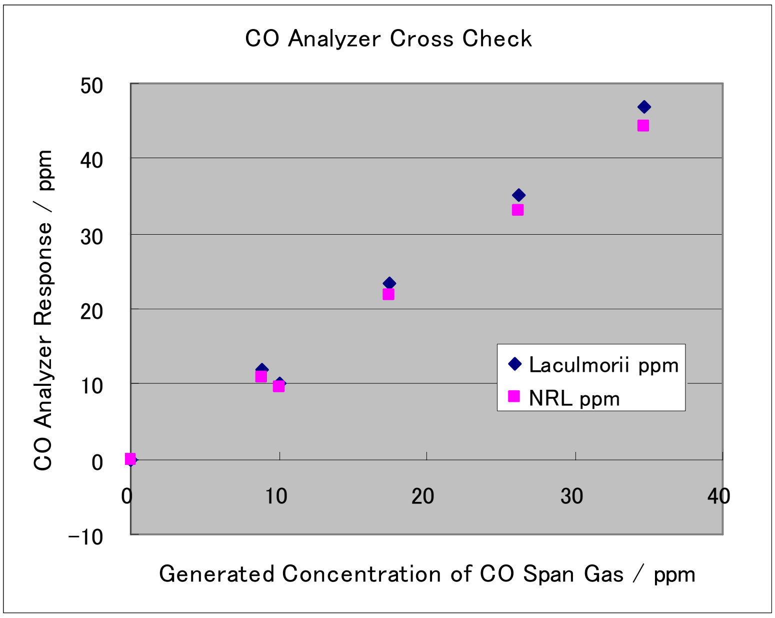


Figure 3.3-17 Test Result of CO Crosscheck

b. O_3 Crosscheck (Day 2)

Following on from the first day, after first warming up the equipment, standard gas was simultaneously introduced into both the permanently-installed CO analyzer in the Lacul Morii Monitoring Station and the NRL CO analyzer, decreasing the gas concentration in decrement steps. Data on the stability and linearity in the response of both analyzers was gathered (see photo).

The adequacy of the O3 generator owned by NRL was also checked against the given O3 standard gas generated from the permanently-installed dilutor in the monitoring station.

Using this data, the performance of the equipment supplied by NRL was compared to that of the station's equipment.

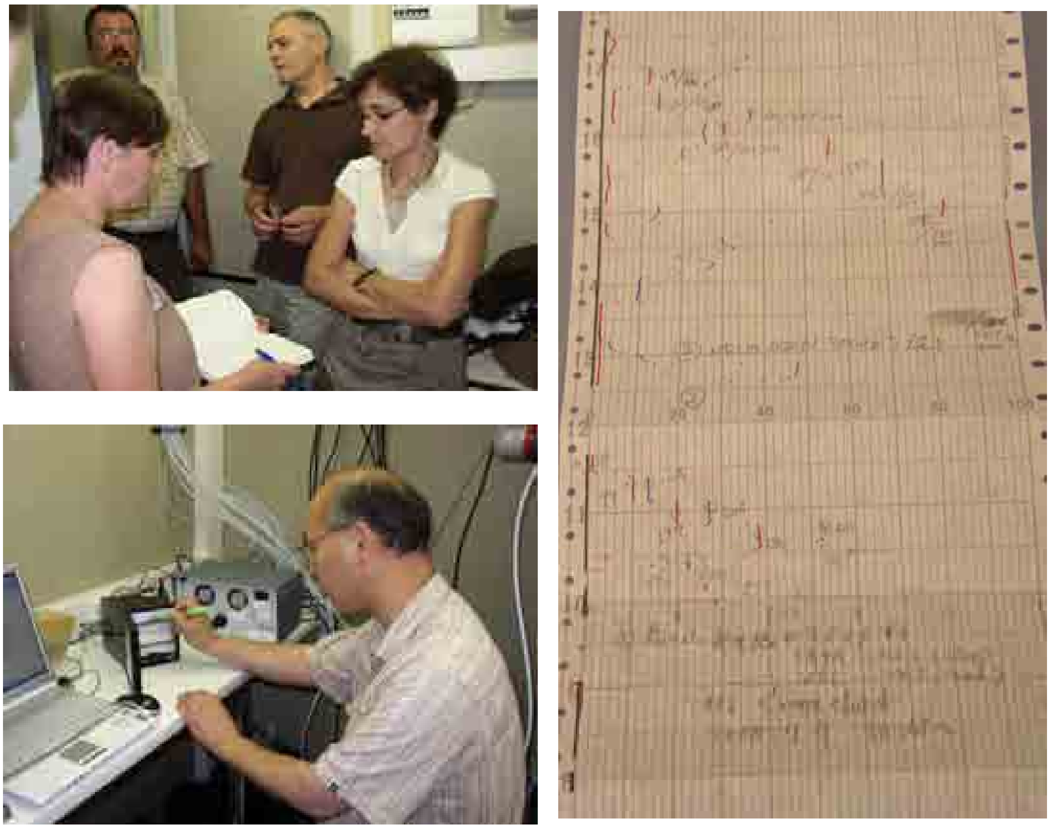


Figure 3.3-18 O3 Crosscheck Test

Figure 3.3-19 shows the connection between NRL equipment and station installed equipment.

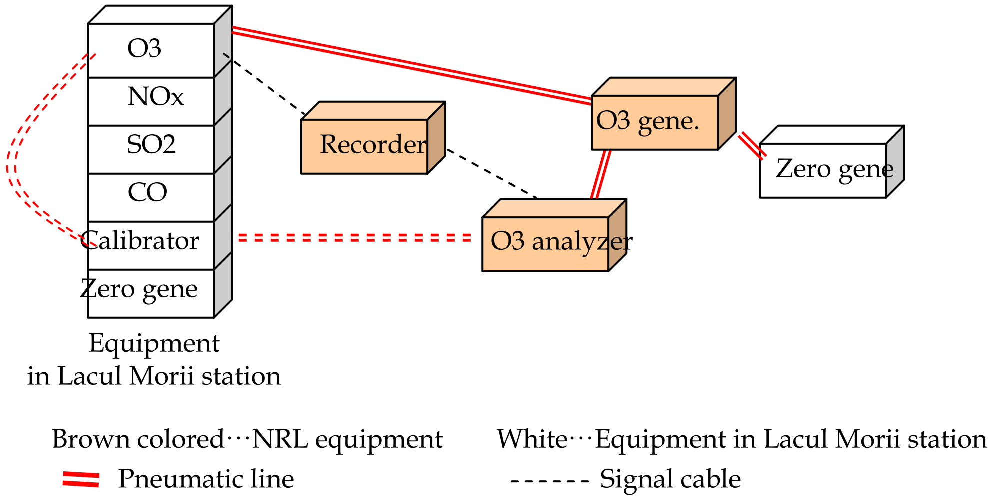


Figure 3.3-19 Equipment Connections for O3 Cross Check Test

As a result of the test, the following estimates were made for the performance of the equipment used.

Table 3.3-15 Performance of O3 Crosscheck Equipment

Name of crosscheck equipment		Present estimated performance
NRL equipment	O3 analyzer	Comparison with the station's O3 analyzer showed a correlation coefficient of R2=1. Response time, stability, and linearity all seem to be normal. Compared with the station's O3 analyzer, span sensitivity was observed to be approximately 7% higher (this calibration difference is due to the performance difference between the NRL O3 generator and station's O3 generator, and was not due to a defect in the O3 analyzer).
	O3 generator	Considering the instantaneous output of both devices is stable but that the anticipated concentration value and the measured value produced by the station's O3 analyzer are slightly different, it is highly likely that the generated O3 concentration is stable but the setting of the pressure and flow rate has deviated. The supply capacity of this equipment barely matches the sample flow rate for the French-made O3 analyzer (1 ℓ/min) but is not sufficient to supply to both this and the NRL O3 analyzer at the same time. It is not recommended that this be used for the sensitivity calibration or for checking O3 analyzers made by Environment S.A.
Station's equipment	O3 analyzer	Response time, stability and linearity were good. Compared with the NRL O3 analyzer, span sensitivity was observed to be approximately 7% lower (this calibration difference is due to the performance difference between the NRL O3 generator and station's O3 generator, and was not due to a defect in the O3 analyzer).
	Zero air generator	The adsorbent used did not deteriorate and the purity of the zero air generated was good (as a result of introducing highly-pure N2 gas).

The performance of the O3 generator had been unclear until tests using the equipment within NRL. Through this test using outside equipment, the possibility of a deficiency in the adjustment was able to be reconfirmed. The O3 analyzer owned by NRL, of which performance defects had been suspected before the test, was successfully tested and performed well. It was confirmed that the sensitivity of the equipment was not so different from that used in the monitoring station.

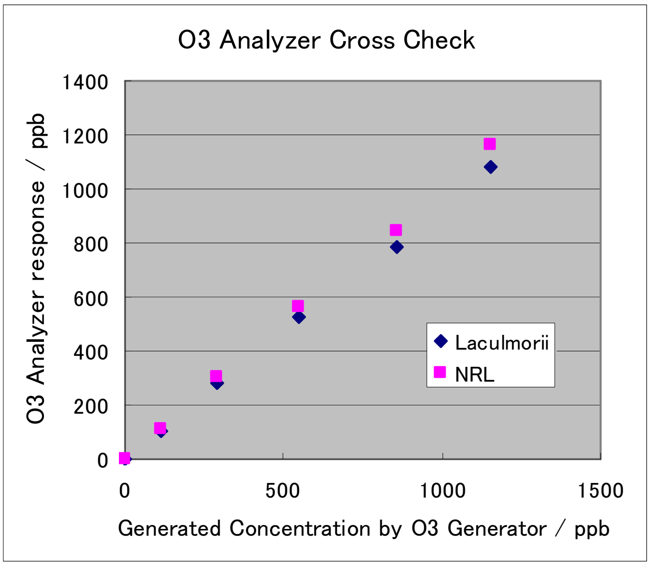


Figure 3.3-20 Test Result of O3 Crosscheck

c. Operational Effect

The crosscheck brought about the following effects. It accomplished the three purposes of the exercise set in 1).

Table 3.3-16 Performance of O3 Crosscheck Equipment

	Operational effect of crosscheck test
1	It was confirmed for the first time that NRL's CO analyzer was normal by comparing with equipment outside of NRL. By this, not only CO analyzer but also diluting performance of NRL's installed type of dilutor was proved to be good with a high possibility.
2	It was reconfirmed that the portable dilutor and O3 generator had problems. Deepened understanding of the internal mechanism by the Romanian counterparts made it possible for them to identify the performance wellness and to estimate the abnormal parts on their own.
3	Owing to the introduction of a chart recorder, determination of stability, etc. became considerably easier.
4	Through the field work, the counterparts became familiarized with the procedures for equipment installation or performance checks.
5	The counterparts experienced conducting an on-site performance check work at site and obtained a virtual image of audit.
6	It provided the real world experience where the Romanian counterparts had to struggle to find the causes of the unexpected phenomena such as response differences.

Figure 3.3-21 Participants in Crosscheck Test

(7) Seminar

"Controlul preciziei in cadrul masurarilor atmosferice automate" ("Quality Assurance for Automatic Air Monitoring") was lectured in Technical seminar held at on July 10th, 2008. The expert explained the standard device and traceability as well as the careful observation of the maintenance rules related to quality control.

The presentation titled "Calibration for Automatic Monitoring Equipment" was implemented by Ms. Violeta Balaceanu in the first technical seminar held in 7th November 2007.The introduction to the operation / maintenance and traceability of standard gas calibration system was informed as her first step of the technical transfer to the LEPA staff.

Figure 3.3-22 Seminar Scene

3.3.1.2 Achievement

We accomplished the following objectives as planned: 1) Enhancement of the operating skill of the counterparts, 2) Document creation, 3) Crosscheck test, 4) Presentation in a technical seminar.

(1) Enhancement of the Operating Skill of the Counterparts

The proficiency of Romanian counterparts has been enhanced nearly to the sufficient level in each skill as described in3.3.1.1. Table 3.3-17 shows the gross proficiency assessed by the expert.

Table 3.3-17 Capability of Counterparts for Monitoring Equipment

Items		Capability	
		Jan.2007	Oct.2008
Common basic knowledge	The nature of standard materials, Microcomputer	△	○
	Unit conversion, Standard condition conversion	△	○
Diluting calibration system Portable dilutor O3 generator	Components, Function of each parts	−	○
	General operation (Automatic mode, Manual mode)	△	○
	The test procedure of basic performance of analyzers and the EU testing method	△	△
	Data record, Report generation	△	○
	Maintenance, Quality control	−	○
Automatic air analyzer	Understanding of the components and function of each parts	−	○
	General operation	△	○
	Understanding of the Basic performance characteristics	△	○
	Maintenance, Quality control	−	○

NOTE: ‘○’ indicates a good level of understanding and operability, ‘△’ indicates a reasonable level, but requires more experience, and ‘−’ more training required.

‘△’that is seen in the column October 2008 in Table 3.3-17 indicates that the drift test could not be performed. We needed to use the analyzer over 24-hours continuously for the drift test, which was not allowed due to the office hour management regulation restriction.

‘○’that is marked in the column of ‘Maintenance, Quality control of Automatic air analyzer’ means that the counterpart now obtains the technical skills and knowledge that are satisfactory in the NRL daily operation. But technical supports from manufacturer and/or affiliates are necessary whenever the preventive maintenance and/or repairs are performed.

(2) Created Documents

The documents were created as shown in Table 3.3-18.

Table 3.3-18 Created Documents

NRL equipment	SOPs	Maintenance log book	Performance test record form /report	Inventory for consumables, spare parts and equipment
Diluting calibration system with zero gas generator and compressor	Completed the Romanian version	Completed the Romanian and English versions	Made at Nov. 2008	Completed the Romanian version
SO2 analyzer	-		-	
NOx analyzer	-		-	
O3 analyzer	-		-	
CO analyzer	-		-	
Portable dilutor	Completed the Romanian version		-	Completed the Romanian and English versions
O3 generator			-	

NOTE: Performance Test Report includes the linearization calculation sheet used in an analyzer performance test.

(3) Crosscheck test/Technical seminar

We successfully obtained the adequate results through Crosscheck test as shown in 3.3.1.1 (6) that achieved the intended purpose of Crosscheck test. "Controlul preciziei in cadrul masurarilor atmosferice automate" was presented in a technical seminar as mentioned in 3.3.1.1 (7) .

3.3.2 Atomic Absorption Spectrometer (AAS)

3.3.2.1 Activity

The term of dispatch of the expert in this field was 7.24 months in total and the technical support activity was conducted dividing the term into six. At the start of the project, the expert had activity with two counterparts for the analysis concerning heavy metals in the air quality using AAS. However, there was no argon (Ar) gas left to be used for measurement, and the counterpart immediately placed an order. However, because it would take six to seven weeks for the distributor to deliver the gas to NRL, the gas was not delivered while the expert was on site. Because of this situation, the expert could not operate the AAS equipment and provide instruction for analysis to the counterparts in the first year. Therefore, the expert could hardly conduct OJT for sampling of particulate matters and AAS analysis, and the expert concentrated on grasping the current situation including baseline data and preparation for the next on-site research and those after that. In early March, Ms. NEGLESCU who was the main person in charge of AAS shifted to the MESD, and there was no person in charge.

When the second year started, it was determined that Ms. SERBAN would be in charge of AAS instead of Ms. NEGULESCU, and the argon gas was delivered. Thereby, it became possible for the experts to provide instruction for analysis and they provided technical transfer in roughly the following stages.

Basic Training Ⅰ
1. AAS Principle
2. How to make the standard solution
3. How to washing materials
4. Make the Calibration Curve
5. Repetition

→

Basic Training Ⅱ
1. How to make matrix modifier solution
2. Make the Calibration Curve
3. PM10 sampling and analysis
4. MW Digestion
5. Repetiton

→

Improvement of Analysis Accuracy Ⅰ （QA）
1. Filter Blank Test
2. Laboratory Filter Blank Test
3. Detection Limit
4. Quantification Limit.

Improvement of Analysis Accuracy Ⅱ （QA/ QC）
1. Recovery Test of Standard Solution
2. Quality Control
3. Monitoring
4. SOP

→

Improvement of Analysis Accuracy Ⅲ （QA/QC）
1. Recovery Test of BCR 038
2. Monitoring
3. SOP

Figure 3.3-23 Activity Flow of Technical Transfer

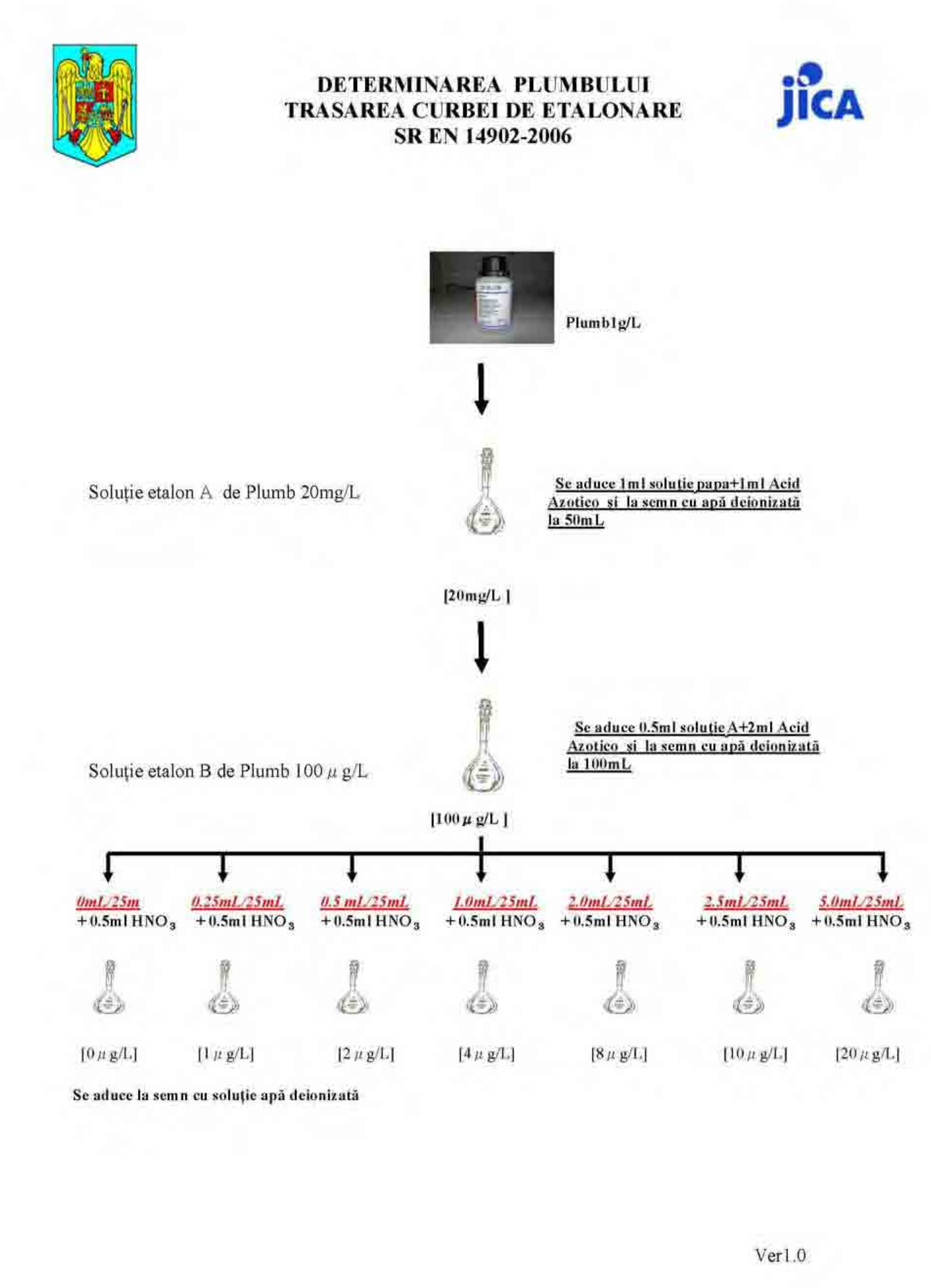
1) Basic Training I and II

Since late June, the expert started the technical training for the counterpart such as collecting samples using the PM10 sampler, analysis of PM10, decomposition using the microwave, and analysis of lead in the air using the AAS furnace analysis method.

First, a lecture was given on the principle of the AAS based on the reference that the expert had created. Second, aiming as the main task at becoming used to the method of preparing the calibration curve standard solution and the operations of the AAS equipment, instruction was provided regarding preparation of the calibration curve standard solution and the operation method of the apparatus, repeating the same operation until a linear calibration curve (r=0.995) was enabled using the calibration curve solution that had been prepared.

Because the linear calibration curve was enabled, technical instruction regarding collection of actual samples by the PM10 sampler, decomposition of samples by the microwave, and weighing was provided during the dispatch in August 2007, for checking each of the operation steps. In addition, the expert prepared the reference to which was added the necessary technical photos, detailed operations, and remarks for the operations, so that the counterparts can operate the apparatus by themselves by looking at this reference. As an example, the method of preparing the calibration curve solution, the matrix modifier solution and the method of change the graphite tube of AAS will be shown below.

The Pb Standard Solution Preparation Procedure



The Matrix Modifier Solution Preparation Procedure

DETERMINAREA PLUMBULUI
TRASAREA SOLUŢIEI DE MATRICE
SR EN 14902-2006

Soluţie de Matrice (Pd)
Paladium10 g/L

↓

Soluţie A de Soluţie de matrice 200mg/L

Se aduce 0.5ml soluţie apa+0.5ml Acid Azotic si apă deionizată până la semnul de 25mL

[200mg/L]

↓

Probele incluide martrice 5mg/L

După filtre se aduce 1.25ml soluţie A si apă deionizată până la semnul de 50mL

Ver2.0

How to change the Graphite Cuvette

1. Change the Graphite Cuvette

1) Put on the Gloves

2) Remove the Metal Cup from upside of Centre Block（Fig.1）

This position is closed.

（Fig.1）

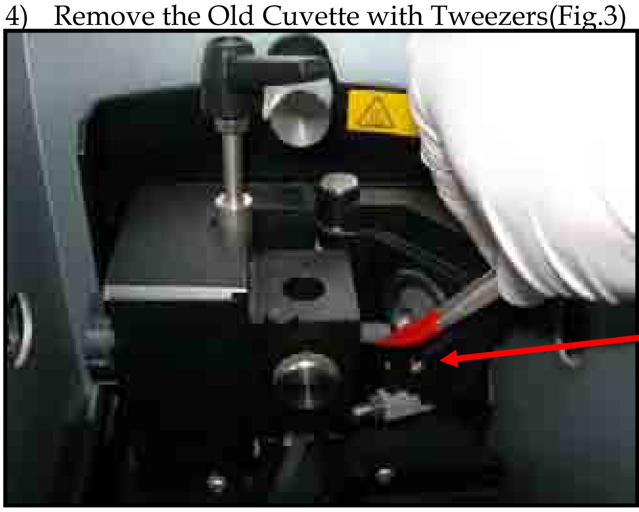
3) Turning the Clamping Lever（Fig.2）

Clamping Lever

Rotate the Clamping Lever Counterclockwise

（Fig.2）

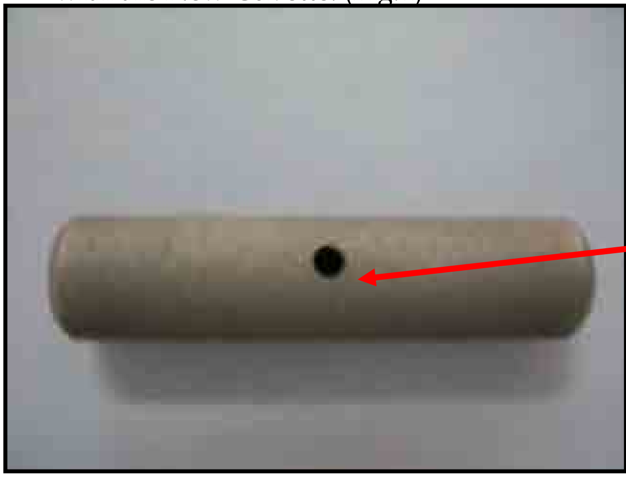
4) Remove the Old Cuvette with Tweezers(Fig.3)



Be Careful to Remove the Cuvette

（Fig.3）

5) Check the Cuvette and If it Becomes Dirty or if it is Damaged, You Have to Change it with the New Cuvette. (Fig.4)



Check around this Point whether is damaged or not by Acid.

(Fig.4)

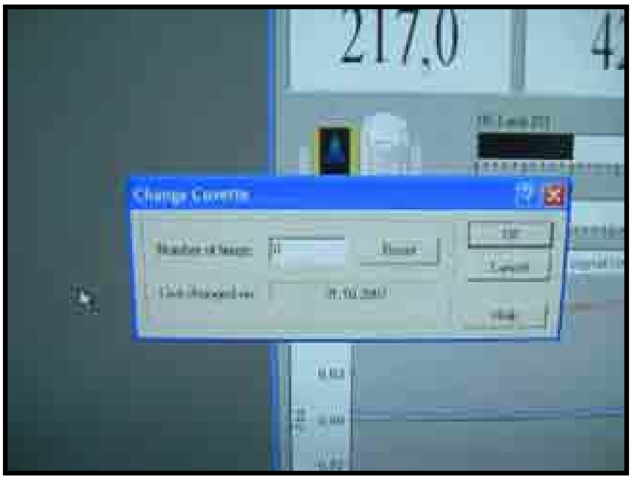
6) Take the Cuvette, and Orientate it so that the Injection Hole is Uppermost
7) Position the Cuvette in the Furnace Head and Carefully Close the Head
8) Use the Cuvette Tool to Make the Injection Hole central in the Furnace Head Injection Port.(Fig.5)

Cuvette Tool

Rotate on Injection hole of Cuvette

(Fig.5)

9) Check that the Cuvette Injection Hole is Positioned Correctly
10) Change the Cuvette Life Counter.(Fig.6)



(Fig.6)

Note:

Check at least once every 100 times using Graphite Furnace

Handle new Cuvette carefully to avoid contamination

2) Improvement of Analysis Accuracy I, II, and III (QA/QC)

Following the instruction regarding analysis of the series of items in the flow from the collection of samples to AAS analysis provided until early September, in and after October, the expert had activity concerning check tests to maintain QA/QC. More specifically, about the accuracy management that is QA, the expert created a quality accuracy management sheet and provided instruction regarding detection limit tests and quantification limit tests. Next, as the quality control that is QC, we created a sheet for the control X-chart (Pb calibration curve slope), a moving range control chart (calibration slope), and a Pb calibration fit chart, and the expert provided technical instruction using the data of the measurement that was actually conducted. The following is the QC management chart in Pb analysis using AAS, which was actually conducted in NRL from June 2007 to October 2007.

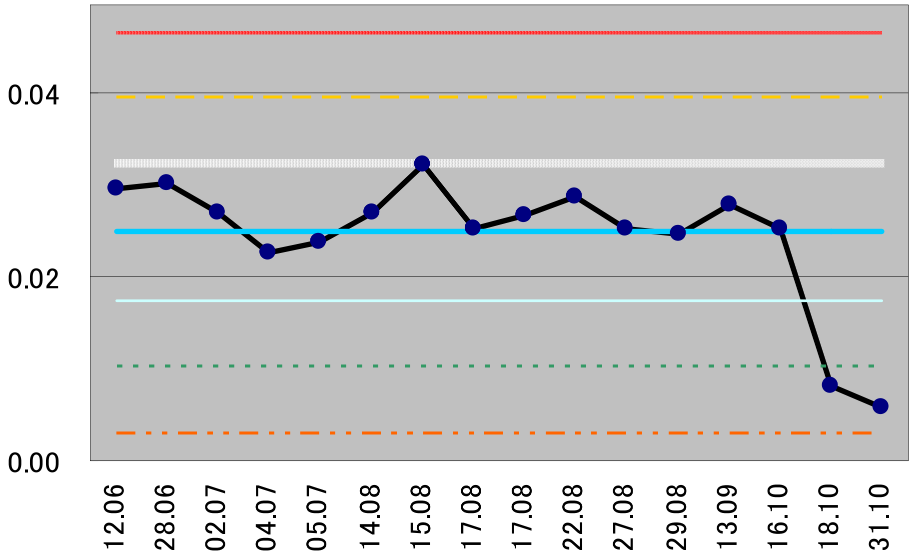


Figure 3.3-24　Control X-Chart(Pb Calibration Slope)

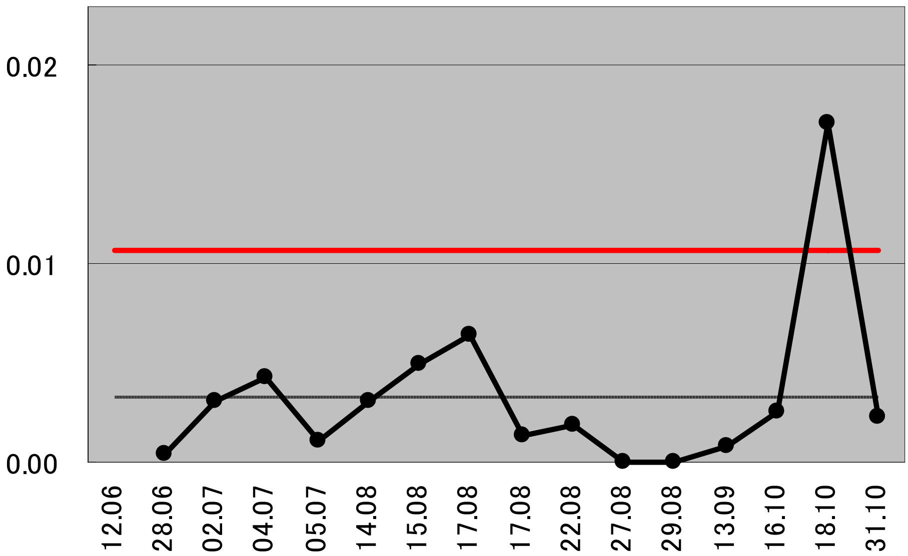


Figure 3.3-25　Moving range control chart (Calibration slope)

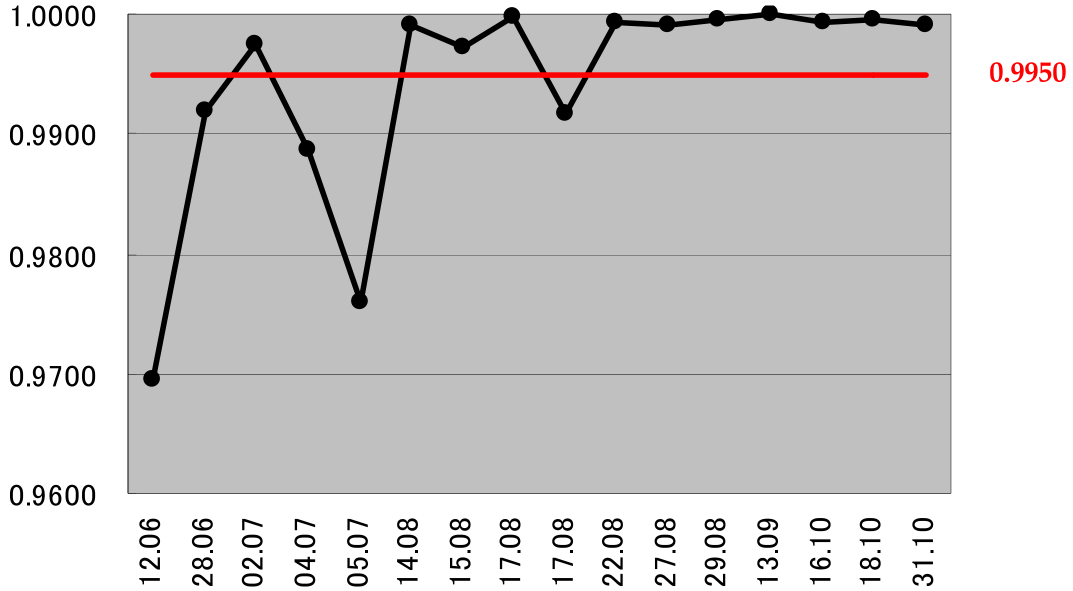


Figure 3.3-26 Pb Calibration fit Chart（r）

At the start of instruction, only low-accuracy calibration curves having no linearity were obtained and they did not satisfy the calibration fit of r=0.995. However, by repeating the same operations, the technical level of the counterparts advanced and they could perform the proper operations and, therefore, linear calibration curves were enabled.

In February 2008, the expert purchased a flow calibrator for the PM10 sampler and initial training was provided by the distributor of the manufacturer whereby the expert could check whether the sampling was carried out with the correct flow. The expert also purchased a hydride generator, which was necessary for analysis of arsenic and a necessary material for it, and initial training regarding the hydride generator was provided by the distributor of the manufacturer, and the expert also asked the distributor of the manufacturer to provide us with instructions regarding the daily maintenance of the AAS furnace measuring apparatus to be used in the Pb analysis, and the distributor provided it.

Based on the agreement of the JCC held in February 2008, the monitoring activity implementation plan was started in March 2008 and the counterparts started to conduct AAS analysis of lead in the air. In March of this year, the counterparts participated in comparative tests among laboratories. In addition, in parallel with this, the counterparts started in March to conduct a recovery test by adding lead to check the precision of their analysis. In the recovery test using samples formed by adding the solution to be used for producing the calibration curve to paper filters, the counterparts could obtain an excellent result, which was a recovery of 104.7%. However, in the recovery test using BCR038, which is a certificated standard matter (particulate matter), the expert initially obtained a very low recovery of 20 to 50%. The expert provided instructions by email as well as, during their on-site research that started in June, checking the operations conducted by the counterparts and gave advice for improving the procedure of Microwave decomposition operation of the sample. After the counterparts made efforts based on the advice of the experts, the recovery was improved to reach 80% or higher.

Figure 3.3-27 Situation of the Activity of the Expert

3.3.2.2 Achievement

For such reasons including transfer of the counterpart and incompleteness of the equipment, the actual provision of instruction regarding analysis was started in June 2007. Therefore, the progress of the instruction was behind the initially considered schedule according to which instruction was scheduled to start in February 2007. However, in March 2008 when the project had reached its final stage, analysis using AAS equipment was conducted regularly every month and, in the same month, the counterparts participated in comparative tests among the laboratories and obtained an excellent result. In April and May when there was no expert staying there, addition and recovery tests were conducted in addition to analysis of lead in actual samples of PM10. The addition and recovery tests using BCR038, which is a certified reference material (particulate matter), initially produced very low recoveries, which were 20 to 50% when the test was started. However, the expert provided instructions by email as well as, during their on-site research that started in June, checking the operations conducted by the counterparts and gave advice for improving the procedure of MW decomposition operation of the sample. After the counterparts made efforts based on the advice of the experts, the recovery was improved to reach 80% or higher.

As of October 2008, the three counterparts can conduct proper analyses that maintain a precision of 80% or higher in the recovery tests using BCR038, which is the certified reference material, for the series of operations from collection of samples to decomposition using the microwave and AAS analysis using the matrix modifier. The capability of counterparts about lead analysis before the start of the project and at the end of the project is shown in Table 3.3-19.

Table 3.3-19 Capability of Counterparts about Pb Analysis

Procedures		Capability	
		Jan.2007	Oct.2008
Standards	Make the standards solutions	△	○
	Use matrix modifier	–	○
	Calibration fit check R^2>0.995R	–	○
Apparatus	Flow late check(PM10 Sampler)		○
	PM10 Sampler Operation	△	○
	Microwave operation	△	○
	Graphite furnace atomic absorption spectrophotometer operation	△	○
	Daily check of microwave	–	○
	Daily check of graphite furnace AAS	–	○
	Graphite furnace AAS maintenance	–	○
Quality Accuracy	Blank test	△	○
	Detection and Quantification limit	–	△
	Repeatability check(RSD below 10%)	–	△
	Quality control solution test	–	○
	Recovery test	–	○
	Inter- laboratory test used by BCR-038		○
Quality Control	Quality Control(X-Control chart)	–	△

RSD: Relative Standard Deviation

	The requirements of the standards methods of EN 14902-2005	
Capability	○	Application Capable
	△	Operative
	–	More training required
	Blank space	Not Implemented

In addition, the following items were achieved during the term of the project

1) Analysis of Lead in the Air

- It became possible for the requirements of conducting the analyses listed in SR EN 14902, which is the standard for analyzing lead in the air, to be satisfied.
- Analyses each with a recovery of about 80% or higher were enabled in the recovery tests using BCR038, which is the certified standard matter (particulate matter), and therefore, high-accuracy analyses were enabled for analyzing lead in the air.
- In March 2008 when the project had reached its final stage and later, analysis using AAS could be conducted regularly every month. The numbers of analyzed samples for ambient

lead in and after March are shown in Table 3.3-20.

Table 3.3-20 Numbers of Analyzed Samples for Ambient Pb

	Pb			Cd
	Field Sample	Recovery Test	Inter-Lab. Test	Inter-Lab. Test
Mar	7	4	4	4
Apr	9	9	—	—
May	10	4	—	—
Jun	10	18	—	—

In addition, the results of the lead concentration of ambient in NRL in March and April are shown in Figure 3.3-28.

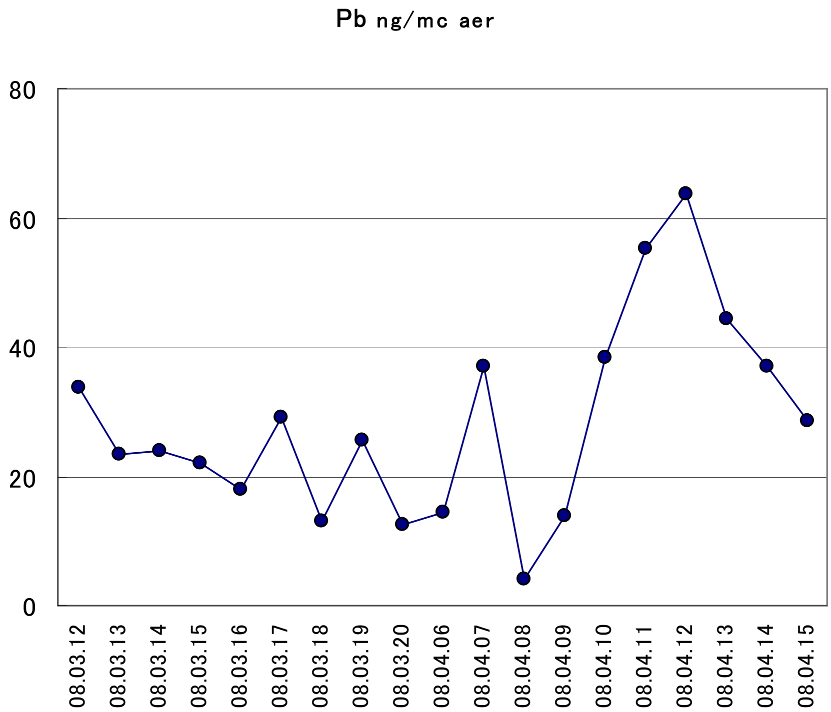


Figure 3.3-28 Pb Concentration of Ambient Pb in NRL

2) Analysis of PM10 Using the PM10 Sampler

- Analysis of PM10 was enabled securing high-precision flow using the flow calibrator for the PM10 sampler.

3) Pre-treatment of Filter Samples Collected by the PM10 Sampler

- In the addition and recovery test where measurement is conducted, using a sample formed by adding the solution used for producing the calibration curve to the paper filter, through the fully same operations as those for measuring the actual sample, the recovery was 105% which was an excellent result as the result of comparing the measured result with the aimed concentration (the measured result/the aimed concentration×100%). Therefore, it became possible to properly conduct the decomposition operation. The results of the recovery tests are shown in Table 3.3-21.

Table 3.3-21 Result of Recovery Test (filter samples added by standard solutions)

Day	Add Volume	Reality concentration	Measured concentration	Recovery Rate
21.03.2008	Add standard solution0.5ml	11.56μg/L	12.11μg/L	105%

- Analyses each with the recovery of about 80% or higher were enabled in the recovery tests using BCR038 which is the certified reference material (particulate matter) and, therefore, the decomposition operation could be properly conducted. The result of the recovery test with CRM (BCR038) is shown in Table 3.3-22.

Table 3.3-22 Result of Recovery Test with CRM (BCR038)

Day	Sampling Weight	Reality concentration	Measured concentration	Recovery Rate
11.06.2008	CRM 68mg	178.16μg/L	141.23μg/L	79%
	CRM74mg	193.88μg/L	154.99μg/L	80%
18.06.2008	CRM77mg	201.74μg/L	266.54μg/L	81%

4) About Analysis of Heavy Metals Using the Atomic Absorption Spectrometer

- Preparation of the standard solution at the same concentration was enabled every time.
- The linearity of the calibration curve and the lower limit value for quantification were checked as the basic QA/QC activity. As the result of the check, the linearity of r=0.995 and the lower limit value for quantification which are the determination criteria satisfied the requirements of the analysis standard and, therefore, the high-accuracy analyses were enabled. The quality accuracy management sheet is shown below.
- Analyses using the matrix modifier were enabled.
- Simple maintenance of the apparatus was enabled.

Ministerul Mediului şi Dezvoltarii Dirabile
Agenția Națională pentru Protecția Mediulu
Direcția Laboratoare Naționale de Referența (D
Serviciul Laborator Aer

Plumb (Pb)

1. Identificarea probei

2. Utilizarea Reactivilor

Standard :Marca.	Cat.810-42	Lot.A1292	
Reactiv: Marca.	Cat.12710-99		Garanție.02.2010

3. Aparat

Spectrofotometru Absorbție Atomic	Thermo Solaar S series
Cu Cuptor de grafit	Software solaar wizard
Grafitul cuptor Atomică	Thermo GFS97
Grafit	Normal
Termo NESLAB	
Auto Mostră	Thermo GFS97
Gazul Argon	99.50%
Lămpa	Catodo Lampă 25NU de Pb în Gaz Thermo. Cat 9423 390 30821

4. Metodă

EN 14902-2005

5. Data şi Analista

Data 05.11.2007 **Analista** Mirela Tarbasanu

6. Curba de calibrare

No.	Std C[μg/L]	A	(X) [μg/L]	RSD (%)	Evaluare (±20%)
1	0.0	0.005	-0.25	9.6	-
2	2.0	0.017	1.73	6.2	-13.3663
3	4.0	0.030	3.88	1.6	-3.0528
4	10.0	0.073	10.97	1.8	9.7360
5	20.0	0.125	19.55	0.7	-2.2277
6	40.0	-	-	-	-

Ecuație

Y=	aX+b
a=	0.00606
b=	0.00650
r^2=	0.99500
r=	0.99750
a'	**165.0165**
b'	**-1.0726**

7. Limită de detecție a metodei(7ori Firtle)

No.	Absorție (A)	Concentrație (X)[μg/L]	Firtle Val.medie [μg/L]	Firtle STEV (SD)	RSD(%)	LD *TSD* [μg/L]	LD *Metoda* [ng/m3]
1	0.006	-0.2691	-0.2865	0.1090	-38.06	**0.26**	**0.23**
2	0.006	-0.1404					
3	0.006	-0.2884					
4	0.007	-0.1614					
5	0.005	-0.3653					
6	0.005	-0.3345					
7	0.004	-0.4461					

T0.95 n =7 2.365

Figure 3.3-29 Quality Accuracy Management sheet

3.3.3 Ultra Violet Spectrophotometer(UV-VIS)

3.3.3.1 Activity

At the start of the project, though NRL had purchased the UV-VIS, the sampling apparatus (wet sampler) and reagents were lacking and the person in charge was also in charge of IC analysis and conducted IC analysis with priority. Therefore, it was determined that instruction would be provided after introducing the materials and the equipment. Because the project purchased the wet sampler at the end of August 2007, instruction was scheduled to be provided mainly in and after October. However, the activity could not actually be conducted due to various factors. Therefore, in November, as the result of a discussion with the counterparts, we set the task, which was to be completed by February, of conducting analyses by repeating collection of samples starting from simple items with operations that were also uncomplicated.

In January 2008, NRL purchased an automatic shipper unit for the UV-VIS, for which unit the experts gave advice to the counterparts as necessary. As a result, the counterparts could easily conduct analysis by and maintenance of the UV-VIS. In January, the experts purchased a passive sampler for ozone and ammonia and, in February, they started analysis of ozone using the passive sampler test method.

Based on the agreement obtained in the JCC meeting held in February 2008, the monitoring activity implementation plan was started in March 2008 and the counterparts started to conduct analysis of ammonia (NH3) in the air.

In addition, estimation of the "uncertainty" for the NH3 analysis using the wet sampler and the UV-VIS was started. An expert, Mr. Fujimura, observed the analysis operations conducted by the counterparts and made a list of possible factors of the uncertainty, and collected data to estimate the magnitude of the uncertainty component for some of the factors.

Figure 3.3-30 Situation of the activity of the expert

3.3.3.2 Achievement

The following items were achieved during the project.

1) Analyzed Items

Before starting the project, air quality analysis such as the analysis of ammonia had not been conducted. However, in and after March 2008, analysis of ammonia was regularly conducted every month by collecting samples using the wet sampler and by using the UV-VIS. The numbers of analyzed samples for and after March are shown in Table 3.3-23.

Table 3.3-23 Number of Analyzed Samples for Ambient NH3

Month	Number
Mar	5
Apr	3
May	3
Jun	12

As an example, the result of ammonia monitoring in March is shown in Table 3.3-24.

Table 3.3-24 Result of NH3 Monitoring in March

Sampling Point	Started Day	Finished Day	Sampling Time (min)	Volume (L)	Debit (L/min)	NH3 (μg)	Absorbance (Abs)	NH3 (mg/m3)
ANPM	08.03.24	08.03.25	1440	1688.4	1	29.075	0.069	0.017
ANPM	08.03.25	08.03.26	1440	1670.6	1	5.530	0.013	0.003
ANPM	08.03.26	08.03.27	1440	1629.0	1	12.401	0.030	0.008
ANPM	08.03.27	08.03.28	1440	1502.3	1	24.718	0.059	0.016
ANPM	08.03.31	08.04.01	1440	1584.4	1	68.331	0.163	0.043
ANPM	08.04.01	08.04.02	1440	1560.0	1	36.030	0.086	0.023
ANPM	08.04.02	08.04.03	1440	1574.5	1	38.083	0.091	0.024
ANPM	08.04.03	08.04.04	1440	1601.1	1	56.642	0.135	0.035

The variation in ammonia concentration in the ambient air is shown in Figure 3.3-31.

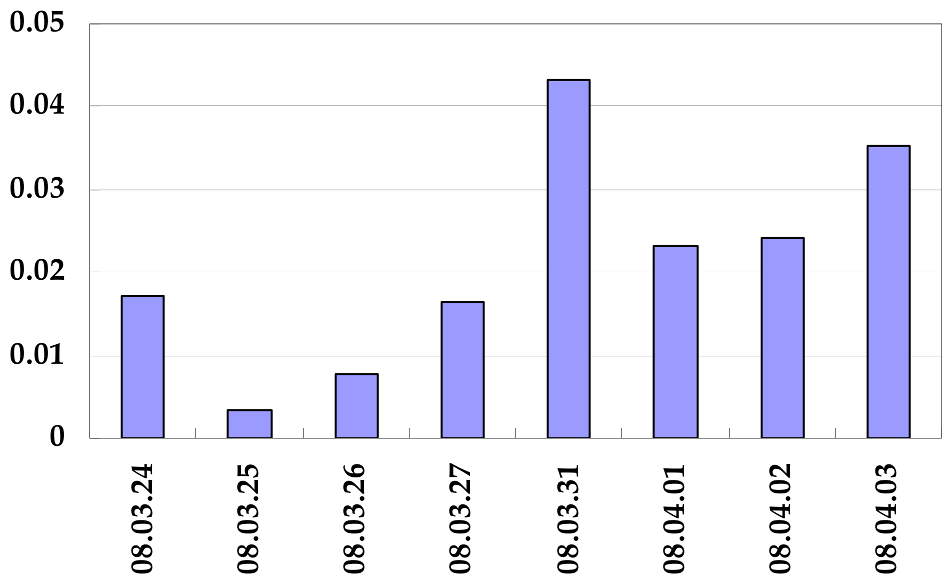


Figure 3.3-31 Concentration of NH3 in Ambient Air (mg/m3)

2) Analysis of Air Quality by the Wet Sampler

The counterparts were enabled to operate the wet sampler purchased by the project and were enabled to collect samples in the air of ammonia and formaldehyde using the apparatus and to analyze them using the UV-VIS.

3) Analysis of Air Quality by the Passive Sampler

Analysis using the UV-VIS after collection of ozone and ammonia with exposure to those gases using the passive sampler that the project had purchased was enabled. As an example, the result of the comparative test of concentrations between the automatic measuring apparatus and the passive sampler for ozone in the air conducted for one week from February 12th to February 19th is shown in Table 3.3-25.

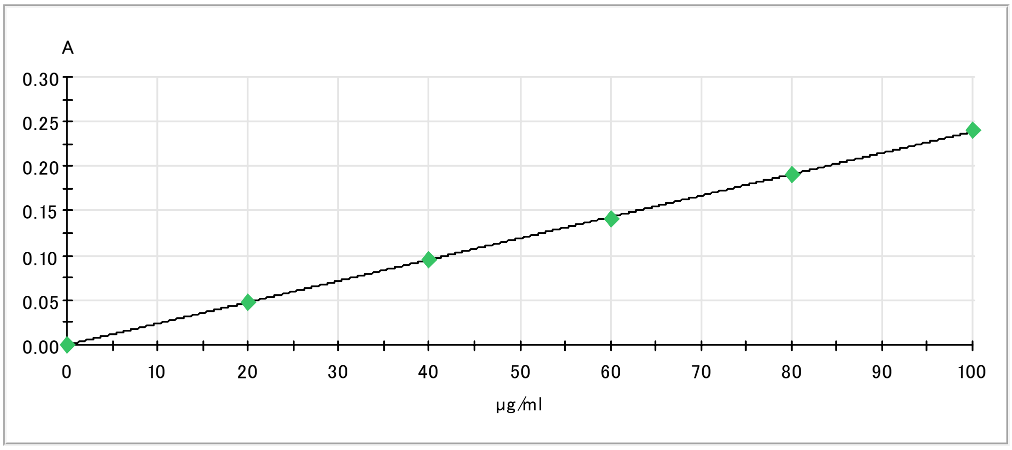
Table 3.3-25 Result of O3 Concentraton

Name of Sample	Absorbance (A)	Concentration	Concentration in Air
NRL (12.Feb-19.Feb)	0.468	39.09mg/L	35.27μg/m^3
Blank (Average)	0.001	0.002mg/L	

4) About Analysis Using UV-VIS

The counterparts can by themselves weigh standard samples, prepare the calibration curve solution, operate the apparatus of UV-VIS, and produce the calibration curve. When the determination criterion of the linearity of the calibration curve was taken as the basic QA/QC activity, the linearity of the calibration curve for the concentrations at four or more points was r>=0.995 and high-precision analysis was enabled. The counterparts produced the calibration curve. An example of the calibration curve that the counterparts actually produced is shown in Figure 3.3-32. The capability of counterparts at the end of the project is shown in Table 3.3-26.

Method:	**amoniac25.03.08.mqa (450 nm)**
Last modified:	**3/25/2008 3:30:26 PM by adriana.zlatan/LA-ADRIANAZ**
Spectrophotometer:	**EV100**
Serial number:	**144519**
Firmware:	**v4.60 v4.80**
Measured:	**4/4/2008 2:58:02 PM by adriana.zlatan/LA-ADRIANAZ**
Result filename:	



Curve parameters: y = 2.386909E-03 x
Residual error: 0.0015 Correlation coefficient: 0.99987

Standard Data

No.	Concentration [μg/ml]	A	Error [A]	Used
1	0	0.001	0.001	Yes
2	20	0.048	0.000	Yes
3	40	0.095	0.000	Yes
4	60	0.141	-0.002	Yes
5	80	0.190	-0.001	Yes
6	100	0.241	0.002	Yes

4/4/2008 2:58:02 PM VISIONlite Page 1 of 1

Figure 3.3-32 NH3 Calibration Curve

Table 3.3-26 Capability of Counterparts about UV-VIS Analysis

Procedures		Capability Oct.2008
Standard	Make the standards solutions	○
	Multiple calibration curve	○
	Calibration fit check R>0.995	○
Measurement	Wet sampler operation	○
	Make the absorption solutions	○
	UV-VIS equipment operation	○
	Calculate Sheet	○
Quality control	Blank	○
	Equipment control log book	○
	UV-VIS equipment Maintenance	△

Capability	○	Application Capable
	△	Operative

3.3.4 Gas Chromatograph(GC)

3.3.4.1 Activity

(1) Grasp of performing situations of analysis

The current situation of GC analysis, analytical condition, equipment for maintenance and calibration were verified by the expert to evaluate the possible difficulties of daily operation. As a result, they found lack of syringes, adsorbent tubes and tool kit like screw wrenches. There were very few TENAX tubes of 25ng for the mixture of benzene, toluene and xylene as well. These items needed to be purchased by the Japanese side.

(2) Equipment for making calibration curve

Regarding the making of calibration curve, the tools necessary for the calibration and the injection were found to be insufficient. The specification of the equipment was reviewed by the expert and the items were purchased by the Japanese side due to the fact that the procurement process of NRL were too complicated to obtain the items in time for the project. The connection tubes and pipes for the injector system for the calibration were also purchased by the Japanese side. The injector system was installed by the counterparts together with the expert, and this was a good opportunity for the counterparts to learn about the connection of metal pipes.

Figure 3.3-33 Injector System for Making a Calibration Curve (left) and the Former TECORA Pump Owned by NRL (right)

(3) Equipment for sampling

As of January 2007, NRL already owned a sampling pump for tube sampling. The pump has the function of auto air sampling at regular time interval for 16 tubes by programming the schedule. This sampler has the flow range from 3 to 30 L/min. The pump was absent at that time because of the changing and adjusting the flow rate and when the pump was returned in April 2007, the flow range of the pump was changed 0.3 to 3 L/min by the attachment of a low flow cell into the pump. Then the pump was used for the sampling rate of 50ml/min but had a breakdown in three days. The pump was absent again for the repair service until September 2007.

Considering the flow rate of 50ml/min for 24 hours, total sample air volume for the thermal desorption was too large to analyze, because the EN standard stipulates the total sample volume for thermal desorption is around 10L. However it shall take only 4 hours to change the adsorbent tubes, which was not practical as field monitoring method. Therefore, the purchase of new pump was considered by the Japanese side.

Finding the pump compliant with EN14662 was not so easy, but the pump produced and sold by national agency of U.K., NPL (National Physical Laboratory), was found to be qualified. Although the pump was very expensive, it was decided to be bought by the Japanese side for the following reasons.

- Both NRL and NPL are located in the EU area, and this is convenient to interchange the information.

- It is relatively easy to obtain the spare parts.

- The pump is qualified to CE Labeling (meet the safety standard of the EU).

- It has structure with double measurement.

- It has mass flow controller

- Expecting good after-sale service

And the size of adsorbent tube matches the size of the pump.

Figure 3.3-34 The Newly Induced Pump Made by NPL

After the pump purchased from NPL was delivered in February 2008, the field sampling was started. Sample inlet was originally 1/8 inches, but the length of tube to the sampling point is too long to secure enough sample flow. Then the size of sample inlet was changed to 1/4 inches from 1/8 inches and the pump worked properly.

The former TECORA pump owned by NRL was sent to manufacturer for version up service in May 2008.

Reference

1. National Physical Laboratory (UK): Quality control procedures for air quality monitoring including procedures for data handling validation and ratification

2. Derby City Council: Derby City Council detailed assessment for benzene

3. National Physical Laboratory (UK): Report on Pilot Study of Manually Pumped and

Diffusive Sampling Techniques for Benzene Measurement

(4) Examination for sampling and sample handling

Field sampling started using TECORA pump in October 2007. The sample in a rainy day in October, contained large amount of water and killed a flame in the FID detector. To solve this problem, the expert suggested that a dehumidification dryer of Magnesium Perchlorate is placed before sampler pump. This method is popular in Japan and was explained in the training program in Japan in November 2007. As glassware used for packing Magnesium Perchlorate was difficult to find in Romania because it is not the EU standard product, the glassware and reagent of Magnesium Perchlorate were purchased by the Japanese side and after then they were used in rainy day sampling. Another option to solve the problem was also introduced by the expert. The method of another option is that nitrogen gas is introduced for a few minutes into sampling tube with injector system to dry the sample gas.

The sampler pump was located at the entrance of NRL as trial building. Sampling was finished before night due to the security reason during the night time. The number of sampling was reduced during winter when the night time temperature falls under -10 degrees Celsius and this may cause the sampler break down advising from the agent. Before purchasing the NPL pump in February 2008, it was not possible to locate the pump in the office room and to sample the air from outside connecting with long tubes, because there were no long tubes available and it was not favorable to leave the window of security guard room opened all the night during winter in order to pass the sampling tubes. After NPL pump was delivered, Sampling with long tubes was started.

Figure 3.3-35 Tube Conditioning System (left) and Nitrogen, Hydrogen and Pure Air Generator (right)

The setting such as the temperature for tube conditioning system was decided by the counterpart herself. The actual flow rate of the system with the series of six tubes was checked and some modifications were made by the expert. For example, the flow rate measured at the point of the carrier gas outlet was not matched with the setting of the system, so flow rate were adjusted and the temperature setting was also checked and adjusted.

The tubes after sampling were stored in a case with silica gel. The Japanese storage method was explained by the expert. The long-term caps and the storage case of activated carbon are used in Japan. These items were purchased by the Japanese side and after then used in sampling process by the counterparts.

It was transferred by the expert to weigh and dilute the benzene for making of calibration curve. Using methanol as the solvent for the calibration curve was agreed between the counterparts and the expert. A volumetric flask of 100ml was replaced to 10 ml flask for dilution purpose with the advice of the expert. A polyethylene bottle of 500 ml was also suggested by the expert to use for the organic liquid waste.

（5） Starting up and adjustment of GC system

Nitrogen career gas was supplied not by gas cylinder but by gas generator because of its low running cost. The generator was sent to Italy for repairing the breakdown in April 2007. It was advised by the expert that nitrogen gas cylinder should be used as an alternative method. However, it was not possible to exchange the equipment due to the contract between NRL and EU.

The generator was returned to NRL after two months, but there was another breakdown found for sample induction system (thermal desorption system). After the repair service of local agent again, there were still malfunction in gas pressure and the generator was replaced by gas cylinder supplied by the agent a few months later. The peak of benzene was confirmed using gas cylinder without any error caused by insufficient gas pressure.

After the warranty period of the generator expired in October 2007, the period was extended by the request of NRL. The generator was sent to Romanian local agent for another repair service. Although the generator worked well after the repair, the capacity was found to be not enough to supply for both GC analyzer and thermal desorption system.

As a gas cylinder rack was not usually available in Romania except to fix by chain on a wall, special order to local agent was made by the counterparts according to some information and photographs in Japanese training program. The racks were delivered in a few months.

The peak of benzene was identified but the shape and height of the peak were not acceptable. The flow rate was quite low at the tip of the column at the entrance of FID detector. The cause of the problem proved to be burn around the column connection. This part may be modified during the repair service by an engineer of a local agent. The connection part was replaced to new one purchased.

Figure 3.3-36 GC Sample Induction System (left) and Adsorbent Tube for Thermal Desorption and Long-term Storage Cap (right)

(6) Establishment of analytical conditions

Software operations such as the way to change the setting for GC analyzer, to save the method, to make a calibration curve, and to change the report layout were transferred by the expert. The only training in the past was the 2-days initial training at the installation of the agent which covered just basic operations. The EU was concerned with this situation and planned GC training course for 2weeks of lectures and 5 weeks of laboratory works in February 2007, but this was not fulfilled (realized).

The initial temperature of the column was set to 50 degrees Celsius, however it seemed to the expert that the temperature was a little too high to analyze the benzene. Therefore, the condition was modified as the table below.

Table 3.3-27 Temperature Conditions of GC Column

Before change	After change
Initial temp : 50 deg. C	Initial temp : 40 deg. C
Initial time : 2.5 min	Initial time : 5.0 min
Rate : 9 deg./min	Rate : 12 deg./min
Final temp : 250 deg. C	Final temp : 260 deg. C

Table 3.3-28 Present Measuring Conditions

Measurement device : Agilent, Technology GC-6890N FID Pre-treatment device : Markes, TD Ultra Unity Desorbing Temperature : 250℃ Column : DB-1ms 30m×0.25mm× 0.25μm Column temperature : 40℃ (5min)-12℃/min-260℃ 2min(25min) Detector temperature : 300℃ Flow rate : 1 ml/min Carrier gas : Nitrogen

As a part of quality control, operational blank, field blank, repeated sample test were measured by the counterpart. Operational blank was measured soon after tube conditioning. For field blank, the sampling tube placed near the sample pump was measured. Some calibration standard tubes at the same concentration were prepared with injector and then measured by the counterpart for the repeated test.

The practical training on exchange of column was done as a part of GC maintenance.

The operation manuals used in the training are shown in the Table 3.3-29.

Table 3.3-29 List of Operation Manuals of Equipment

No.	Document title	Language
1	Unity Thermal Desorber – User Manual Version 4. 7 July 2007	English
2	Ultra Automated Sampler – User Manual Version 2. 4 August 2003	English
3	TCR TECORA Delta Wireless Sampler Battery Sampler Instruction Manual	English
4	NPL Controlled flow air sampler	English
5	NPL Pumped Tubes Local Site Operator Instructions Issue 2.1 Dec 2007	English
6	TALBOYS Instruction Manual （ATIS）	English
7	ATIS™ Adsorbent Tube Injector System OPERATION MANUAL	English
8	Gas chromatograph Agilent 6890 – Instruction Manual	English
9	Agilent 6890 Gas Chromatograph Maintaining Your GC	English
10	Agilent 6891 Gas Chromatograph Troubleshooting	English
11	Agilent 6892 Gas Chromatograph User Information	English
12	Series 942 User's Manual Watlow Controls Condition System	English
13	CLAIND HG2200 Manual	English
14	CLAIND HG2381 Manual	English

Table 3.3-30 Reference Document of GC

1	Bullten 853B Capillary GC Troubleshooting Guide: How to Locate Problems and Solve Them :Supelco	English

（7） Training in Japan

In the training program in Japan, the counterpart took the lecture by Mr. Watanabe at National Environmental Research and Training Institute. The training at the Institute was 4 days and covered a guidance of general information, such as role of the Institute, outline of the training course, budget and facilities. And useful topics for the counterpart were explained such as that the significance and necessity of VOC monitoring, Japanese method of VOC measurement, sampling, GC analysis, change of column, calibration curve, gas piping etc. The training in Green Blue Corporation covered ISO 17025, air ventilation system and waste effluent system of the laboratory, VOC measurement, analysis records, important points in analysis, and so on.

（8） Performing of field monitoring for ambient benzene

The field air quality monitoring was implemented every month form March 2008 and about 10 samples a month have been monitored. The number of samples, blanks, and repeated tests that were done are indicated the Table 3.3-31. The double measurements were implemented by the counterpart with new pump.

Sufficient number of samples were analyzed by the counterpart for about half a year. Sampling record and calculation sheet were organized and necessary information such as sampling person, GC analyst, and date of measurement was also included in the record. One of the pumps in NRL was absent for the up-grade service from May 2008, however, regular sample analysis was still implemented. Although, there were no material problems like carrier gas for GC operation, there was a little problem about the accuracy of the linearity of the calibration curve.

Table 3.3-31 Number of Analyzed samples for Ambient Benzene

	Sample	Blank	Repeat test
March	20	5	5
April	12	5	—
May	8	4	—
June	11	11	5
July	10	5	5

Table 3.3-32 Sampling Status by DELTA TECORA Pump

No.	Tube Lot No.	Sampling									
		c	d	e	f	g	h	i	j	k	
		Sampled Quantity	Start Day	Start time	End Day	End time	Sampling Time	Average flow	Average temp.	Air Pressure	Name
		L					min	ml/min	℃		
1		―	―	―	―	―	―	―	―	―	
2	Mi10/GC164	11.58	26-02	10:10	26-02	14:10	240	49.79	19.3	101	Popescu
3	Mi10/GC167	9.32	26-02	14:10	26-02	17:18	188	49.71	22.0	101	Popescu
4	Mi088524/GC16	―	―	―	―	―	―	―	―	―	
5	Mi088526/GC19	67.22	4-03	13:54	5-03	13:54	1440	49.95	13.2	100	Popescu
6	Mi088527/GC14	69.41	5-03	13:54	6-03	13:54	1440	49.95	7.3	101	Popescu
7	Mi088528/GC15	69.09	6-03	13:54	7-03	13:54	1440	49.95	10.0	101	Popescu
8	Mi109126/GC26	―	―	―	―	―	―	―	―	―	
9	Mi109121/GC27	66.35	12-03	15:23	13-03	15:23	1440	49.96	15.6	99	Popescu
10	Mi109122/GC28	67.40	13-03	15:23	14-03	15:23	1440	49.95	12.8	99	Popescu
11	Mi109124/GC57	―	―	―	―	―	―	―	―	―	
12	Mi109121/GC55	66.13	18-03	11:35	19-03	11:35	1440	49.94	16.1	100	Popescu
13	Mi109122/GC56	68.24	19-03	11:35	20-03	11:35	1440	49.93	9.5	100	Popescu
14	Mi109123/GC54	66.92	20-03	11:35	21-03	11:35	1440	49.93	14.3	99	Popescu
15	Mi088528/GC82	―	―	―	―	―	―	―	―	―	
16	Mi088524/GC78	61.80	24-03	10:30	25-03	10:30	1440	49.95	15.5	98	Popescu
17	Mi088541/GC79	66.70	25-03	10:30	26-03	10:30	1440	49.95	11.3	98	Popescu
18	Mi088529/GC80	68.00	26-03	10:30	27-03	10:30	1440	49.95	9.9	99	Popescu
19	Mi088530/GC81	67.19	27-03	10:30	28-03	10:30	1440	49.95	14.4	100	Popescu
20	Mi088529GC102	―	―	―	―	―	―	―	―	―	
21	Mi088523/GC 98	65,03	7-04	10:45	8-04	10:45	1440	49,96	16.4	99	Popescu
22	Mi088527/GC 100	65,44	8-04	17:05	9-04	17:05	1440	49,96	20.7	100	Popescu
23	Mi088528/GC 101	65,84	9-04	17:05	10-04	17:05	1440	49,96	19.3	99	Popescu

Table 3.3-33 GC Measuring Status（DELTA Pump）

Sample name		RT	Area	benzene	-Blank	Sampling Volume	Temp.	Air P
		min		ng/tube	ng/tube	L(Gas)	℃	kPa
BLK		5.4	0.7	0	-	-	-	-
Sample 1/2	Mi088526/GC19	5.3	5.6	-0.11	-0.11	67.22	13.2	99.5
Sample2/3	Mi088527/GC14	5.4	203.8	211.35	211.35	69.41	7.3	100.5
Sample 3/4	Mi088528/GC15	5.4	3.3	-2.57	-2.57	69.04	10.0	101.0
BLK	Mi109126/GC26	5.2	0.7	-5.31	-	-	-	-
Sample 4/6	Mi109121/GC27	5.4	65.6	63.90	69.21	66.35	15.6	99.1
Sample 5/7	Mi109122/GC28	5.4	4.1	-1.71	3.60	67.4	12.8	99.2
BLK	Mi109124/GC57	5.3	9.6	4.15	-	-	-	-
Sample 6/9	Mi109121/GC55	5.2	77.6	76.70	72.55	66.13	16.1	99.8
Sample 7/10	Mi109122/GC56	5.2	14.6	9.49	5.33	68.24	9.5	99.6
Sample 8/11	Mi109123/GC54	5.2	28.2	24.00	19.84	66.92	14.3	99.4
BLK	Mi088528/GC82	5.3	6.0	0.31	-	-	-	-
SAMPLE 9/13	Mi088524/GC78	5.2	13.3	8.10	7.79	61.80	15.5	97.6
SAMPLE 0/14	Mi088541/GC79	5.2	185.8	192.15	191.83	66.70	11.3	98.1
SAMPLE11/15	Mi088529/GC80	5.4	39.1	35.63	35.32	68.00	9.9	99.4
SAMPLE12/16	Mi088530/GC81	5.3	8.4	2.87	2.56	67.19	14.4	99.8

Note: Concentration values are not showed because of a problem of linearity of calibration curve

Table 3.3-34 Sampling Status by NPL Pump

No	Sample name	A B	Lot No.	Sampled Quantity (L)	Start Indication	End Indication	Start Day	Start Time	End day	End time	Name
1	BLK		–	—	—	—	—	—	—	—	Popescu
2	N-1-1		Mi109121	7.2	13	25	26-feb.	14:45	27-feb.	14:38	Popescu
3	N-1-2		Mi109122	7.2	13	25	26-feb.	14:45	27-feb.	14:38	Popescu
4	N-1-3	B	Mi109123	7.0	26	37	27-feb.	14:47	28-feb.	15:10	Popescu
5	N-1-4	A	Mi109124	7.0	26	37	27-feb.	14:47	28-feb.	15:10	Popescu
6	BLK		–	—	—	—	—	—	—	—	Popescu
7	N-1-5	A	Mi109125	7.4	37	50	28-feb.	15:42	29-feb.	14:54	Popescu
8	N-1-6	B	Mi109126	7.4	37	50	28-feb.	15:42	29-feb.	14:54	Popescu
9	BLK		Mi088525	—	—	—	—	—	—	—	Popescu
10	N-I-9	A	Mi109124	15	192	217	12-mar.	14:19	14-mar.	15:00	Popescu
11	N-1-10	B	Mi109126	15	192	217	12-mar.	14:19	14-mar.	15:00	Popescu
12	BLK		Mi088525	—	—	—	—	—	—	—	Popescu
13	N-1-11	A	Mi088526	16	217	244	19-mar.	11:24	21-mar.	15:47	Popescu
14	N-1-12	B	Mi088527	16	217	244	19-mar.	11:24	21-mar.	15:47	Popescu
15	BLK		Mi088641	—	—	—	—	—	—	—	Popescu

16	N-1-13	A	Mi109125	14	244	267	24-mar.	10:40	26-mar.	10:47	Popescu
17	N-1-14	B	Mi109126	14	244	267	24-mar.	10:40	26-mar.	10:47	Popescu
18	BLK		Mi109123	—	—	—	—	—	—	—	Popescu
19	N-1-15	A	Mi109121	14	268	291	26-mar.	13:20	28-mar.	13:20	Popescu
20	N-1-16	B	Mi109122	14	268	291	26-mar.	13:20	28-mar.	13:20	Popescu
21	Blk		Mi109126	—	—	—	—	—	—	—	Popescu
22	N-I-17	A	Mi109124	16	291	318	7 apr.	11:08	9.apr	15:27	Popescu
23	N-I-18	B	Mi109125	16	291	318	7 apr.	11:08	9.apr.	15:27	Popescu
24	Blk		Mi088527	—	—	—	—	—	—	—	Popescu
25	N-i-19	A	Mi088523	7.4	318	330	14.apr.	15:28	15.apr.	15:55	Popescu
26	N-I-20	B	Mi088524	7.4	318	330	14.apr.	15:28	15.apr.	15:55	Popescu
27	Blk		Mi 088529	—	—	—	—	—	—	—	Popescu
28	N-i-21	A	Mi088526	21	330	366	15.apr.	16:10	17.apr.	15:36	Popescu
29	N-L-22	B	Mi088528	21	330	366	15.apr.	16:10	17.apr.	15:36	Popescu
30	Blk		Mi088527	—	—	—	—	—	—	—	Popescu
31	N-I-23	A	Mi088523	14	366	390	22.apr	14:32	24 apr.	14:40	Popescu
32	N-l-24	B	Mi088524	14	366	390	22.apr	14:32	24 apr.	14:40	Popescu
33	Blk		Mi088525	—	—	—	—	—	—	—	Popescu
34	N-I-25	A	Mi088523	15	390	416	12-mai.	11:05	14-mai.	14:15	Popescu
35	N-I-26	B	Mi088524	15	390	416	12-mai.	11:08	14-mai.	14:15	Popescu
36	Blk		Mi109124	—	—	—	—	—	—	—	Popescu
37	N-i-27	A	Mi109122	15	416	440	14-mai.	14:27	16-mai.	15:35	Popescu
38	N-I-28	B	Mi109123	15	416	440	14-mai.	14:27	16-mai.	15:35	Popescu
39	Blk		Mi086641	—	—	—	—	—	—	—	Popescu
40	N-i-29	A	Mi109126	16	440	467	21-mai.	9:57	23-mai.	14:46	Popescu
41	N-L-30	B	Mi109142	16	440	467	21-mai.	9:57	23-mai.	14:46	Popescu
42	Blk		Mi109147	—	—	—	—	—	—	—	Popescu
43	N-I-31	A	Mi088543	15	467	491	26-mai.	14:54	28-mai.	15:37	Popescu
44	N-l-32	B	Mi109143	15	467	491	26-mai.	14:54	28-mai.	15:37	Popescu
45	Blk		Mi088528	—	—	—	—	—	—	—	Popescu
46	N-I-33	A	Mi109121	14	491	514	3 iun.	16:07	5 iun	13:29	Popescu
47	N-I-34	B	Mi088529	14	491	514	3 iun.	16:07	5 iun	13:29	Popescu
48	Blk		Mi109125	—	—	—	—	—	—	—	Popescu
49	N-i-35	A	Mi109122	16	527	554	10iun	9:23	12 iun	14:38	Popescu
50	N-I-36	B	Mi109126	16	527	554	10iun	9:23	12 iun	14:38	Popescu
51	Blk		CO9382	—	—	—	—	—	—	—	Popescu
52	N-I-37	A	CO10911	14	554	577	17 iun	16:00	19 iun	15:30	Popescu
53	N-L-38	B	CO10412	14	554	577	17 iun	16:00	19 iun	15:30	Popescu
54	Blk		Mi109123	—	—	—	—	—	—	—	Popescu
55	N-I-39	A	Mi088524	14	577	601	23 iun	16:00	25 iun	15:31	Popescu
56	N-l-40	B	Mi088527	14	577	601	23 iun	16:00	25 iun	15:31	Popescu
57	Blk		CO9382	—	—	—	—	—	—	—	Popescu
58	N-I -41	A	CO10412	7.5	601	613	25 iun	15:32	26 iun	16:30	Popescu
59	N-I-42	B	CO10911	7.5	601	613	25 iun	15:32	26 iun	16:30	Popescu

Table 3.3-35 GC Measuring Status (NPL Pump)

Analysis Day GC	Sample name			RT	Area	benzene	-Blank	Sampling Volume
				min		ng/tube	ng/tube	L(Gas)
17-Mar	Blk			5.325	2.3	0.00	-	-
17-Mar	N-1-9		A/GC30	5.300	8.1	3.74	3.74	7.6
17-Mar	N-1-10		B/GC31	5.316	9.8	5.59	5.59	7.6
19-Mar	Blk			5,306	4.8	0.25	-	-
19-Mar	N-1-11		A/GC58	5,228	6.72	2.31	2.05	7.9
19-Mar	N-1-12		B/GC60	5.325	4.45	0.86	0.61	7.9
26-Mar	Blk			4.895	14.8	0.00	-	-
26-Mar	N-1-13		A/GC70	5.183	22.24	18.75	18.75	7.1
26-Mar	N-1-14		B/GC69	4.724	5	0.00	0.00	7.1
28-Mar	BLK			5.380	5.14	0.00	-	-
28-Mar	N-1-15	A/GC84	Mi109121	5.302	7.028	1.41	1.41	14.3
28-Mar	N-1-16	B/GC85	Mi109122	5.340	4.449	-1.34	0.00	14.3
11-Apr	Blk		Mi109126	5379	1.75	0.00	-	-
11-Apr	N-I-17		Mi109124	5382	5.06	-0.69	-2.10	15.7
11-Apr	N-I-18		Mi109125	5335	3.90	-1.93	-3.34	15.7
16-Apr	Blk		Mi088527	5295	1.06	-4.96	-6.37	0.0
19-Apr	N-1-19		Mi088523	5110	1.29	-4.71	-6.12	7.4
19-Apr	N-1-20		Mi088524	5274	1.67	-4.31	-5.72	7.4
25-Apr	Blk		Mi 088529	5202	0.00	-6.09	-1.13	0.0
25-Apr	N-I-21		Mi088526	5307	5.06	-0.69	4.27	21.4
25-Apr	N-L-22		Mi088528	5274	4.88	-0.88	4.08	21.4
25-Apr	Blk		Mi088527	5223	1.95	-4.01	-3.32	0.0
25-Apr	N-I-23		Mi088523	5384	2.65	-3.26	-2.56	14.4
25-Apr	N-I-24		Mi088524	5275	2.41	-3.52	-2.82	14.4
3-May	Blk		Mi088525	5.202	0.962	0.00	-	-
16-May	N-I-25		Mi088523	5.255	2.139	-3.81	3.27	15.4
16-May	N-I-26		Mi088524	5.160	17.00	12.05	2.03	15.4
2-May	Blk		Mi109124	5.188	4.629	-1.15	-	-
2-May	N-I-27		Mi109122	5.222	3.568	-2.28	0.25	14.8
2-May	N-I-28		Mi109123	5.453	5.950	0.26	0.65	14.8
16-May	Blk		Mi086641	5.267	2.411	0.00	-	-
16-May	N-I-29		Mi109126	5.431	4.129	-1.68	-0.69	15.9
16-May	N-L-30		Mi109142	5.442	2.709	-3.20	-0.88	15.9
16-May	Blk		Mi109147	5.518	3.130	0.00	-	-
13-May	N-I-31		Mi088543	5.328	0.337	-5.73	0.75	14.6
13-May	N-l-32		Mi109143	5.526	3.778	-2.06	0.50	14.6
8-Jun	Blk	GC 37	Mi088528	5.490	0	0.00	-	-
8-Jun	N-I-33	A/GC38	Mi109121	5.223	2.116	0.00	0.00	13.6
8-Jun	N-I-34	B /GC39	Mi088529	5.526	2.884	0.00	0.00	13.6
8-Jun	Blk	GC/ 103	Mi109125	5.540	4.84	0.03	-	-
8-Jun	N-I-35	A/104	Mi109122	5.457	2.131	0.00	0.00	16.0
8-Jun	N-I-36	B/105	Mi109126	5.409	1.722	0.00	0.00	16.0
19-Jun	Blk	GC71	CO9382	5.270	4.018	0.00	-	-
19-Jun	N-I-37	A/72	CO10911	5.392	3.711	0.00	0.00	14.2
19-Jun	N-I-38	B/73	CO10412	5.294	2.753	0.00	0.00	14.2
8-Jun	Blk	GC106	Mi109123	5.482	0	0.00	-	-

8-Jun	N-I-39	A/GC107	Mi088524	5.482	0	0.00	0.00	14.1
8-Jun	N-I-40	B/GC108	Mi088527	5.686	6.58	2.13	2.13	14.1
8-Jun	Blk	GC100	CO9382	5.560	0.96	0.00	-	-
8-Jun	N-I-41	A/GC101	CO10412	5.273	4.638	0.07	0.07	7.5
8-Jun	N-I-42	B/GC102	CO10911	5.274	2.003	0.00	0.00	7.5

Figure 3.3-37 Situation of the Activity of the Expert

3.3.4.2 Achievement

(1) Procurement and arrangement of equipment

The additional equipment necessary for GC maintenance and flow meters etc. were purchased by the Japanese side. In order to avoid the immediate difficulties in analysis, gas syringes and adsorbent tubes for ambient air samples were specified with the assistance from the counterpart, and also bought by the expert .These spare parts should be purchased by NRL for continuing analysis operation.

The expert also purchased GC columns and TENAX tubes of 25ng for the mixture of benzene, toluene and xylene which are the same as the model used in NRL.

In addition, injector system for multiple calibration was procured by the Japanese side, which contributed to prepare reference tubes for calibration more accurately. By introducing injector system, 5-points calibration is implemented more easily without buying expensive reference tubes for calibration. It is also possible for NRL to prepare many reference tubes for calibration at the same concentration, and these tubes can be used as internal quality control materials.

(2) Procurement of sampling equipment and Review of sampling conditions

Air sampling under low flow rate became possible by purchasing new NPL sampler. The sampling accuracy was improved because the mass flow controller in the pump makes it possible to aspirate the air at constant rate of 10ml/min. Sampling for double measurement also became possible by new NPL pump. After changing the metal tips of air inlet by the expert, it has worked well without any errors. The former TECORA pump owned by NRL was often absent for the repair service for a long time, and the available period of the pump during the project was only for 8 months.

The desiccant tubes proposed by the expert were placed into sampling tubes and made it possible to analyze the samples in the rainy days without any influence on GC analyzer. Although there is another option to dry the sample air by blowing nitrogen gas, the decision on which of two options are adopted will depends on the test by the counterpart, the running cost, and the operability.

Sampling has been done by the counterpart using one sampler. The sampling method during winter after the decision of sampling location remains pending issue. In case of the sampling at the auto sampling station, there is no operational problem because of the air conditioner in the station.

(3) Conditioning of sampling tubes and storage of the samples

Tube conditioning system made it possible to clean tubes at 300 degrees Celsius after manually adjusting the flow rate of nitrogen. The conditioning method and setting can be decided by the counterpart. Before introducing the conditioning system, the tube cleaning was done using the thermal desorption system and took much time. The system shortened the time for conditioning because it cleans up to 6 tubes at the same time and increased the time for GC analysis.

Sampled tubes are sealed with the cap for sample intake system (thermal desorption system) and stored in a case. No activated carbon is in the case in case of less than 2 weeks storage, but it should be noted that the contamination by the benzene should be avoided. When the sample must be stored more than 2 weeks, storage stability is improved by using the long-term storage caps.

(4) Making of calibration curve and condition of analysis

Dilution method for calibration reference was trained and calibration curve with more than 5 points can be made and tubes for calibration reference can be prepared by the counterpart.

The contamination in the measurement of benzene may be reduced by separating the place of dilution and measurement of benzene. Personal exposure of the counterpart is taken care by wearing the mask and gloves.

It is also taken care that no methanol which can be contaminated by benzene must be used; Subdevided methanol must not put back to the reagent bottle again. Syringes should be washed well with methanol and pipette operation should be done carefully. The volume of benzene waste was reduced by changing the flask for dilution.

(5) Setting up and improve the condition of GC operation

The nitrogen generator, often absent for repair service but was returned to NRL in January 2008, proved to have insufficient capacity in the supply flow rate of GC carrier gas and caused errors in GC analyzer after it was switched from nitrogen gas cylinder. As no errors occurred when using the nitrogen gas cylinder, the gas cylinder is still used and the generator is not used any more.

Gas cylinder racks were installed to prevent the turnover accident and this improved the safety level of the laboratory. The safety will be increased more by fixing the base of the rack to the floor.

The column condition was verified by the expert, and some parts were exchanged. As a result, the flow rate at the exit of the column rose and the peak shape became better.

When routine analysis starts, more efficient way of time usage must be considered so that more time can be used for the data analysis and preparation for next analysis during day time by analyzing during the night time. General operation method by the counterpart was that of starting the analyzer in the morning and stopping it before night because of the higher running costs and the problems of accidents during the night time. The running cost rises a little but the working efficiency also rises by night time operation, but this is a possible option after some analysis experiences of the counterpart and confirmation of safety of night time operation. More samples can be analyzed by introducing this method. The expert and the counterpart discussed about a possible option of automatic night time operation in the future.

The way and items of setting the analysis condition were understood by the counterpart. Then identification and quantification of peaks in chromatogram were transferred and the capacity of GC software operation by the counterpart was also enhanced. Each time the calibration tubes were measured by the counterpart, their capacity to draw the new calibration curve gained.

There were no satisfactory results of the standard deviation of the measured value by the counterpart for the blank measurements and repeated tests. The leakage from the calibration injector was found by the expert in June 2008. Then the modification was done such as reducing of nitrogen flow rate and decreasing the temperature to extend the adsorption time and increase the total flow volume. Then the test was repeated, but no improvement in standard deviation was observed.

For GC maintenance, the setting and arrangement of the tubes, the change of the column were trained to the counterpart by the expert. Then it was recognized by the counterpart that the daily routine maintenance can be done by the counterpart alone without service persons of agent. The flow check by a portable flow-meter can be done by the counterpart afterward.

(6) Performing of field monitoring for ambient benzene

Benzene has been analyzed by the counterparts from February 2008 at the site of the NRL property by using sampling pump. Although there were very few routine analysis and few GC operations in 2007, samples are measured almost every day recently around the end of the project period, and the technical skill has progressed depending on their analytical experience. Spare parts management can be handled by the counterpart as well.

(7) Outcomes by training in Japan and capacity development of the counterpart

A VOC analysis method was transferred at National Environmental Research and Training Institute. Sampling, calibration curve, machinery analysis, and important points for safety consideration were also lectured. Main outputs of the training are as follows: The capacity of VOC- GC analysis was enhanced: The counterpart realized that the time for pretreatment for VOCs could affect the results etc. The advice or suggestion from the expert was accepted more than before.

The counterpart have a variety of experiences such as breakdown of the machine, field monitoring activity, drafting of SOP, two times seminars, etc. for this one year. Table 3.3-36 shows the capability of counterpart.

For the future, the quality control must be enhanced to get the accreditation of ISO17025. In case of adsorbent tube analysis, the quality control is especially important, because the tube can be analyzed only once. Making a record on data measured, calibration curve, and fluctuation of sensitivity helps to find the abnormality of the samples.

Table 3.3-36 Capability of Counterpart about GC Analysis

Items		Capability	
		Jan. 2007	**Oct. 2008**
Tube condition	Cleaning methods	△	○
	Storage of samplers	－	○
Standard	Multiple calibration curve	－	△
	Specificity（Qualitative）	△	○
Measurement	Sampling operation	△	○
	Record	－	○
	GC equipment operation	△	○
	Integration	－	○
	Calculate Sheet	－	○
Quality control	Blank	△	○
	Repeat measurement	－	△
	Equipment control log book	－	○
	Maintenance	－	○

	The requirements of the standards methods of SR EN 14662-1	
Capability	○	Application Capable
	△	Operative
	－	More training required

3.3.5 Ion Chromatograph(IC)

3.3.5.1 Activity

(1) Confirmation of the method and separating a peak of chromatogram

Although the counterpart had measured by using a passive sampler made in Italy before the project started, this method was not likely to be adopted as an official air sampling method in the EU. Therefore, the active sampling method, which was more likely to be adopted, was recommended by the expert. However, few laboratories owned IC, and because of this, NRL considered the ability to perform synchronous analysis of anion with IC was attractive. In addition, the colorimetric analysis could be done by LEPA. Then NRL had so strong interest to the passive method that the expert decided to support this method.

In order to make the passive sampler and IC method adopted as an official method for SO2 and NO2 quantification, the counterpart planed to practice comparison tests between this method and the automatic measurement.

At the beginning, IC method was unlikely to separate the peak of SO3 and SO4 through the separation column, but changing the pretreatment seemed to have possibility to solve this problem. Then, the Japanese method, in which SO3 in the sample solution is oxidized and changed to SO4 by adding hydrogen peroxide (H2O2) before the analysis, was introduced by the expert.

(2) Performing routine measurement

The counterpart started comparison tests between the passive method (NO2 and SO2) and the automatic measurement from the end of February, 2007. Since then, the counterpart has changed the samplers every 2 weeks and compared the data. Passive samplers were installed on the rooftop of the 4 automatic monitoring stations in Bucharest, and the measurements were continued sequentially. The results were presented at the seminar in the fall of 2007.

After March, 2008, the counterpart has measured only at 2 points (Drumul Taberei and Lacul Morii). The results are shown in Table 3.3-37.

Table 3.3-37 Comparison between Automatic Method and Passive Method ($NO2$ and $SO2$) in Bucharest City

Station	No.	Start day	End day	Concentration NO_2^- (ppm)	Concentration SO_4^{2-} (ppm)	Concentration NO_2 μg/m³	Concentration SO_2 μg/m³	Temp. (℃)	Factor of correction
Drumul Taberei	1	27.02.2007	13.03.2007	3.12	1.46	*31.15*	*4.13*	6.7	1.64
	2	27.02.2007	13.03.2007	2.76	1.37	*27.52*	*3.91*		1.86
Lacul Morii	1	27.02.2007	13.03.2007	1.65	1.15	*16.68*	*3.25*	6.3	-
	2	27.02.2007	13.03.2007	2.30	1.28	*23.24*	*3.62*		-
Titan	1	27.02.2007	13.03.2007	2.43	2.01	*24.41*	*5.71*	6.4	2.01
	2	27.02.2007	13.03.2007	2.56	1.70	*25.72*	*4.82*		1.91
Universitate	1	27.02.2007	13.03.2007	3.98	1.33	*38.92*	*3.78*	7.5	3.09
	2	27.02.2007	13.03.2007	5.99	1.82	*58.58*	*5.17*		2.05
Drumul Taberei	1	13.03.2007	27.03.2007	2.18	1.71	*23.03*	*5.20*	9.0	2.44
	2	13.03.2007	27.03.2007	2.65	1.48	*28.12*	*4.50*		2.00
Lacul Morii	1	13.03.2007	27.03.2007	3.25	1.86	*32.85*	*5.66*	11.0	-
	2	13.03.2007	27.03.2007	2.92	1.88	*29.51*	*5.72*		-
Titan	1	13.03.2007	27.03.2007	2.27	1.66	*23.09*	*5.05*	10.6	2.17
	2	13.03.2007	27.03.2007	2.87	1.66	*29.19*	*5.05*		1.71
Universitate	1	13.03.2007	27.03.2007	7.53	1.56	*74.99*	*4.74*	11.6	1.77
	2	13.03.2007	27.03.2007	8.21	1.58	*81.76*	*4.81*		1.62
Drumul Taberei	1	27.03.2007	11.04.2007	2.39	0.77	*22.57*	*2.34*	11.3	2.58
	2	27.03.2007	11.04.2007	2.27	0.89	*21.43*	*2.70*		2.71
Lacul Morii	1	27.03.2007	11.04.2007	1.91	0.97	*18.41*	*2.95*	12.2	-
	2	27.03.2007	11.04.2007	1.86	0.86	*17.92*	*2.61*		-
Titan	1	27.03.2007	11.04.2007	1.49	0.96	*13.77*	*2.92*	10.7	3.44
	2	27.03.2007	11.04.2007	2.27	1.23	*21.12*	*3.74*		2.24
Universitate	1	27.03.2007	11.04.2007	5.81	1.06	*57.16*	*3.22*	12.6	-
	2	27.03.2007	11.04.2007	-	-	-	-		-
Drumul Taberei	1	11.04.2007	25.04.2007	2.36	0.54	*23.02*	*1.64*	12.8	1.86
	2	11.04.2007	25.04.2007	2.37	0.66	*23.12*	*2.00*		1.85
Lacul Morii	1	11.04.2007	25.04.2007	1.57	0.58	*15.21*	*1.77*	12.7	-
	2	11.04.2007	25.04.2007	-	-	-	-		-
Titan	1	11.04.2007	25.04.2007	1.19	0.55	*11.51*	*1.67*	12.8	2.74
	2	11.04.2007	25.04.2007	1.02	0.48	*10.15*	*1.46*		3.11
Universitate	1	11.04.2007	25.04.2007	7.72	0.66	*74.50*	*2.00*	12.9	-
	2	11.04.2007	25.04.2007	6.46	0.75	*62.34*	*2.28*		-
Drumul Taberei	1	25.04.2007	10.05.2007	3.22	0.62	*27.11*	*1.76*	15.6	-
	2	25.04.2007	10.05.2007	2.71	0.66	*22.81*	*1.87*		-
Lacul Morii	1	25.04.2007	10.05.2007	-	-	-	-	15.0	-
	2	25.04.2007	10.05.2007	3.22	1.91	*27.52*	*5.42*		-
Titan	1	25.04.2007	10.05.2007	1.96	0.76	*16.62*	*2.15*	15.3	-
	2	25.04.2007	10.05.2007	1.30	0.88	*11.02*	*2.50*		-
Universitate	1	25.04.2007	10.05.2007	7.11	0.97	*59.13*	*2.75*	16.1	-
	2	25.04.2007	10.05.2007	9.99	0.90	*83.08*	*2.55*		-

Table 3.3-38 Results of Double Measurement by Passive Sampler

Station	No.	Start day	End day	Concentration NO_2^- (ppm)	Concentration SO_4^{2-} (ppm)	Concentration NO_2 $\mu g/m^3$	Deviation (%)	Concentration SO_2 $\mu g/m^3$	Deviation (%)
	1	27.02.2007	13.03.2007	3.12	1.46	31.15	12.4	4.13	5.5
Drumul Taberei	2	27.02.2007	13.03.2007	2.76	1.37	27.52		3.91	
	1	27.02.2007	13.03.2007	1.65	1.15	16.68	32.9	3.25	10.8
Lacul Morii	2	27.02.2007	13.03.2007	2.30	1.28	23.24		3.62	
	1	27.02.2007	13.03.2007	2.43	2.01	24.41	5.2	5.71	16.9
Titan	2	27.02.2007	13.03.2007	2.56	1.70	25.72		4.82	
	1	27.02.2007	13.03.2007	3.98	1.33	38.92	40.3	3.78	31.1
Universitate	2	27.02.2007	13.03.2007	5.99	1.82	58.58		5.17	
	1	13.03.2007	27.03.2007	2.18	1.71	23.03	19.9	5.20	14.4
Drumul Taberei	2	13.03.2007	27.03.2007	2.65	1.48	28.12		4.50	
	1	13.03.2007	27.03.2007	3.25	1.86	32.85	10.7	5.66	1.1
Lacul Morii	2	13.03.2007	27.03.2007	2.92	1.88	29.51		5.72	
	1	13.03.2007	27.03.2007	2.27	1.66	23.09	23.3	5.05	0.0
Titan	2	13.03.2007	27.03.2007	2.87	1.66	29.19		5.05	
	1	13.03.2007	27.03.2007	7.53	1.56	74.99	8.6	4.74	1.5
Universitate	2	13.03.2007	27.03.2007	8.21	1.58	81.76		4.81	
	1	27.03.2007	11.04.2007	2.39	0.77	22.57	5.2	2.34	14.3
Drumul Taberei	2	27.03.2007	11.04.2007	2.27	0.89	21.43		2.70	
	1	27.03.2007	11.04.2007	1.91	0.97	18.41	2.7	2.95	12.2
Lacul Morii	2	27.03.2007	11.04.2007	1.86	0.86	17.92		2.61	
	1	27.03.2007	11.04.2007	1.49	0.96	13.77	42.1	2.92	24.6
Titan	2	27.03.2007	11.04.2007	2.27	1.23	21.12		3.74	
	1	27.03.2007	11.04.2007	5.81	1.06	57.16	-	3.22	-
Universitate	2	27.03.2007	11.04.2007	-	-	-		-	
	1	11.04.2007	25.04.2007	2.36	0.54	23.02	0.4	1.64	19.8
Drumul Taberei	2	11.04.2007	25.04.2007	2.37	0.66	23.12		2.00	
	1	11.04.2007	25.04.2007	1.57	0.58	15.21	-	1.77	-
Lacul Morii	2	11.04.2007	25.04.2007	-	-	-		-	
	1	11.04.2007	25.04.2007	1.19	0.55	11.51	12.6	1.67	13.4
Titan	2	11.04.2007	25.04.2007	1.02	0.48	10.15		1.46	
	1	11.04.2007	25.04.2007	7.72	0.66	74.50	17.8	2.00	13.1
Universitate	2	11.04.2007	25.04.2007	6.46	0.75	62.34		2.28	
	1	25.04.2007	10.05.2007	3.22	0.62	27.11	17.2	1.76	6.1
Drumul Taberei	2	25.04.2007	10.05.2007	2.71	0.66	22.81		1.87	
	1	25.04.2007	10.05.2007	-	-	-	-	-	-
Lacul Morii	2	25.04.2007	10.05.2007	3.22	1.91	27.52		5.42	
	1	25.04.2007	10.05.2007	1.96	0.76	16.62	40.5	2.15	15.1
Titan	2	25.04.2007	10.05.2007	1.30	0.88	11.02		2.50	
	1	25.04.2007	10.05.2007	7.11	0.97	59.13	33.7	2.75	7.5
Universitate	2	25.04.2007	10.05.2007	9.99	0.90	83.08		2.55	

(3) Comparison of different passive samplers

In the first fiscal year discussion between the counterpart and the expert, the comparison of different kinds of samplers was brought up as well as the comparison passive samplers and automatic analyzers. An Italian passive sampler (made by Radiello Co.,) which is usually used in NRL and two different types of Japanese samplers which were supplied from Japan were used to examine the differences.

Figure 3.3-38 Italian Passive Sampler (left) and 3 Types of Passive Samplers (right)

After the expert reviewed the results from the point of QA/QC view, a discussion was made about the results of the double measurement which the counterpart conducted

Samples of calculation sheets and other information were provided for the counterpart. In addition, some reference documents which could help to acquire ISO 17025 were also supplied. Their contents were about a method validation, an estimation of measurement uncertainty, proficiency tests and so on.

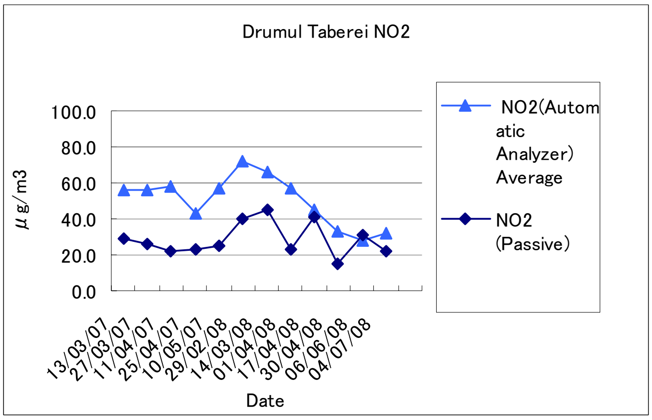
(4) Continuation of filed monitoring

From February 2007, the monitoring with the passive sampler has been continued voluntarily, and up to the end of March 2008, the number of samples totaled more than 60.

The counterpart and the expert cooperated with each other to decide the monitoring activity implementation plan in February 2008. The results of the monitoring after March 2008 are shown in Table 3.3-39. Sampling was conducted periodically, but due to the limitation of the number of the samplers, 8 samples were taken per month. Figure 3.3-39 and Figure 3.3-40 show the monitoring results after 2007.

Table 3.3-39 Number of Analyzed samples for Ambient NO2 and SO2

	NO_2			SO_2		
Month	Sample	Blank	Repeat test	Sample	Blank	Repeat test
March	8	4	—	8	4	—
April	8	4	—	8	4	—
May	8	4	—	8	4	—
June	8	4	7	8	4	7
July	8	4	—	8	4	—



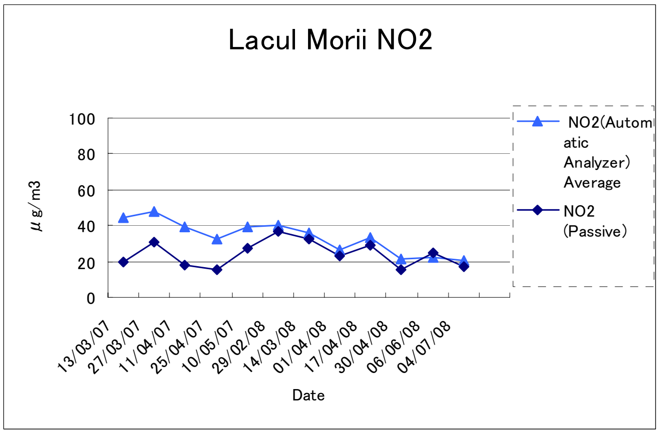
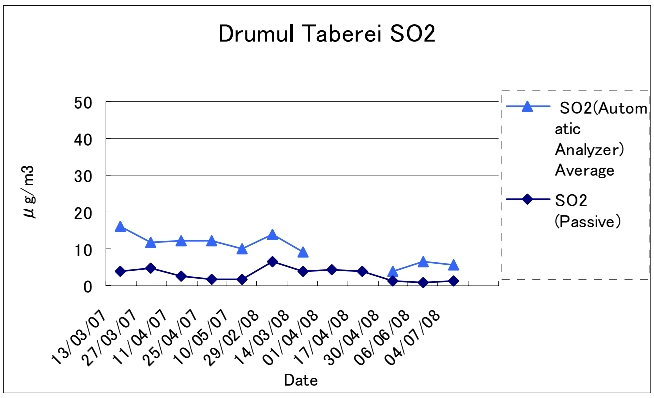


Figure 3.3-39 Comparison between Automatic Analyzer and Passive Method in Bucarest (NO2)



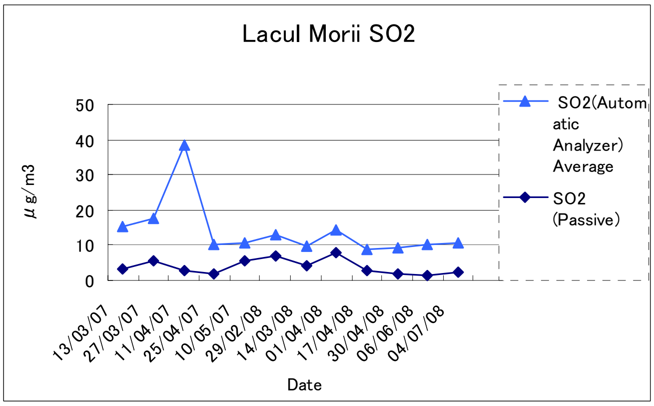


Figure 3.3-40 Comparison between Automatic Analyzer and Passive Method in Bucarest (SO2)

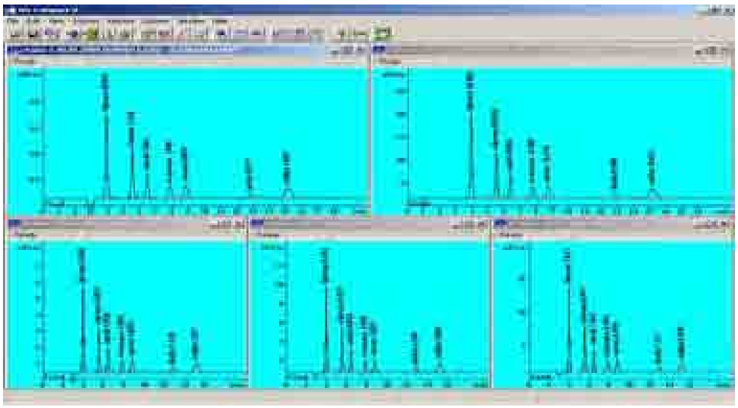


Figure 3.3-41 Peak of NO2 on Chromatograms (Standard : 1.0 ~10 mg/l)

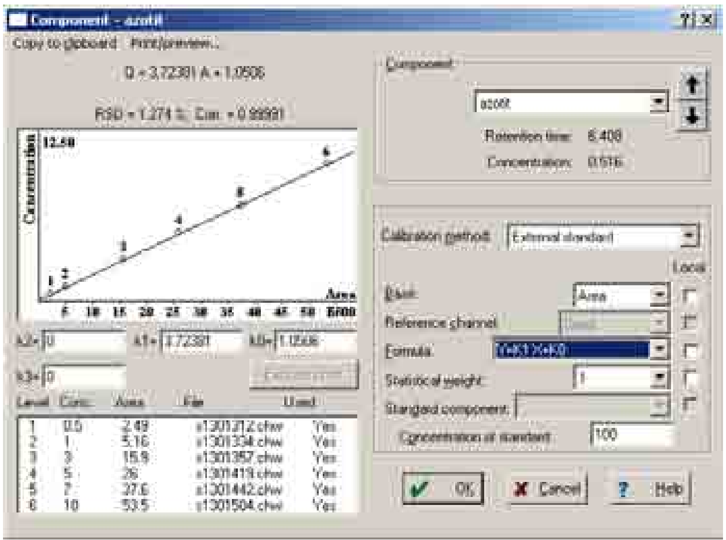


Figure 3.3-42 Linearity of a Calibration Curve for NO_2

Table 3.3-40 Result of Repeatability of the Calibration Curves

Sample name	Area	Standard. deviation, σ	Detection limit, 3.3σ/slope	Quantification limit, 10σ/slope	Conc.	Standard deviation, σ	Detection limit, 3.3σ	Quantification limit, 10σ
		-	mg/L	mg/L	mg/L	-	mg/L	mg/L
1.0mg/l	4.981				1.06377			
1.0mg/l	5.014				1.06985			
1.0mg/l	4.977				1.06303			
1.0mg/l	4.976	0.017525	0.010667	0.032325	1.06284	0.0032325	0.010667	0.032325
1.0mg/l	5.006				1.06838			
1.0mg/l	4.973				1.06229			
1.0mg/l	4.969				1.06155			

(5) Inter-laboratory crosschecking

A crosschecking test among the laboratories in the whole country of Romania was performed in February 2008. The test items for IC were sulfate ion (the concentration range: 50-150 mg/l), chloride ion (100-200 mg/l), and nitrite ion (0.15-0.3 mg/l). The approximate concentration range was known, and some samples needed to be diluted. The counterpart could deal with such kinds of samples properly, and submitted the results to the testing organization.

Figure 3.3-43 IC System

3.3.5.2 Achievement

(1) Verification of passive sampling method

With the support from the expert for the passive sampling, various basic data could be obtained. Through the measurements, the important factors for analysis such as a detection limit, a quantification limit, and blank values were instructed to the counterpart.

By adding hydrogen peroxide (H_2O_2) to the extracted solution, the chromatographic peak of sulfate ion can be isolated, and the counterpart employs this method.

Finally the counterpart learned the whole work such as sampling, measurement and data arrangement, and could conduct routine analysis. The data was reviewed with the expert, and this enabled the counterpart to develop her capacity.

(2) Verification of passive sampling method

Comparison tests were conducted using two types of passive samplers made in Japan, one sampler made in Italy, and an automatic analyzer. During the test, blank was also measured, and then an interpretation of blank data was also added into to the technical discussions matter.

A blank is one of the indicators of accuracy of analysis, and it is important factor for self quality control. A measurement of blank will teach that there were several ideas about a blank, a detection limit and a quantification limit, and these ideas help to determine the limit value which suits the purpose.

(3) Verification of the reliability of passive measurement

According to the double measurement results, the Italian passive sampler, which NRL would plan to use, had larger error compared to the Japanese samplers.

Regarding active sampling, in general, more than two samples are taken under the same condition in Japan. They are analyzed with the same method, and the difference of the results over the quantification limit is checked if it is less than 30% to ensure the certainty of the sampling and analysis process. If the difference is more than 30%, the measurement data are considered unreliable and shall be omitted as a 'missing' from monitoring data. In this case, each point is checked, for example a sampling flow rate, leakage of the flow line, and stability of the analytical equipments. After this maintenance, re-sampling is necessary. Although passive sampling and active sampling are different, data from this kind of double measurement is meaningful.

Some information was given to the counterpart so that the counterpart could conduct measurement with IC keeping good accuracy.

Table 3.3-41 Reference Documents about ISO 17025

1	Guide to Quality in Analytical Chemistry	CITAC / EURACHEM Guide
2	Quantifying Uncertainty in Analytical Measurement	EURACHEM / CITAC Guide
3	The Fitness for Purpose of Analytical Methods	EURACHEM Guide
4	The Expression of Uncertainty in Testing	UKAS
5	The International Harmonized Protocol for the Proficiency Testing of (Chemical) Analytical Laboratories	IUPAC
6	Harmonized Guidelines for International Quality Control in Analytical Chemistry Laboratories	IUPAC
7	Traceability in Chemical Measurement	CITAC / EURACHEM Guide
8	Guidelines for the Selection and Use of Reference Materials	ILAC
9	ILAC Policy on Traceability of Measurement Results	ILAC
10	A Beginner's Guide to Uncertainty of Measurement	National Physical Laboratory (UK)

UK: United Kingdom

(4) Seminar presentation and report

Test of the passive samplers through 2007 and seminar presentation were good opportunities for the counterpart to gain more sophisticated understanding about sampling and IC measurement. The counterpart skill was improved through the preparation of a report regarding one theme and the presentation in the seminar.

Table 3.3-42 shows the capability of the counterpart about IC analysis. Improvement of column exchange capability is recommended.

Table 3.3-42 Capability of Counterpart about IC Analysis

Items		Capability	
		Jan. 2007	Oct. 2008
Standard	Multiple calibration curve	△	○
	Specificity (Qualitative)	○	○
	Quantification limit	−	△
Measurement	Sampling operation	○	○
	Sampling Record	−	○
	Pre-treatment	△	○
	IC equipment operation	△	○
	Integration	△	○
	Calculate Sheet	−	○
Quality control	Blank	△	○
	Repeat measurement	−	○
	Equipment control log book	−	○
	Maintenance	−	△

Capability	○	Application Capable
	△	Operative
	−	More training required

(5) Data collection by monitoring

A trend graph was created using results of periodical monitoring. A lot of data was accumulated from the double measurements, and this will be helpful for future analysis.

It is important to continue the monitoring especially with contrasting with meteorological parameters (e.g. humidity and wind velocity). From the view of the expert, the following actions will be also necessary.

- To integrate the data when all data is obtained
- To create a trend graph to check the differences in different seasons
- To make judgment if abnormal data is detected, and
- To put together the results of the double measuring

In the future, it will be necessary to conduct measurements under the internal quality control, and to estimate the uncertainty of measurement, and so on.

(6) Result of the inter-laboratory cross check

The crosschecking test results of the laboratories were delivered to NRL in June 2008. Table 3.3-43 shows them. Although the other laboratories probably do not use IC but absorption photometric method and this is not clear, the result was satisfactory.

Table 3.3-43 Results of the Inter-laboratory Cross Check

Analyzed item	Z score
Chloride ion (Cl^-)	0.1
Sulfate ion (SO_4^{2-})	0.2
Nitrite ion (NO_2^-)	1.13

Results with a value for z of less than 2 are regarded as satisfactory.

3.4 Support for Aiming Acquisition of ISO 17025 Accreditation (Output 3)

3.4.1 Activity

3.4.1.1 Document Preparation and Discussion

After February, 2007, various documents have been made by Ms. MUREŞAN, who already had the experience of the ISO management, and "Quality Manual (usually abbreviated as "QM") which is placed in the top of the quality management system was completed at the point in June, 2007. The Quality Manual is described based on a chapter constitution of 17025 ISO/IEC standard, and the table of contents is shown in the following Table 3.4-1.

Table 3.4-1 Table of Contents of NRL's Quality Manual

SECTION I INTRODUCTORY AND PRESENTATION FEATURES
1. INTRODUCTORY FEATURES
1.1. Purpose and application range
1.2. Reference documents
1.3. Terms and definitions, abbreviations
2. LABORATORY PRESENTATION
2.1. Laboratory history
2.2. Activity and strategy
2.3. Identification, contacts
3. PRESENTATION OF THE QUALITY MANUAL
3.1. Qulaity manual structure
3.2. Manual contorol procedure
3.3. Changes in the Quality manual
3.4. Software editing of the Quality manual
3.5. Archivation of quality management sysytem documents
SECTION II REQUIREMENTSFOR THE QUALITY MANAGEMENT SYSTEM
4. MANAGEMENT REQUIREMENTS
4.1. Organisation of the National Refernce Laboratory
4.2. Management system
4.2.1. Defining management system
4.2.2. Quality policy
4.2.3. Management commitment for Synthesis, Monitoring and Coordination (SMC) implementation
4.2.4. Meeting customer requirements and legal regulations

4.2.5. SMC documents structure 4.2.6. Role and duties of technical manager and quality manager 4.2.7. Maintaining SMC integrity to changes 4.3. Document contorol 4.3.1. General 4.3.2. Document approval and issue 4.3.3. Changes of documents 4.4. Test requirement analysis 4.5. Subcontracting the analysis 4.6. Supply with services and items 4.7. Customer care services 4.8. Handling complaints 4.9. Control of nonconforming test 4.10. Improvement 4.11. Corrective action 4.12. Preventive action 4.13. Record control 4.14. Internal audits 4.15. Management reviews
SECTION III TECHNICAL COMPETENCE REQUIREMENTS **5. TECHNICAL REQUIREMENTS FOR NRL** 5.1. General condition 5.2. Personnel 5.3. Locations and environment conditions 5.4. Test method and method validation 5.5. Equipment 5.6. Measurement traceability 5.7. Sampling 5.8. Handling of items for testing/anaysis 5.9. Assuring the quality of result/test 5.10. Reporting the results ANNEX **A1.** Organization chart of the Nation Agency for Environment Protection **A2.** Organization chart of the National Reference Laboratories **A3.** Official testing list cod FL-4.4-01 **A4.** List of testing equipments and / or of measurement equipments cod FL-5.5-01 **A5.** Plans of laboratories **A6.** List of staff of the National Reference Laboratories **A7.** C.V. of the Chief of the laboratory **A8.** C.V. of the Quality responsible staff

The document on the management system including this Quality Manual was considerably prepared. Figure 3.4-1 shows the system of these documents. Main documents among these system documents listed in Table 3.4-2 were translated into English in order to be confirmed on their contents. The expert showed some comments about his opinions and discussed with the counterpart.

Table 3.4-2 List of System Documents Made by NRL

Doc. Nr	English title	Romanian title
MCL-02	Quality Manual Reference Standard ISO/IEC 17025:2005	Manualu l Calitatii Laboratorului Standard de referinta SR EN ISO/CEI 17025:2005
PGL4.3	Document control	Controlul documentelor
PGL4.4	Analysis of the quotations, orders or the testing contracts	Analiza ofertei, comenzii sau contractului de analiza
PGL4.5	Subcontracting of Tests	Subcontractarea incercarilor
PGL4.6	Supply of measuring/testing equipment, reagents, services, and materials	Aprovizionarea cu echipamente de masurare si/sau incercare, reactivi, servicii, materiale
PGL4.8	Handling complaints	Tratarea reclamatiilor
PGL4.9	Non-conforming activity control	Controlul activitatilor de incercare neconforme
PGL4.11	Corrective actions	Actiuni corrective
PGL4.12	Preventive actions	Actiuni preventive
PGL4.13	Control of data records	Controlul inregistrarilor
PGL4.14	Internal audit	Audit intern
PGL4.15	Management review	Analiza efectuata de management
PGL5.2	Personnel training	Instruirea personalului
PGL5.4	Methods of testing and their validation	Metode de incercare si validarea metodei
PGL5.5	Inspection of the testing and/or measuring equipment	Controlul echipamentelor de incercare si/sau masurare
PGL5.6	Measurement traceability	Trasabilitatea masurarii
PGL5.7	Sample standardization	Esantionare
PGL5.8	Handling testing items	Manipularea obiectelor de incercat
PGL5.9	Assuring quality of measurement results	Asigurarea calitatii rezultatelor incercarilor
PGL5.10	Test results reports	Raportarea rezultatelor incercarilor

MCL：Quality manual (QM)、PGL: General procedures for whole laboratory

However, SOPs were not readily made as the start was late because of the technical requirements of testing method, and their testing procedures were not fixed in particular. In about October, 2007, Ms. MURESAN conducted interviews to the persons in charge for the analysis about the outline of their operation and helped the work of documentations.

Furthermore, NRL employed a consultant specialized for the ISO in 2006 and received her guidance for SOP preparation. The shape of necessary SOP has been finally completed.

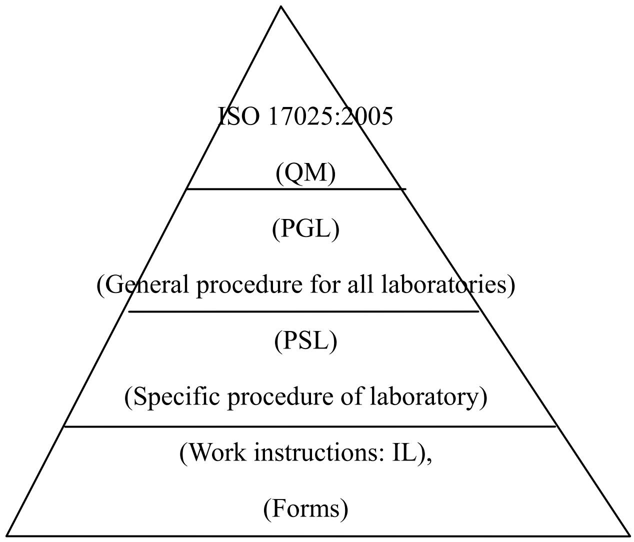


Figure 3.4-1 System of NRL's Management Documents

3.4.1.2 Presentation and Discussion

(1) Outline Explanation of ISO/IEC 17025

A presentation about significance for NRL to acquire an accreditation and explanation of the requirements of ISO/IEC 17025 standard was given to the NRL staff in June, 2007 to deepen their understanding about laboratory accreditation. The explanation items are listed in Table 3.4-3 (The slide material, which was used for the presentation, is contained in the attachment)

The expert explained that it is important to clarify the purpose and the effect of the acquisition of accreditation for the laboratory, but the accreditation itself is no meaning for the so-called authorization. He suggested that NRL should apply on the testing method with any merit for NRL. For the acquisition of accreditation, it is important to establish the procedures of testing which NRL carried out regularly, and to actually perform the testing activity along to the description in the SOPs.

From the NRL side, there was a presentation about document preparations to acquire the accreditation, and the opinions were exchanged in both sides. The expert advised that NRL had better to select as their applied testing method for the accreditation of ISO 17025 from standard testing method and public testing methods, such as European Standard and so on.

Figure 3.4-2 Explanation of the Summary of ISO 17025 by the Expert

(2) Presentation in Technical Seminar

In the 1st technical seminar of October, 2007, the presentation was implemented to the participants from not only from NRL but also from LEPA about the introduction of the standard and their requirements about the same contents as the former presentation.

Table 3.4-3 Presentation Items about the Requirements of the Standard

OUTLINE OF LABORATRY MANAGEMENT SYSTEM
BASED ON ISO/IEC 17025 STANDARD

・History of establishment
・Testing and calibration laboratory
・ISO 9001 and 17025
・Composition of ISO/IEC 17025 standard
・Conformity assessment and ISO standard
: Certification and accreditation
・Assessment for accreditation of 17025
: Scope, system assessment and technical assessment
・Acquiring the accreditation for NRL
・The 12 steps for building a laboratory management system
・Assuring the quality of test results
・Uncertainty of measurement

(3) Lecture on Uncertainty of Measurement

As a response for NRL's demand, the introductory lecture was held in August, 2007, about an "Uncertainty of measurement" which is the one of the requirements of ISO 17025. Table 3.4-4 shows the items of the lecture (the slide material, which was used for the lecture, is contained in the attachment).

Laboratory staff shall review the own testing method which is carried out by themselves and extract all the possible factors of uncertainty. To investigate what is the biggest factor, will be connected for deeper understanding of the corresponding testing method.

Table 3.4-4 Lecture Items on Uncertainty of Measurement

INTRODUCTION TO UNCERTAINTY IN MEASUREMENT
・True value and error
・Error and uncertainty : Recent concept
・Estimation processes according to "Guide to the Expression of Uncertainty in Measurement" (GUM)
・Normal distribution, rectangular and triangular distributions
・Example 1：Calibrate a standard weight using an electric balance
・Requirement of ISO/IEC 17025 (Para.5.4.6.2)
・JCLA (Japan Chemical Laboratory Accreditation) assessment guideline
・Example 2：Standardizing a NaOH solution
Clarify the procedure / Identify the factors of uncertainty / Quantification of the uncertainty components / Calculation of the combined uncertainty / Evaluation of values (Budget sheet)

3.4.1.3 Examination about Data Quality Assurance

(1) Correspondence to the Requirements of the Standard

In cooperation with the experts of each field, the examinations were done on the necessary ways and procedures to secure the data reliability in each analysis.

For example, about the measurement of ambient lead, interpretation was made for the requirements of European standard "SR EN14902:2005" and examination was done for a concrete method and procedure.

- The data shall be taken to demonstrate the satisfaction to the requirement of the standard.
- To repeat three times of measurements about all standards, blanks and samples solutions.
- The biggest problem is the recovery of the target element. The recovery rate of lead in the stage of decomposition of sample must be in the range from 90 to 110%.
- To carry out the daily maintenance of the analyzing machine.
- To file the data such as calibration curves.
- To consider not to run out of the consumable stocks (gas in particular).
- To evaluate the competence of each personnel, and to give a necessary training and record it.

(2) Equipment Satisfying the Requirements of the Standard

About the measurement of atmospheric benzene concentrations, the sampler was chosen and it was decided to procure the product to satisfy the following requirements of sampling conditions, prescribed by the European standard SR EN 14662-1. The procured product is made by U.K. National Physical Laboratory (NPL).

- Air sampling flow rate : 5 - 200 mL/min
- Variation of flow rate : +-5 % against setting value
- Air sampling time and volume: usually 5 L in 24 hours.

(3) Consideration on Measurement Accuracy of Passive Sampling Method (NO2 and SO2)

About the simple measurement of NO2 and SO2 which was started from February, 2007 in NRL, The consideration of the measurement precision was performed particularly based on the results of double measurement. The Sampling is done every half month by the passive tubes of Radiello Co. "120-1". The data analysis was performed with the result of the IC analysis completed as of July 2007.

・Result of double measurements and their deviations

Table 3.4-5 shows the measurement result of ambient NO2 and SO2 (μg/m3) and relative deviation (difference, %) of D1 and D2 from each of the two averaged values.

Because the average value of two data is just at midpoint, each deviation becomes either plus or minus as equal absolute value.

$$D1 = (C1 - Cav) / Cav = C1 / Cav - 1$$

D1：Deviation to sample 1、C1：Result of sample 1、

Cav：Average of samples 1 and 2

$$D2 = -D1$$

D2：deviation to sample 2

The average of all relative deviations would naturally be ±0 %, but when the standard deviation (σ) was computed, to the results were 11.9% for NO2 and to 7.4％ for SO2. These results were thought to be little bigger when compared with the same kind of passive measurements. Also, deviation was not calculated when result of can be obtained for only one sample.

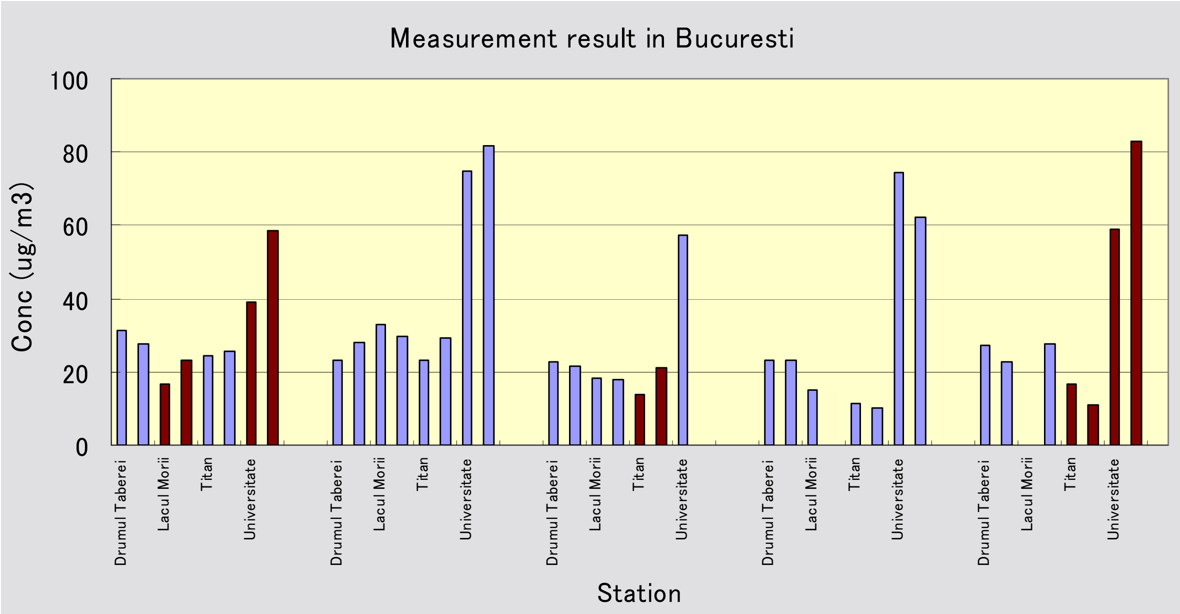
Table 3.4-5 Measurement Result in Monitoring Stations of Bucharest

Data		Station	No	Concentration (μg/m3)		Deviation (%)	
Start	End			NO2	SO2	NO2	SO2
27/02/2007	13/03/2007	Drumul Taberei	1	31.15	4.13	6.2%	2.7%
			2	27.52	3.91	-6.2%	-2.7%
		Lacul Morii	1	16.68	3.25	-16.4%	-5.4%
			2	23.24	3.62	16.4%	5.4%
		Titan	1	24.41	5.71	-2.6%	8.5%
			2	25.72	4.82	2.6%	-8.5%
		Universitate	1	38.92	3.78	-20.2%	-15.5%
			2	58.58	5.17	20.2%	15.5%
13/03/2007	27/03/2007	Drumul Taberei	1	23.03	5.20	-10.0%	7.2%
			2	28.12	4.50	10.0%	-7.2%
		Lacul Morii	1	32.85	5.66	5.4%	-0.5%
			2	29.51	5.72	-5.4%	0.5%
		Titan	1	23.09	5.05	-11.7%	0.0%
			2	29.19	5.05	11.7%	0.0%
		Universitate	1	74.99	4.74	-4.3%	-0.7%
			2	81.76	4.81	4.3%	0.7%
27/03/2007	11/04/2007	Drumul Taberei	1	22.57	2.34	2.6%	-7.1%
			2	21.43	2.70	-2.6%	7.1%
		Lacul Morii	1	18.41	2.95	1.3%	6.1%
			2	17.92	2.61	-1.3%	-6.1%
		Titan	1	13.77	2.92	-21.1%	-12.3%
			2	21.12	3.74	21.1%	12.3%
		Universitate	1	57.16	3.22		
			2	-	-		
11/04/2007	25/04/2007	Drumul Taberei	1	23.02	1.64	-0.2%	-9.9%
			2	23.12	2.00	0.2%	9.9%
		Lacul Morii	1	15.21	1.77		
			2	-	-		
		Titan	1	11.51	1.67	6.3%	6.7%
			2	10.15	1.46	-6.3%	-6.7%
		Universitate	1	74.50	2.00	8.9%	-6.5%
			2	62.34	2.28	-8.9%	6.5%
25/04/2007	10/05/2007	Drumul Taberei	1	27.11	1.76	8.6%	-3.0%
			2	22.81	1.87	-8.6%	3.0%
		Lacul Morii	1	-	-		
			2	27.52	5.42		
		Titan	1	16.62	2.15	20.3%	-7.5%
			2	11.02	2.50	-20.3%	7.5%
		Universitate	1	59.13	2.75	-16.8%	3.8%
			2	83.08	2.55	16.8%	-3.8%
					Average =	0.0%	0.0%
					Std.dev. =	11.9%	7.4%

・The agreement situation of the double measurement

Figure 3.4-3 includes graphs comparing the results of NO2 and SO2 in the air (μg/m3).

There are two bars for each sample measured at the same time (double measurement), and while they should actually be equal, there are differences due to various factors. The dark bars indicate the samples with deference of two over 15% which is set as tentative criteria. Thus, it is clear that many differences in the results of NO2.



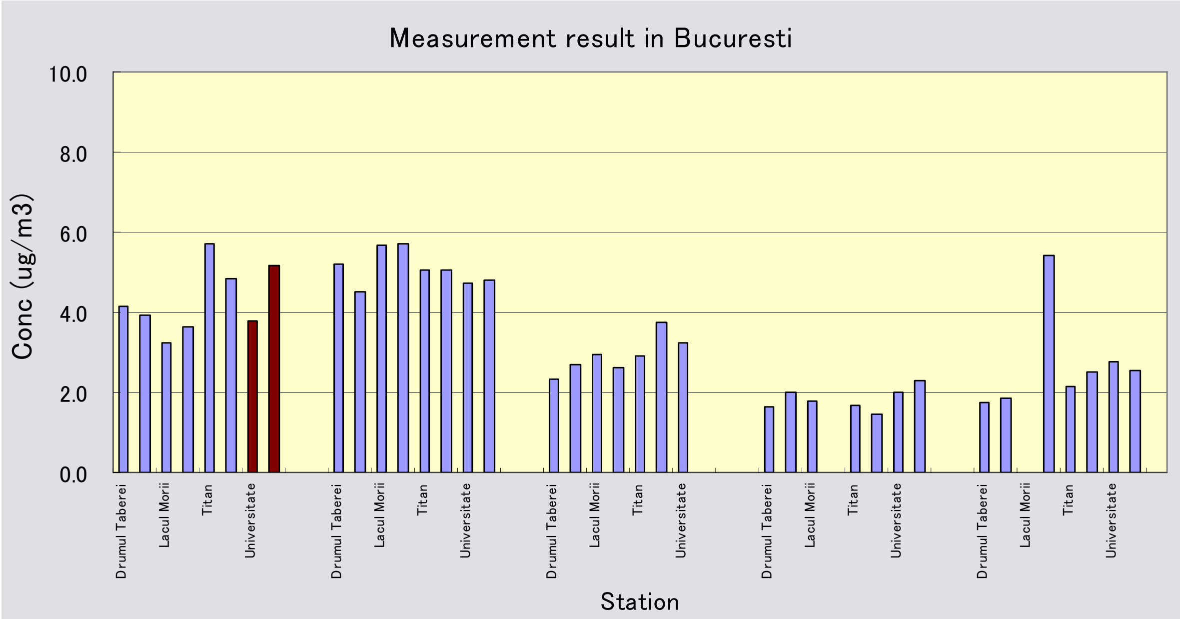


Figure 3.4-3 Analytical Results of the Monitoring Stations in Bucharest

・Distribution of deviations

Next, Figure 3.4-4 is drawn in order to see the distribution of the deviations. These graphs depicting double measurements are symmetrical with the value of 0% (i.e. average values) in the centre and the other split up and down. This case appears clearly that the deviations are unevenly distributed. In a typical case of normal distribution there is 68% probability that they stand within the standard deviation (1σ), so out of the total of 34 data items, 23 would be within 1σ. The 1σ range is indicated with the arrows on the graph. So it is clear that 5 to 6 data above and below exceed the said range.

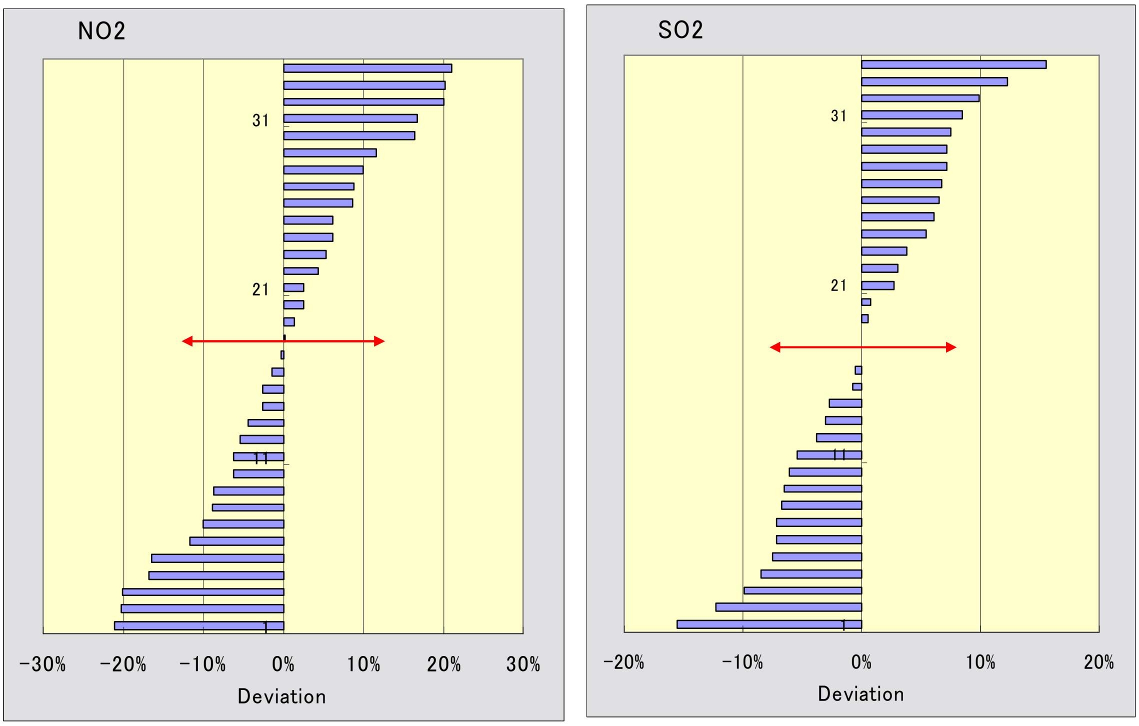


Figure 3.4-4 Distribution of the Deviations in Double Measurement

(4) Analyzing of Measurement Uncertainty

NRL had interested in estimation of "uncertainty of measurement" as the requirements in ISO 17025. NRL planned that the counterpart would give a presentation of an example of the uncertainty estimation for ambient ammonia measurement with UV-VIS in the 3rd technical seminar of July 10, 2008.

Therefore, along a procedure of standard method "STAS 10812-76" of Romania, the estimation of uncertainty factors and their amounts were carried out.

The examination of the analysis flow mentioned in the standard method was implemented, and in addition, the procedure was confirmed when the counterpart performed the analysis according to the method. As the first stage, the possible factors which have influence on the uncertainty of result were listed as follows.

1. Uncertainty of sampling: Suction flow rate, temperature, pressure, absorbing efficiency of ammonia into solution
2. Molar mass and content (purity) of the standard reagent (NH4Cl)
3. Weighing by electric balance
4. Measuring volume（Scale of volumetric flask, repeatability, temperature)
5. Preparation of standard solutions for calibration curve: (Dilution with pipette and volumetric flask)
6. Influence of a standing time and temperature to coloring effect before the measurement
7. UV-VIS measurement (Resolution of photometer, regression to the curve)
8. Reproducibility of the regression (calibration curve)

In order to estimate the each component of the uncertainty, there are two types of approaches. One is to quote from calibration report, certificate and/or document of manufacturer to estimate the "standard uncertainty", and another is to collect data by conducting basic experiment and calculate statistically. In addition, some calibration curves were made during days and we confirmed the basic data for our consideration.

From the gathered information the memorandum was prepared for approaching of the uncertainty estimation. Discussions were sometimes carried out to deepen our understanding.

As a result of examination, uncertainties such as chemical reagent and weighing operation, the volumetric glassware was slight things, and the influence on result was negligible.

On the other hand, the degree of fitness of the standard solutions to the calibration curve -the dispersion from the regression curve was found to have a considerably big effect to the uncertainty of result.

Furthermore, one representing calibration curve is always used for analysis in different date, is very risky to obtain results with the curve. It was thought that the calibration curve must be made on each day of analysis.

3.4.2 Achievement

In the JCC meeting held in May, 2007, the Romanian side expressed a strong demand that the cooperation relating to ISO 17025 should be as the first priority, and then chose a realistic selection for possible effort for acquisition of accreditation.

3.4.2.1 Decision of the Application Scope and Responsibility

In order to realize and make effective the acquisition of laboratory accreditation by ISO 17025, NRL decided to narrow down the application scope. The two testing methods were limited for application, which were the same analysis methods with the original cooperation targets of the project, and will be enlarged in the future.

1) Atmospheric lead measurement (SR EN 14902:2005): PM10 filter sampling - Flameless atomic absorption analysis

2) Atmospheric benzene measurement (SR EN 14662-1): Tube sampling -- Gas chromatograph analysis

As a regime based on ISO 17025 in NRL, two responsible personnel were appointed; Ms. MURESAN was the quality manager and Ms. MURESAN was the technical manager. However, Ms. ZLATAN took over the roles of the quality manager because Ms. MURESAN resigned from her job in July, 2008.

3.4.2.2 Establishment of Documents

(1) ISO Quality Manual and General Procedures

The most of the quality system documents were made during 2007 by Ms. MURESAN who was in charge in those days. Table 3.4-2 is a list of documents completed which is related to the quality management system. Under the Quality manual of 74 pages, there accomplished many documents called "General Procedure (GP)" which prescribed the management rule of the laboratory, corresponding with the requirements of each clause of ISO 17025.

The preparation was taken over and pushed forward to define more detail by Ms. NEACSU and Ms. ZLATAN aiming practical operation in NRL. A consultant for ISO comes to the laboratory for advice and discussion about the system preparations once every week.

(2) Documents relating PDM

On the other hand, adding to the requirements for the application of ISO 17025, the indicators of the achievements about the laboratory management is described in Clause 3 of PDM of this project.

(Indicator 3-1) All NRL staff maintains the equipment regularly.

(Indicator 3-2) Spare parts and consumable materials management system is established.

(Indicator 3-3) Chemical reagents are properly stored and cared according to the o/m manual.

(Indicator 3-4) Liquid and solid wastes from laboratory are properly treated according to the o/m manual.

(Indicator 3-5) Safety and health control system is established.

(Indicator 3-6) Documentation system is established.

The expert examined the indicators of PDM, and compared them with the document s and the records prepared for ISO17025, and confirmed that most of the indicators can be covered by the quality manuals and the general procedures which NRL has already prepared. Table 3.4-6 lists up the management documents and the records, which correspond to the indicators of PDM.

In addition, the expert examined the maintenance records that were prescribed in each document, and requested that the lacked record format shall be made and applied as soon as possible. Because ISO 17025 standard does not have requirements about the waste disposal treatment of the indicator 3-4 and the working safety and health of the indicator 3-5, the "General procedure" about them were not prepared in NRL. Therefore, as a result of discussion with C/P, descriptions about the treatment of waste from analysis and the instructions on safety remarks were written in each SOP.

(3) SOPs

The making of SOP was mentioned in each section above, and it is more important that the testing analysis shall be carried out according to the SOPs which were established by themselves. In the case of the accreditation assessment of ISO, the evidences are confirmed if the analysis is carried out according to the SOP.

Therefore the expert examined the contents of SOPs and made work confirmation check sheet of the procedures, and checked the actual procedures with them beforehand.

Table 3.4-6 PDM Indicators and ISO Documents of ISO 17025

Item	Indicator in PDM	Manual document (QM and General Procedures)		Records to be required
1. Maintenance of equipment	3-1 All NRL staff maintain the equipment regularly	QM, 5.5 Equipment	PGL5.5 Inspection of the testing and/or measuring equipment FL5.5-01 List of laboratory equipment FL5.5-02 List of laboratory equipment that must undertake the metrological control FL5.5-08 List of reference materials	*Maintenance record* FL5.5-06 Equipment calibration schedule FL5.5-07 Maintenance schedule
2. Spare parts management	3-2 Spare parts and consumable materials management system is established.	QM, 4.6 Supply with services and items	PGL4.6 Supply of measuring/testing devices, reagents, services and, materials FL4.6-01 List of potential suppliers of materials/equipment/services	*Record of purchase and use of spare parts/ consumables.* FL 4.6-04 Warehouse file
3. Chemical reagents storage	3-3 Chemical reagents are properly stored and cared according to the o/m manual	*Ditto.*	*Ditto.*	*Reagent list* FL4.6-01 Record of chemical substance RL4.6-01 Registry of reagent inventory
4. Liquid and solid waste treatment	3-4 Liquid and solid waste from laboratory are properly treated according to the o/m manual	—	*described in each SOP*	*Records*
5. Safety and health control	3-5 Safety and health control system is established	—	*described in each SOP*	*Safety and health control record*
6.Documentation system	3-6 Documentation system is established	QM, 4.3 Document control	PGL4.3 Document control	*Documentation and files*
		QM, 4.13 Record control	PGL4.13 Control of data records	

3.4.2.3 Data Quality Assurance

(1) Contents Examination of SOP

Documented SOPs of work procedures are necessary for a laboratory whether it will be applied for the ISO 17025 accreditation or not. It was decided to perform analysis of certain samples a month in each field in March, 2008, and it might improve the work procedure step by step acquiring their experience through the process out of implementation. The first drafts were made so that the work procedure could be seen from the third person in July, 2008, and continuous improvement is desirable.

During the process of establishing the procedures, it is necessary that the contents of the testing standard should be well understood and the basic data must be accumulated by repeated analysis in order to satisfy the requirements. The data as the evidence to explain that the requirements of the testing standard are achieved, are is necessary.

The following descriptions related to the requirements of PDM were also added in each SOP.

- Rules about daily check and maintenance of main equipment.
- Lists of the consumables which are necessary for the testing concerned and/or lists of spare-parts for using equipment.
- Rules and instructions about the handling of waste created from the testing concerned.
- Instructions about the safety and health control of the work

(2) Records of Equipment Use

As evidences of actual operation of management system, the records of use about five main equipment (Gas chromatograph, Ion chromatograph, Atomic absorption spectrophotometer, UV-VIS spectrophotometer, and Calibrator for automatic analyzers) are kept.

(3) The selection of equipment satisfying the standard requirements

As the equipment for ambient benzene sampling, the sampler made by NPL of UK was selected as a model to satisfy the requirements of European standard SR EN 14662-1. The procured sampler is used for the sampling.

(4) Estimation of uncertainty

One of the requirements of ISO 17025 is "Uncertainty of measurement". The laboratory must list all the factors causing the uncertainty about its own the testing method to perform, and should reasonably estimate the amount of uncertainty component. Regarding the testing method besides the ones for the application of ISO 17025 accreditation and the calibration method of automatic air analyzers, their uncertainties should be estimated as the position of NRL in the future.

In addition, at the 3rd technical seminar in June, 2008, NRL took up the theme of uncertainty estimation in the UV-VIS analysis for ambient ammonia measurement, and the counterpart tried the estimation and presented the results in the seminar.

3.5 Support for Strengthening MD and NRL Staff Capability of Data Management. (Output 4)

3.5.1 Improvement of Data format and report format for Air Quality Monitoring

3.5.1.1 Activity

In February 2007, the counterparts of MD (Monitoring Directorate) provided information on making of the database reported for the EIONET, the primary inventory and the environment annual report. However, during the JCC held on May, it was confirmed that the inventory was confirmed as not to be included in the project.

In August 2007, the expert prepared the materials regarding management, analysis, and data format of Japan, the US, and the EU, and the methods of management and certification, and the utilization examples of air quality monitoring data in Japan. The materials were provided presented to the counterparts of MD and NRL as subjects of discussion. The flow diagram of the air quality monitoring data in Japan is shown in Figure 3.5-1.

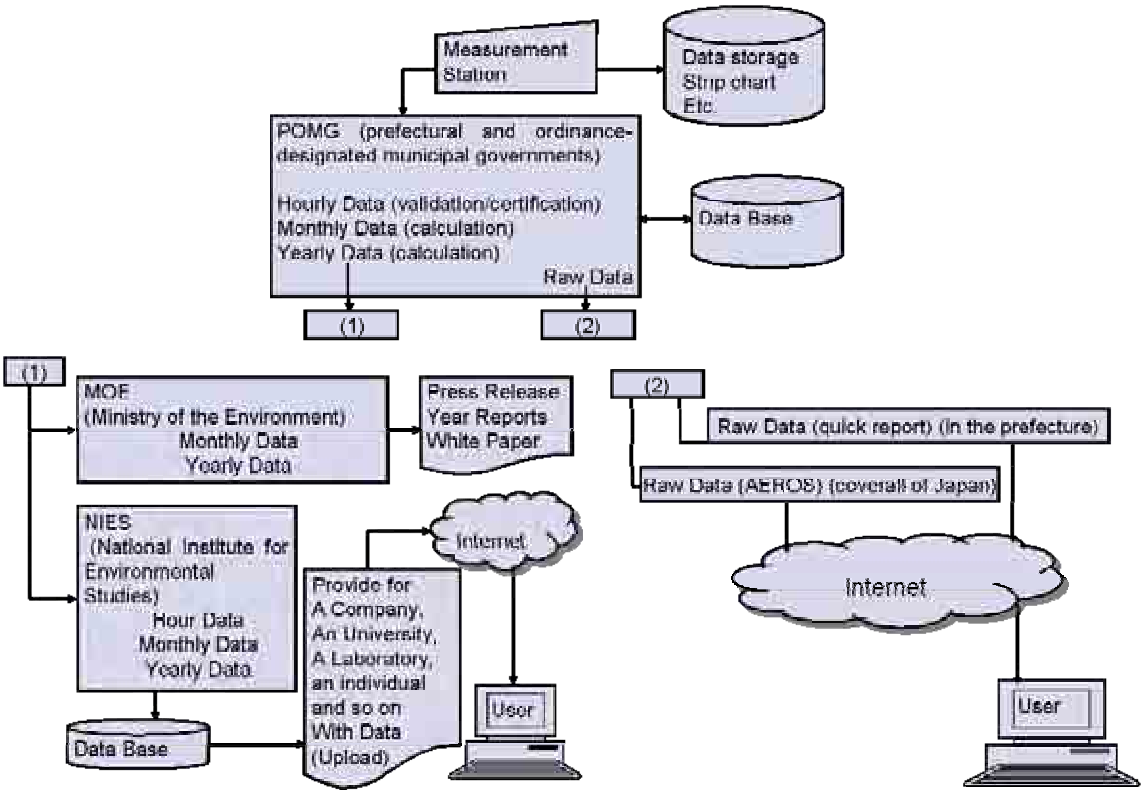


Figure 3.5-1 Flow Diagram of Air Quality Monitoring Data in Japan

The data report formats in Japan are as below.

- Annual data report format from “the prefectural and ordinance-designated municipal governments (POMG)” to “the Ministry of the Environment (MOE)”
- Monthly data report format from POMG to MOE
- Hourly, monthly, and annual Data Report Format from “National Institute for Environmental Studies”(NIES) to POMG
- Hourly, monthly, and annual data report format from NIES to the users
- Press release (Format of fiscal year report and White Paper)
- The annual data compilation report format (Annual monitoring results, monthly monitoring results)

The expert introduced all of these report formats to the counterparts. The examples of the annual and monthly data report formats from POMG to MOE” are shown in Table 3.5-1 and Table 3.5-2 below.

Table 3.5-1 Annual Data Report Format from POMG to MOE

	Names of Items	Data type	Bytes	Comments
Key	Site type code	I	1	1:Urban or background , 2:Traffic
	Data type code	I	1	1:Annual data ,2 :Monthly data
	Pollutant code	I	2	01 : SO_2 (ppm) 02 : NO (ppm) 03 : NO_2 (ppm) 04 : NO_X (ppm) 05 : CO (ppm) 06 : O_X (ppm) 07 : NMHC (ppmC) 08 : CH_4 (ppmC) 09 : THC (ppmC) 10 : SPM (mg/m^3) 11 : SP (mg/m^3)
	Prefecture code	I	2	JIS code (Japanese Industrial Standards)
	City code	I	3	JIS code
	Site code	I	8	
	Site type code	A	1	Blank : To be evaluated with AQS * : Not to be evaluated with AQS AQS (Air Quality Standards)
	Code defined in the Ministerial Ordinance	A	5	Source : Air Pollution Control Law
	Area code	I	1	Source : City Planning Act Law
	Record type	A	1	0:Annual value
	Space	A	5	
	Data part 1~16	I	5	Calculation item1 ~16
	Reserved part	A	18	Site name (Japanese 'KANA')

I: Integer, A: Alphabet and Integer
* Sites not to be evaluated with the air quality standards. The sites locate in areas of industrial or port land

use types, or without inhabitants.

Table 3.5-2 Monthly Data Report Format from POMG to MOE

	Item name	Data type	Byte	Comments
Key	Site type code	I	1	1:Urban or background , 2:Traffic
	Data type code	I	1	2 :Monthly data
	Pollutant code	I	2	01 : SO_2 (ppm) 02 : NO (ppm) 03 : NO_2 (ppm) 04 : NO_X (ppm) 05 : CO (ppm) 06 : O_X (ppm) 07 : NMHC (ppmC) 08 : CH_4 (ppmC) 09 : THC (ppmC) 10 : SPM (mg/m^3) 11 : SP (mg/m^3)
	Prefecture code	I	2	JIS code (Japanese Industrial Standards)
	City code	I	3	JIS code
	Site code	I	8	
	Site type code	A	1	Blank : To be evaluated with AQS * : Not to be evaluated with AQS AQS (Air Quality Standards)
	Code defined in the Ministerial Ordinance	A	5	Source : Air Pollution Control Law
	Area code	I	1	Source : City Planning Act Law
	Record type	A	1	Types of Statistical Values from 1 to 9
	Space	A	5	
	Data part 1	I	5	Monthly average of April
	Data part 2	I	5	Monthly average of May
	Data part 3	I	5	Monthly average of June
	Data part 4	I	5	Monthly average of July
	Data part 5	I	5	Monthly average of August
	Data part 6	I	5	Monthly average of September
	Data part 7	I	5	Monthly average of October
	Data part 8	I	5	Monthly average of November
	Data part 9	I	5	Monthly average of December
	Data part 10	I	5	Monthly average of January
	Data part 11	I	5	Monthly average of February
	Data part 12	I	5	Monthly average of March
	Space		20	Space（Because it has the same number of bytes with the annual value file）
	Reserved part	A	18	Site name (Japanese 'KANA' or Latin characters)

I : Integer , A : Alphabet and Integer

* Sites not to be evaluated with the air quality standards. The sites locate in areas of industrial or port land use types, or without inhabitants.

On the other hand, the counterpart introduced the data flow of the air quality monitoring in Romania to the expert. And the counterpart provided information of data reporting format in Romania to the expert.

The data flow of the air quality monitoring data is shown in Figure 3.5-2 below. Raw data of the automatic measurement stations are validated by each LEPA and are finally certified by NRL. On the other hand, the manual measurement data are measured by each LEPA and are reported to NRL at suitable time.

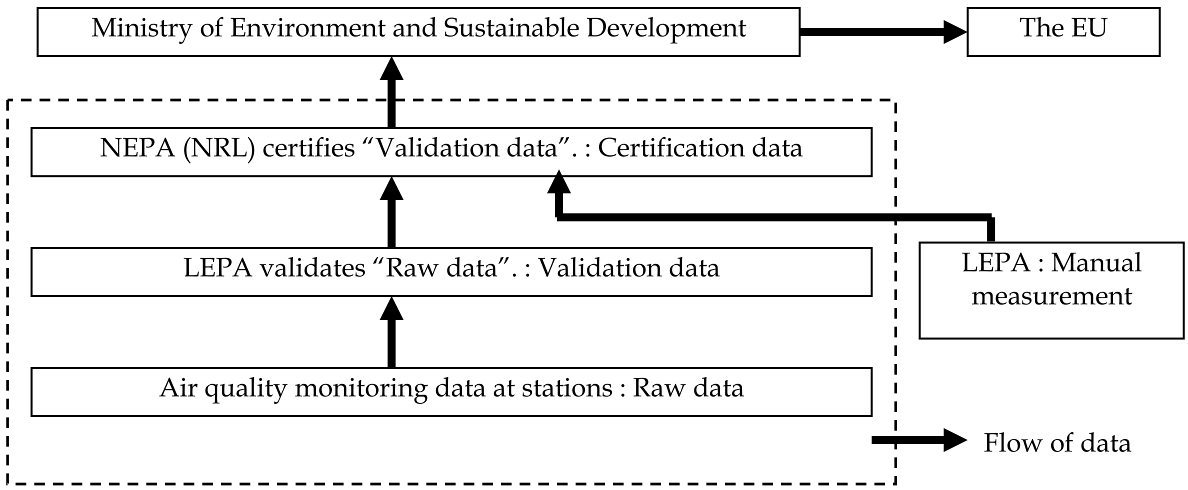


Figure 3.5-2 Flow Diagram of Air Quality Monitoring Data in Romania

In Romania, the air quality monitoring data are reported in the format defined by the EU.

COMPONENT <component code>, <averaging time>	COMPONENT Ozone (air), hour
STATION <station code>	STATION BUC - B6
<Date_time1>,<value1>	20060101 00:00,-999,0
<Date_time2>,<value2>	20060101 01:00,5,1
...	20060101 02:00,4,1
<Date_timeN>,<valueN>	20060101 03:00,6,1
STATION <station code>	20060101 04:00,6,1
<Date_time1>,<value1>	...
<Date_time2>,<value2>	...
...	20061231 22:00,5,1
<Date_timeN>,<valueN>	20061231 23:00,4,1
STATION <station code>	STATION BUC - B3
<Date_time1>,<value1>	20060101 00:00,-999,0
<Date_time2>,<value2>	20060101 01:00,5,1
...	20060101 02:00,5,1
<Date_timeN>,<valueN>	...

Figure 3.5-3 Report Format decided in the EU and Examples of the Romanian Data

Table 3.5-3 and Table 3.5-4 represent the locations where measurements have been taken for reporting them to EIONET in 2006. 23 of the stations, from RO0065A to RO0087A are automatic continuous monitoring stations, and the others are locations where manual measurements were carried out. The data provided by the 23 automatic continuous monitoring stations are sent to the collection system of the automatic continuous monitoring data at NRL, and graphically analyzed by the system. The system can also make daily, monthly and annual reports.

Table 3.5-3 List of Monitoring Sites of Romania in 2006 - 1

Code of monitoring sites	Code of location of monitoring sites	Name of measurement stations	Code of monitorin g network	Name of monitoring network
RO0001A	SB-SB1	Sediu APM Sibiu	RO010A	Sibiu
RO0002A	MM-BM4	Nr. 4 Nod de presiune	RO007A	Maramures
RO0003A	MM-BM16	Nr. 16 St. electrica	RO007A	Maramures
RO0004A	MM-BM19	Nr.19 SIL Tautii de Sus	RO007A	Maramures
RO0005A	MM-BM23	Nr.23 Fabrica de paine	RO007A	Maramures
RO0006A	MM-BM29	Nr.29 Agrochimie	RO007A	Maramures
RO0007A	MM-BM31	Nr.31 Sediu APM	RO007A	Maramures
RO0009A	CS-r3	Combinatul Siderurgic Resita	RO013A	Caras Severin
RO0010A	CS-R4	Mociur-Uzina Constr. Masini Resita	RO013A	Caras Severin
RO0011A	TM-TM1	B-dul M. Viteazul	RO011A	Ti mis
RO0013A	Gl_GL2	Laborator APM	RO004A	Galati
RO0014A	PH-PL1	Sediu APM	RO009A	Prahova
RO0016A	PH-PL4	UBEMAR	RO009A	Prahova
RO0017A	IS-IS1	Depoul C.F.R.	RO005A	Iasi
RO0018A	IS-IS2	CONEL	RO005A	Iasi
RO0019A	IS-IS3	S.C. Niciman S.A.	RO005A	Iasi
RO0020A	IS-IS4	S.C. Bucium S.A.	RO005A	Iasi
RO0034A	SB-MD1	Sediu APM Medias	RO010A	Sibiu
RO0035A	SB-MD2	Vitrometan	RO010A	Sibiu
RO0036A	SB-MD3	Policlinica	RO010A	Sibiu
RO0037A	SB-CM1	Tirnava Scoala	RO010A	Sibiu
RO0038A	SB-CM2	Micasasa nr. 119	RO010A	Sibiu
RO0039A	SB-CM3	Observator	RO010A	Sibiu
RO0040A	SB-CM4	Spital	RO010A	Sibiu
RO0041A	MS-MS1	CNAR Directia Apelor Mures	RO008A	Mures
RO0042A	MS-MS2	Sediul APM Targu Mures	RO008A	Mures
RO0043A	MS-MS3	SC FORAJ SONDE SA Targu Mures	RO008A	Mures
RO0052A	PH-PL3	Cart. Corlatesti	RO009A	Prahova
RO0053A	PH-PL5	Unit. nr. 2 Pompieri	RO009A	Prahova
RO0054A	MM-BM36	Nr.36 EGA Baia Mare	RO007A	Maramures

Table 3.5-4 List of Monitoring Sites of Romania in 2006 -2

Code of measurement stations	Code of location of measurement stations	Name of measurement stations	Code of monitoring network	Name of monitoring network
RO0056A	CS-R1	APM	RO013A	Caras Severin
RO0057A		Moldomobila	RO005A	Iasi
RO0058A	GR-GR1	APDF	RO001A	Giurgiu
RO0059A	GR-GR2	DGFP	RO001A	Giurgiu
RO0060A	CL-CL1	Chiciu	RO014A	Calarasi
RO0061A	CL-CL2	DSV	RO014A	Calarasi
RO0062A	TR-T1	Primaria Turnu Magurele	RO015A	Teleorman
RO0063A	TR-T2	Criburi	RO015A	Teleorman
RO0064A	TR-Z1	Primaria Zimnicea	RO015A	Teleorman
RO0065A	BUC - B1	ARPM	RO016A	Bucharest
RO0066A	BUC - B2	Titan	RO016A	Bucharest
RO0067A	BUC - B3	Mihai Bravu	RO016A	Bucharest
RO0068A	BUC - B4	Berceni	RO016A	Bucharest
RO0069A	BUC - B5	Drumul Taberei	RO016A	Bucharest
RO0070A	BUC - B6	Cercul Militar	RO016A	Bucharest
RO0071A	BUC - B7	Magurele	RO016A	Bucharest
RO0072A	BUC - B8	Balotesti	RO016A	Bucharest
RO0073A	CLU1	Cluj1_aurel_vlaicu	RO017A	Cluj
RO0074A	CLU2	Cluj2_lic_balcescu	RO017A	Cluj
RO0075A	CLU3	Cluj3_grigorescu	RO017A	Cluj
RO0076A	CLUJ4	Cluj4_dambovitei	RO017A	Cluj
RO0077A	CLUJ5	Cluj5_dej	RO017A	Cluj
RO0078A	CRA1	Craiova1-calea Bucuresti	RO018A	Craiova
RO0079A	CRA2	Craiova2_primarie	RO018A	Craiova
RO0080A	CRA3	Craiova3_billa	RO018A	Craiova
RO0081A	CRA4	Craiova4_isalnita	RO018A	Craiova
RO0082A	CRA5	Craiova5_breasta	RO018A	Craiova
RO0083A	IAS1	Iasi1_pod_de_piatra	RO019A	Iasi_retea
RO0084A	IAS2	Iasi2_decebal	RO019A	Iasi_retea
RO0085A	IAS3	Iasi3_oancea	RO019A	Iasi_retea
RO0086A	IAS4	Iasi4_copou	RO019A	Iasi_retea
RO0087A	IAS5	Iasi5_tomesti	RO019A	Iasi_retea

In addition, the expert recognized the following items:

- The metadata of air quality monitoring station were not posted the air quality web page.
- The data provision from NRL to MD was not decided by August 2007.

- In August 2007 the system of collection and compilation of manual monitoring data was still under preparations.
- The counterpart wanted to know the process and the background on making processes of report formats in Japan.

In October 2007, the counterpart provided the expert the report formats of the EU with which NRL submitted data to EIONET. The expert analyzed the contents of the formats and summarized the differences with the ones of Japan. The analysis result is shown in Table 3.5-5. Although some of the forms are empty because of unavailability of data, most of the items are reported in the forms.

Table 3.5-5 Analysis Results of Forms from Romania to the EU

Items	Contents / Remarks
Form 0	Member state, Contact address, Reference year, Compilation date
Form 1	Contact body and address
Form 2	Delimitation of zones and agglomeration (Blank)
Form 3	Stations and measuring methods
Form 4	Stations used for assessment of ozone, including nitrogen dioxide and nitrogen oxides in relation to ozone
Form 5	Stations and measurement methods of VOC(only Benzene ; Code is M13)
Form 6	Stations and measurement methods of other ozone precursor substances (Blanks)
Form 7	Methods used to sample and measure PM10, PM2.5 and ozone precursor substances (M13 is explained in the Romania.)
Form 8	List of zones and agglomerations where levels exceed or do not exceed limit values (LV) or limit values plus margin of tolerance.
Form 9	List of zones and agglomerations where levels exceed or do not exceed target values or long term objectives for ozone
Form 10	List of zones and agglomerations where levels exceed or do not exceed upper assessment thresholds (UAT) or lower assessment thresholds.
Form 11	Individual exceedences of limit values and limit values plus margin of tolerance (MOT)
Form 12	Reasons for individual exceedences: optional additional codes to be defined by the Member State (S14~S18 in Romania)
Form 13	Individual exceedences of ozone thresholds.
Form 14	Exceedence of ozone target values.
Form 15	Annual statistics of ozone (vegetation protection : forest protection)
Form 16	Annual average concentrations of ozone precursor substances. (Blank)
Form 17	Monitoring data on 10 minutes mean SO2 levels. (Blank)
Form 18	Monitoring data on 24hr mean PM2.5 levels
Form 19	Tabular results of and methods used for supplementary assessment. (Blank)
Form 20	List of references to supplementary assessment methods referred to in Form 19. (Blank)
Form 21	Exceedence of limit values of SO2 due to natural sources. (Blank)
Form 22	Natural SO2 sources: optional additional codes to be defined by Member State (Blank)
Form 23	Exceedence of limit values of PM10 due to natural events (Blank)
Form 24	Exceedence of limit values of PM10 due to winter sanding (Blank)
Form 25	Consultations on transboundary pollution (Blank)
Form 26	Exceedences of limit values (Blank)
Form 27	Reasons for exceedences of limit values (Blank)

Note: From the table 1 to the table 4 are the tables of the EU Commission Decision 2004/461/EC.

The counterpart and the expert argued about the possibility taken up as the themes of the technical cooperation. As a result, the data format and reporting format were decided by the EU, so the simple improvement of the basic data format and reporting format is not included in this project. On the other hand, the counterpart wanted to examine the possibility of Romanian original ways of management and application of data except the format decided by the EU. Therefore the expert analyzed format of the EU, and found the useful format which was introduced in Japan but not introduced in the EU. And the expert showed improvement plan to the counterpart.

At the 2nd technical seminar on 21st February, 2008, the expert introduced the outlines of the Japanese monitoring data management, some examples of data screening, and actual utilization of the data to the participants of the seminar including the staff from LEPAs.

The expert introduced the examples of the data browsing and downloading services via the internet, the connection between Tokyo Metropolitan Government and the neighboring prefectures, and the Atmospheric Environmental Regional Observation System (the AEROS) of the Ministry of Environment of Japan.

The AEROS provides information about the air quality situation of the nation for 24 hours. By this system, you can watch hourly data of the air quality monitoring on a map. Furthermore, you can check the latest weekly data of the official announcement of caution and alert for photochemical oxidants on a map, too.

The site has the information like list and locations of the monitoring stations, data collection situations, legends of terms, links, contact address etc and the functions like monitoring stations search and links for mobile phones and so on.

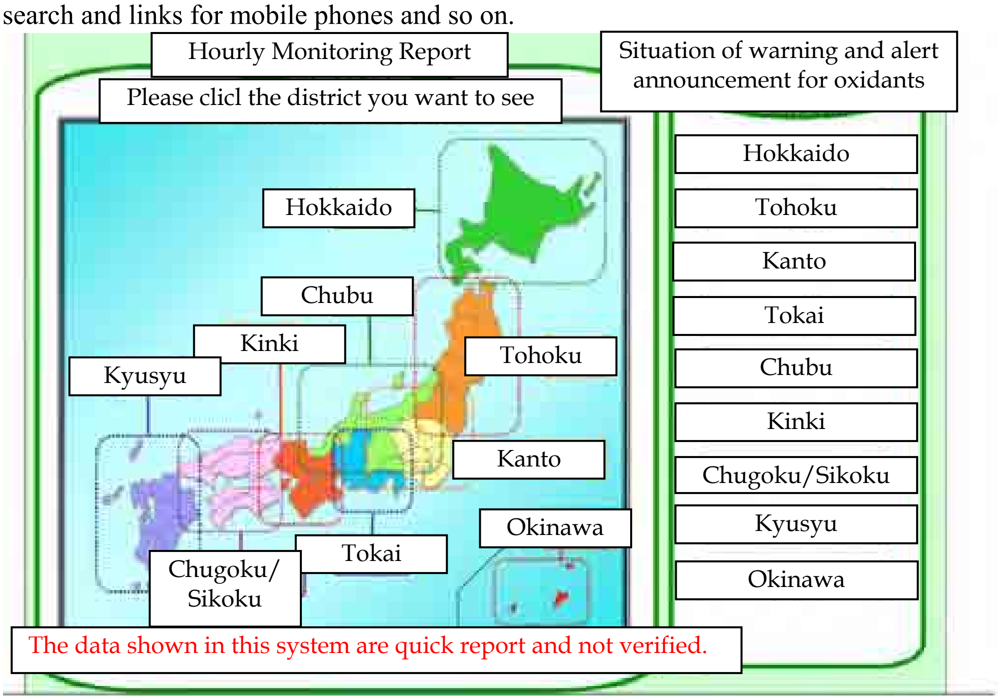


Figure 3.5-4 Example of Menu of the AEROS Site

As other information offering, there are lists of measurement stations, a search of the measurement stations, the link to the mobile phone site, the construction information of the site, links, the figure of measurement stations placement, the data collection situation, explanations, reference.

Tokyo exchanges raw air monitoring data with neighboring prefectures of Saitama, Chiba and Kanagawa. This helps understand the situation of large-area pollutions and the contaminations with photochemical oxidants and issue warnings on time.

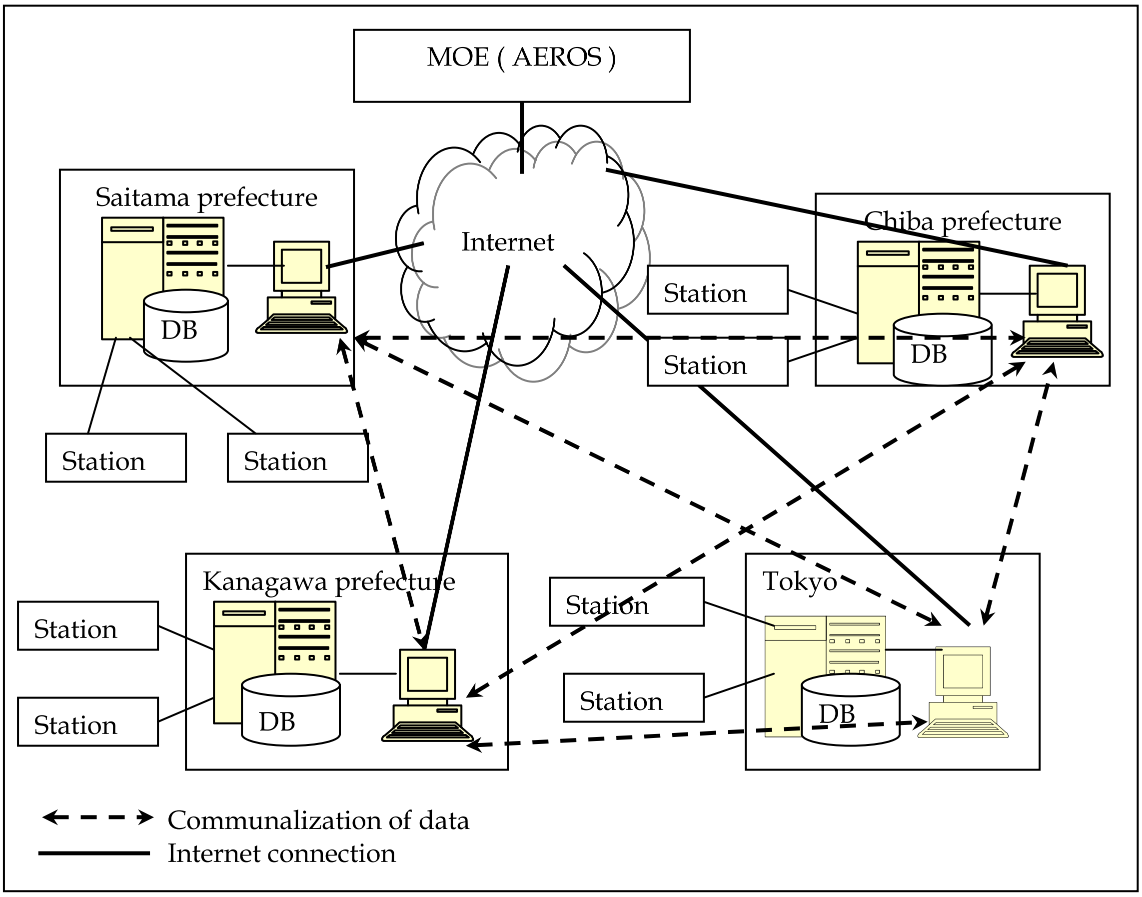


Figure 3.5-5 Data Exchange between Tokyo and the Neighboring Prefectures

In June, 2008, the expert proposed "Information maintenance of the air quality monitoring stations" as the improvement of data format and reporting format with concrete example of the maintenance, and discussed it with the counterpart. As a result, the counterpart understood importance and the effectiveness of the compilation. Therefore the expert gathered the examples on the information maintenance in Japan, and showed them to the counterpart in November, 2008.

Finally, the "Information maintenance of the air quality monitoring stations" became output of the improvement of data format and the reporting format.

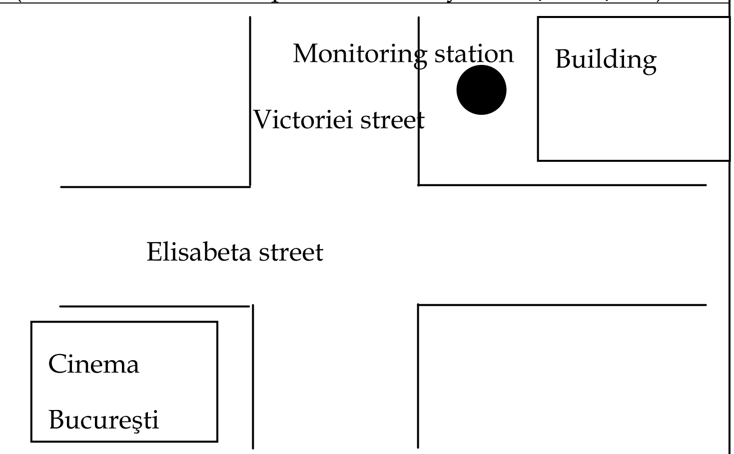
Figure 3.5-6 Situation of the Activity of the Expert

3.5.1.2 Achievement

The output was mostly achieved by the proposal of the "Information maintenance of the air quality monitoring stations".

The following example was actually proposed to the counterpart.

Table 3.5-6 Example of Position Information of Monitoring Station

Name of monitoring station	B-6, Cercul Militar, municipiul Bucureşti
Address	Calea Victoriei nr.32-34, Sector 1
Position information	It is about 10m from Victoriei street
Area code	Urban
Height of the sampling inlet	
Height of wind vane and anemometer	
Summary of surroundings of the monitoring station	In commercial area Located near to the intersection of Victoriei street and Elisabeta street Comparatively heavy traffic (.numbers of vehicles per hour surveyed DD/MM/YY)
The map around the monitoring station	

Furthermore, the expert proposed a method of compiling information in case of network modification such as station removal, integrations, new station establishment, etc.

The example of "Information maintenance of the air quality monitoring stations" (Kawasaki City)

Table 3.5-7 Example of History of Monitoring Station (Kawasaki City)

History of Monitoring Stations

	Monitoring Station	Monitoring point	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05
Ambient Air Quality Monitoring Stations	Daishi	Daishi branch	3																																								
		Daishi health branch			5																																						
	Tajima	Tajima health branch			8																																						
	Kawasaki	Old Kawasaki public health center	1																																								
		Kawasaki city hall				8																																					
		Monitoring center								4																																	
	Saiwai	Saiwai health welfare center							4																																		
		Saiwai sports center																																									7
	Nakahara	Nakahara ward office	3																																								
		Nakahara health welfare center																4																									
	Takatsu	Life Cultural Center			Kanagawa			6																																			
	Miyamae	Saginuma swimming pool														5																											
		Miyamaedaira elementary school																																								2	
	Tama	Old Tama public health center			Kanagawa			6																																			
		Noborito elementary school																												4													
	Asao	Kouhoumatsu Park															5																										
Roadside Air Quality Monitoring Stations	Ikegami	Ikegami																	5																								
	Nisshincho	Sinkawa street										9																															
		Nisshincho																																							4		
	Shiyakushomae	Shiyakushomae									1																																
	Endocho	Endocho									8																																
	Nakahara heiwa koen	Kitzuki 4 chome									8																																
		Nakahara heiwa koen																											10														
	Futago	Takatsu cross road											4																														
		Futago																					4																				
	Miyamaedaira ekimae	Umakinu															4																										
		Miyamaedaira (station square),																																				4					
	Honmurabashi	Center of Tama ward office														6																											
		Monmurabashi																												12													
	Kakio	Kakio																	5																								

Note1 : The number shows month of monitoring start.

Note2 : "Kanagawa" shows that Kanagawa-Prefecture set up the monitoring station and started the measurement.
In June of the next year, these monitoring station was transferred in Kawasaki-Cityi from Kanagawa-Prefecture.

Table 3.5-8 Example of History of Monitoring Item -part1 (Kawasaki City: Ambient Air Quality Monitoring Station)

History of Monitoring Items

	Monitoring Station	Monitoring items	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05
Ambient Air Quality Monitoring Stations	Daishi	Daishi branch	3																																								
		Daishi health branch			5																																						
		SO_2	3																								○																
		NO_x							8														○														○						
		SPM				8					Suspended dust (digital dust meter)																4		Suspended particles (βrays absorption method)										○				
		O_x							4																						○									●			
		CO								4										suspension																			abolition				
		HC															6													○													
	Tajima	Tajima health branch			8																																						
		SO_2			8																												○										
		NO_x				4																												○									
		SPM				4				Suspended dust (digital dust meter)														4	Suspended particles (βrays absorption method)								○										
		O_x							4																							○											
		CO								1																							○										
		HC														10																○											
	Kawasaki	Old Kawasaki public health center	1																																								
		Kawasaki city hall				8																																					
		Monitor center								4																																	
		SO_2	1																								○																
		NO_x							1														○														○						
		SPM				8					Suspended dust (digital dust meter)																4	Suspended particles (βrays absorption method)											○				
		O_x							4																							○								●			
		CO								4																												suspension			abolition		
		HC											5										○																○				

Note1 : The number shows month of monitoring start.

Note2 : "○" shows that monitoring machine is updated.

Note3 : "●" shows that monitoring machine is updated, and monitoring machine was updated from wet type to dry type.

Note4: monitoring machine

Suspended dust (digital dust meter)　Suspended particles (βrays absorption method)

SO2 : ○ wet tyoe (conductomitric analysis)　● dry type (ultraviolet fluorescence method)

NOx : ○ wet tyoe (absorption spectrophotometry)　● dry type (chemiluminescence method)

Ox : ○ wet tyoe (absorption spectrophotometry)　● dry type (ultraviolet spectrophotometer)

Table 3.5-9 Example of History of Monitoring Item -part2 (Kawasaki City: Roadside Air Quality Monitoring Station)

History of Monitoring Items

	Monitoring Station	Monitoring items	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05
Roadside Air Quality Monitoring Stations	Ikegami	NO_x																	5															○						●			
		SPM																															4							○			
		CO																	5															○									
	Nisshincho	Sinkawa street										9																															
		Nisshincho																																							4		
		NO_x										9																			○									●			
		SPM																																			4						
		CO										9									○																		○				
	Shiyakushomae	NO_x																			1							○							○							●	
		SPM																																				4					
		CO									1									○																	suspension		1				
	Endocho	NO_x									8																											○					
		SPM																																				4					
		CO									8																	○															
	Nakahara heiwa koen	Kitzuki 4 chome									8																																
		Nakahara heiwa koen																												10													
		NO_x									8												○														○						
		SPM																																4									
		CO									8										○																	suspension		abolition			

Note1 : The number shows month of monitoring start.
Note2 : "○" shows that monitoring machine is updated.
Note3 : "●" shows that monitoring machine is updated, and monitoring machine was updated from wet type to dry type.
Note4: monitoring machine
Suspended dust (digital dust meter) Suspended particles (βrays absorption method)
SO2 : ○ wet tyoe (conductomitric analysis) ● dry type (ultraviolet fluorescence method)
NOx : ○ wet tyoe (absorption spectrophotometry) ● dry type (chemiluminescence method)
Ox : ○ wet tyoe (absorption spectrophotometry) ● dry type (ultraviolet spectrophotometer)

3.5.2 Improvement of Data Management and Analysis for Air Quality Monitoring

3.5.2.1 Activity

In February 2007, the expert analyzed the materials on the procedure for handling of monitoring data and the screening methods of abnormal values, which were provided by the counterparts of NRL. The expert analyzed the materials and used the results as the basis for the discussion in August.

In August 2007, the expert prepared the materials regarding management, analysis, and data format of Japan, the US, and the EU, and the methods of management and certification, and the utilization examples of air quality monitoring data in Japan, and the materials were presented to the counterparts as the subjects of discussion. On the other hand, the counterpart introduced the data flow of the air quality monitoring in Romania, and provided information on the former data collection system of automatic continuous monitoring, basic data for annual report making, monitoring stations, and error flags and so on to the expert.

Error flags are displayed on the table of the hourly value of the telemeter. This signal is a sign to stand for the maintenance management condition and the trouble of the monitoring equipments and the telemeter system. In addition, this signal contributes to the judgment (good or bad) of the existing operation situation and the adoption or the rejection of the collected data.

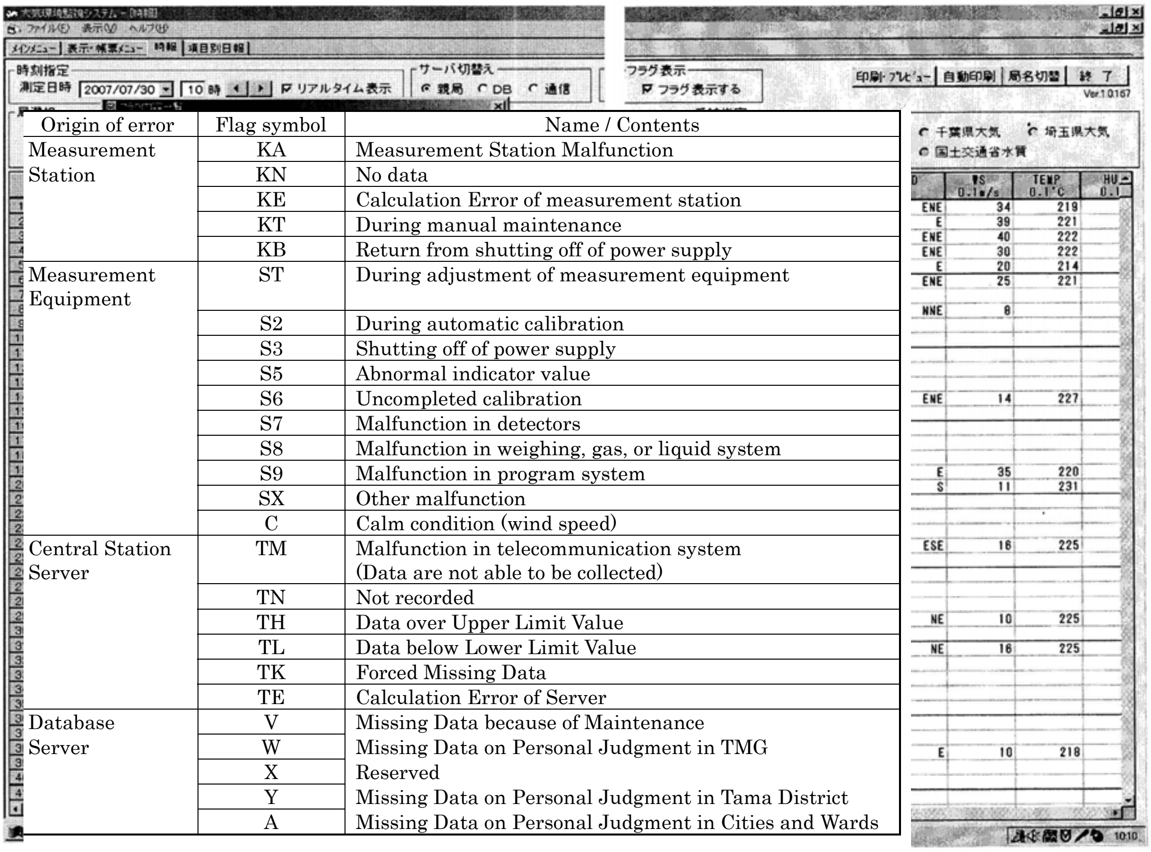
When the number of air quality monitoring station was 23, the error flag information was shown in Table 3.5-10 below. In addition, the number of air quality monitoring stations was going to be 117, but it was not yet completed in July 2008, and the counterpart did not obtain the error flag information of this new system. Therefore, the expert provided the error flag information of Japan for the counterpart, but did not propose any improvements for the error flag of the new system.

Table 3.5-10 Error Flag Information of the Former System

Flag	Contents	Notes / Comments
A	Out of scanning	The time when maintenance was carried out at the measurement station.
B	Average to calculate	Collecting data now. (When instant value data pile up from now until the appointed hour, this flag means that the hourly average can be calculated.)
C	No elemental data	Instant values don't come to a logger from a measurement machine at all.
D	**Elemental data not sufficient**	**Among one hour, some instant values don't come to a logger.**
E	Delta ＞ threshold	This flag is unused now.
F	Delta ＜ threshold	This flag is unused now.
G	Average ＜ threshold	This flag is unused now.
H	Average ＞ threshold	This flag is unused now.
K	**Average OK**	
I	Wind calm	Calm (Judged from a instant value)
L	Variable wind	The direction of the wind changes intensely within a short time. (Judged from a instant value)
M	Zero not OK	
N	Span not OK	
O	Zero OK	
P	Not linear data	
S	Span OK	
T	**Calibration in progress**	
U	**Data invalidated by user**	
Z	**Data not acquired**	

Note: Bold character means frequently used flag.

The expert provided the error flag information of Japan as shown in Figure 3.5-7. The error flags of the telemeter system of Tokyo Metropolitan Government (TMG) are used to confirm that the whole system works normally, by comparing the flagged monitoring data with the values read from the chart.



Origin of error	Flag symbol	Name / Contents
Measurement Station	KA	Measurement Station Malfunction
	KN	No data
	KE	Calculation Error of measurement station
	KT	During manual maintenance
	KB	Return from shutting off of power supply
Measurement Equipment	ST	During adjustment of measurement equipment
	S2	During automatic calibration
	S3	Shutting off of power supply
	S5	Abnormal indicator value
	S6	Uncompleted calibration
	S7	Malfunction in detectors
	S8	Malfunction in weighing, gas, or liquid system
	S9	Malfunction in program system
	SX	Other malfunction
	C	Calm condition (wind speed)
Central Station Server	TM	Malfunction in telecommunication system (Data are not able to be collected)
	TN	Not recorded
	TH	Data over Upper Limit Value
	TL	Data below Lower Limit Value
	TK	Forced Missing Data
	TE	Calculation Error of Server
Database Server	V	Missing Data because of Maintenance
	W	Missing Data on Personal Judgment in TMG
	X	Reserved
	Y	Missing Data on Personal Judgment in Tama District
	A	Missing Data on Personal Judgment in Cities and Wards

Figure 3.5-7 Example of Error Flag of TMG

The list of analysis menus of the former system is shown in Table 3.5-11below.

The analysis menus of the former system defer from the ones in Japan, and there are some aspects with regard to crosscheck relations of meteorology and air quality that still need development. The meteorological conditions such as wind directions, wind speed and atmospheric stability give big influence to air quality in a certain spot. In Japan, these relations are analyzed, too.

Table 3.5-11 List of Analysis Menus of the Former System

	Substance	Analysis menus
Graphical Analysis	SO_2, NO, NO_2, NO_x, CO, O_3	Hourly value, Hourly average, Hourly instant maximum value, Hourly instant minimum value, and so on
Daily Report Analysis	SO_2, NO, NO_2, NO_x, Benzene, Toluene, O-xylen, Ethylbenzne, MP-Xylen Wind Directions, Wind Speed, Temperature, Relative Humidity, Atmospheric Pressure, Solar Radiation, Rain	Summation, Maximum, Minimum, From 0 to 8 o'clock, From 8 to 16 o'clock, From 16 to 24 o'clock etc.
Monthly Report Analysis	SO_2, NO, NO_2, NO_x ,CO, PM10, Benzene, Toluene, O-xylen, Ethylbenzne, MP-Xylen,	Summation, Maximum, Minimum
Annual Report Analysis	SO_2, NO, NO_2, NO_x, O_3, PM10 Wind .Direction, Wind Speed, Temperature, Relative. Humidity, Atmospheric Pressure, Solar Radiation	Summation, Maximum, Minimum

The counterpart and the expert discussed the concrete contents of the technical cooperation in October 2007. The number of air quality monitoring station increases to 117 in Romania, and the staff of LEPA are going to implement data screening. Then, the counterpart requested technical assistance about Japanese experience for the purpose of reliable data screening. Therefore the expert collected a lot of examples of the Japanese data screening and showed it to the counterpart and discussed it.

The expert showed an example of the Japanese data certification process for the counterpart in detail in February 2008. The expert performed technical assistance about the outlines of data certification, of the TMG and maintenance company, and the details of certification process of hourly values.

Table 3.5-12 Outlines of Data Certification in Japan

Daily check of measurement values	It is the basic operation. Online data is tabulated and verified as hourly and daily reports. Normal operation is confirmed by checking state signals of set for each measuring device and comparing values with the standard values of each measurement items defined by the MOEs.
Measurement value verification	It is the operation generally performed when devising the primary monthly report. Every collected measurement value is checked with every record chart for each measurement devices. Collected measurement values are checked with the reports on maintenance control operations. It is the basic operation in confirming the normal functioning.
Measurement value screening	It implies detecting the measurement values believed to be abnormal by using the judgmental criteria (discrimination values) determined from data certified in the past. The crimination value are determined by the following methods: ➢ the method that uses measured values ➢ the method that uses the fluctuation tendency of measured values ➢ the method that uses values of the other items measured at the same station or values of the same item measured in the neighboring stations Nowadays, when the quick report bulletin values are important, the discrimination values are used also as reference values within the daily checks.
Treating abnormal measurement values	First, investigation of the cause is important. Based on the cause, correction treatment or missing treatment of values is necessary. When verification concluded the abnormality comes from the analyzer, the “missing measurement treatment standard” is applied.
Correction of measurement values	When the abnormal value has been found and correction has been deemed as necessary, this action should be taken after creating a correction logbook. The type of corrections and their descriptions can be referred to afterwards.

The TMG executes data certification in the 3 steps according to Table 3.5-13 below:

Table 3.5-13 Outlines of Data Certification of TMG

Check step	Executing body	Details
Error check by the maintenance company	Maintenance comp. (3 companies in charge in Tokyo Metropolitan Area)	**<u>Operations conducted by the maintenance company:</u>** Certificates every morning the data for one day. Go once a week to every measuring station and check its working condition and the surroundings Draw up a maintenance control log Compares the chart info, maintenance book and the hourly values "Check on the daily fluctuations of the hourly values" "Organises one conference a week with the department in charge of Tokyo Metropolitan on the environment conditions around the stations"
Primary check by TMG	Tokyo Metropolitan Area is divided into 3 zones and persons in charge are appointed full time to each zone	**<u>Operations conducted by the full time charge</u>** Compare error flags with the chart info Compare chart info with measurement values Judge according to their experience "Verification of monthly fluctuations (drift and weekly fluctuations, etc)" "Compare daily fluctuations with the neighboring stations, check drifts, etc"
Secondary check by TMG	Head responsible for Air Quality Monitoring of TMG	**<u>Operations of inspection for the whole Tokyo Metropolitan Area</u>** Checking on charts and measured values Judge on the field experience of the head in charge "Certification of the annual fluctuations (seasonal fluctuations, etc)" "Judgment based on daily and seasonal fluctuations, comparison with the neighboring stations, check the advection flows from the neighboring prefectures, check drifts, etc"

The maintenance company executes data selection according to Table 3.5-14below:

Table 3.5-14 Outlines of the Certification Operation by Maintenance Company in Japan

Data certifying personnel	Maintenance personnel
The data for the whole previous day is collected every morning. Then time variation graph is devised and data is certified considering the conditions below: ➢ Generally the concentration fluctuates similarly at neighbouring stations (very important point). ➢ Fluctuations tendencies between the measured pollutants （NO,CO,NMHC) are compared within the same station, they should be similar. ➢ NO2 and O3 have an inverse correlation ➢ O3 correlates with the sunlight. ➢ Thorough investigation is performed by adding in the meteorological factors (rain and wind).	Maintenance is performed once a week for each station. ➢ Check on the ambient surrounding the monitoring station. ➢ Compare the environment info assumed from the ambient surrounding the station with the chart info. ➢ Maintenance is performed for the analysers ➢ A maintenance control log is devised

The maintenance company checks the hourly measurement data everyday. The hourly data is checked while taking into account the following items: 1 - Low indications, 2 - Zero indications, 3 - Full scale over, 4 - Non-continuity, 5 - Relations with concentration and the meteorology, 6 – Relations with neighboring environment.

At the 2nd technology seminar held on 21st February, 2008, the expert introduced the outlines of the Japanese data management, and some examples of the data screening to the participants of the seminar including the staff from LEPAs. The document in which the expert summarized the presentation materials of this seminar and the example of the Japanese data screening was offered to the counterpart. The counterpart offered these documents to LEPA as basics documents of data screening of Romania. As a result, the expert judged that technology transfer of the Japanese data screening was achieved.

In June 2008, the expert used analytical technique in Japan and performed the statistical analysis of air quality monitoring data of Romania. The expert discussed this analysis result with the counterpart. As a result, the counterpart is improving the analytical technique such as the average concentration by the rank of wind speed, the average concentration by the atmosphere stability rank and the average concentration by the humidity rank.

The air quality monitoring station was going to increase in 117 stations, but it was the situation that the data communications system from the air quality monitoring station was not completed about at the point in time in July, 2008 either. Therefore the expert introduced the example of the Japanese data analysis without performing the suggestion about the improvement of the data analysis in the new system.

3.5.2.2 Achievement

The improvement of the data management was mostly achieved by having transferred Japanese data screening example to the counterpart. The Japanese data screening example was offered to counterpart and LEPA as basic document for establishment of data screening technique of Romania.

Based on Japanese analytical technique, the improvement of the data analysis was mostly achieved by having transferred to the counterpart the analytical technique such as the average concentration by the rank of wind speed, the average concentration by the atmosphere stability rank and the average concentration by the humidity rank.

(1) Japanese Data Screening Example

In Japan one-hour value is mainly checked by the maintenance company. The local government judges data comprehensively.

1) Verification Work of Data of the One Hour Values

The expert showed some examples such as a) low indications, b) zero indications, c) full scale over, d) non-continuity, e) relations with concentration and meteorology and f) relation with neighboring environment, as verification work of data of the one hour values.

a. Low Indications

The drawing below shows a low indication. There is a peak during daytime, and then concentration decreases, which in itself is a correct Ox (photochemical oxidants) tendency. However, when compared to the neighboring stations the decreasing concentration shown is too low, leaving room to a suspicion of low indication.

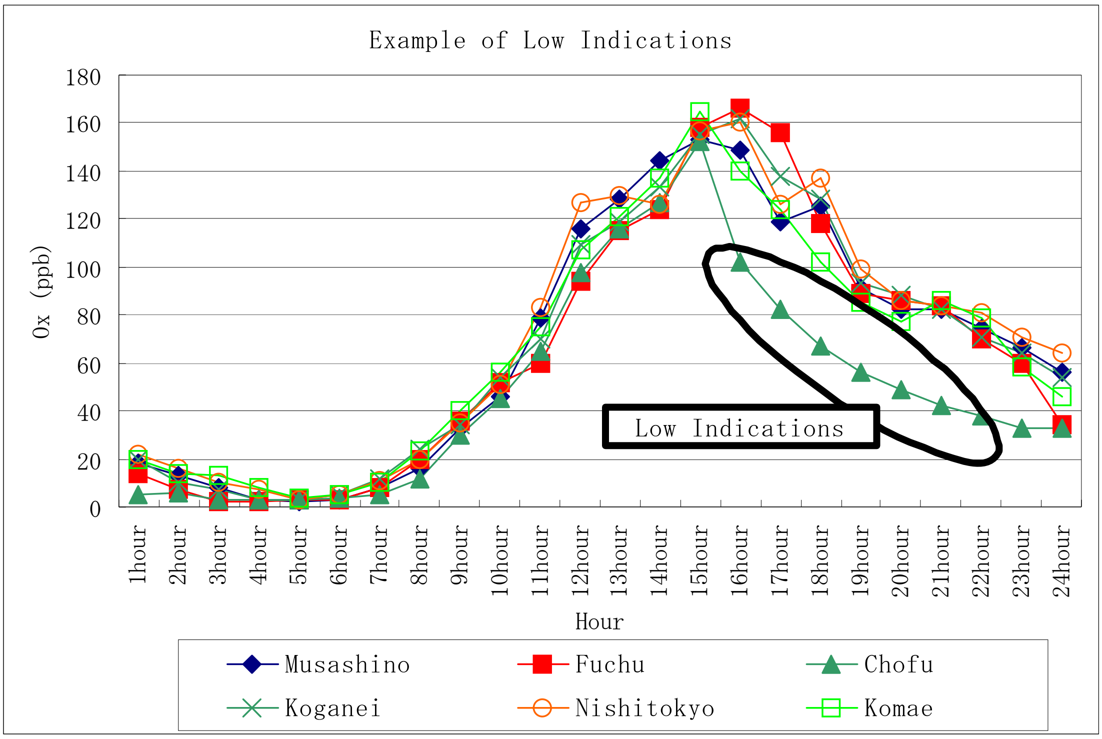


Figure 3.5-8 Example of Low Indications

b. Zero Indications

Figure 3.5-9 is an example of making decisions on one-hour value graphs. In case of Ox the time of zero indication is checked and whether that time may have actually been the time when it could have shown zero. Also, Ox concentration and tendency should be checked in the neighboring stations and decision whether any error occurred should be made.

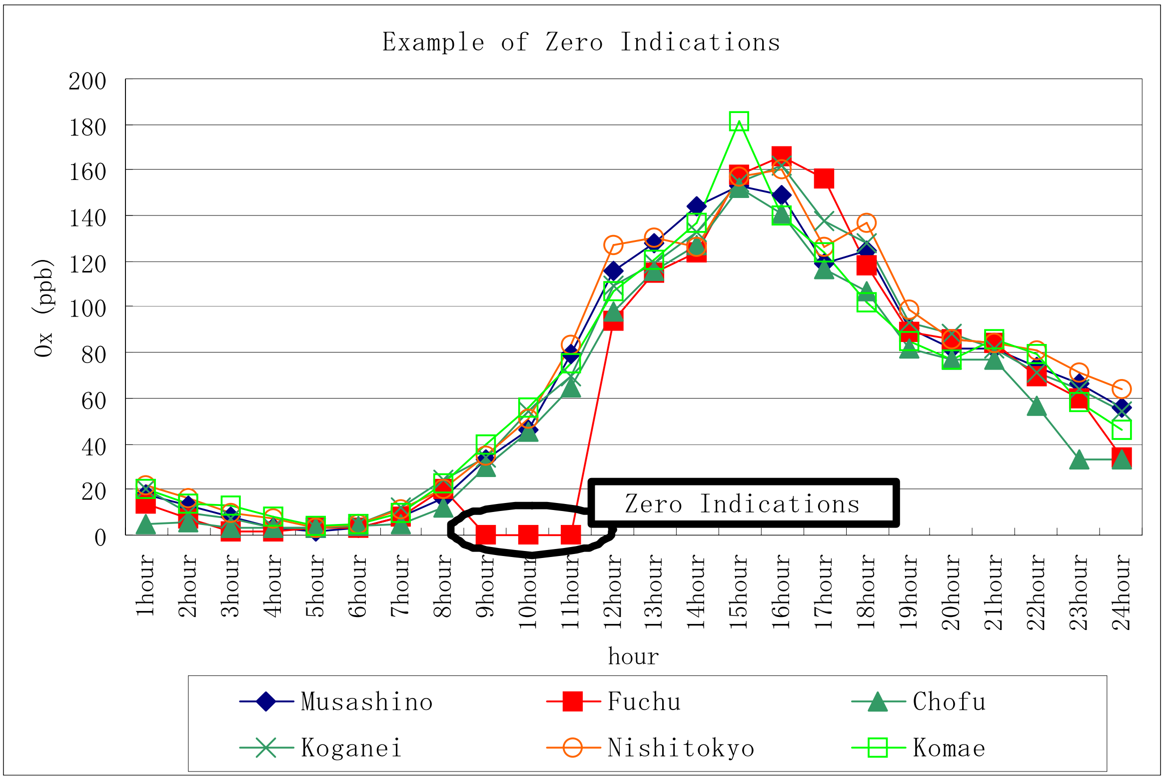


Figure 3.5-9 Example of Zero Indications

c. Full Scale Over

Figure 3.5-10 shows a chart in full scale over condition. The measurements between 0:00-1:00 and 1:00-2:00 recorded full scale over, that is why the integrated 1-hour values at 1:00 and 2:00 also have high concentrations.

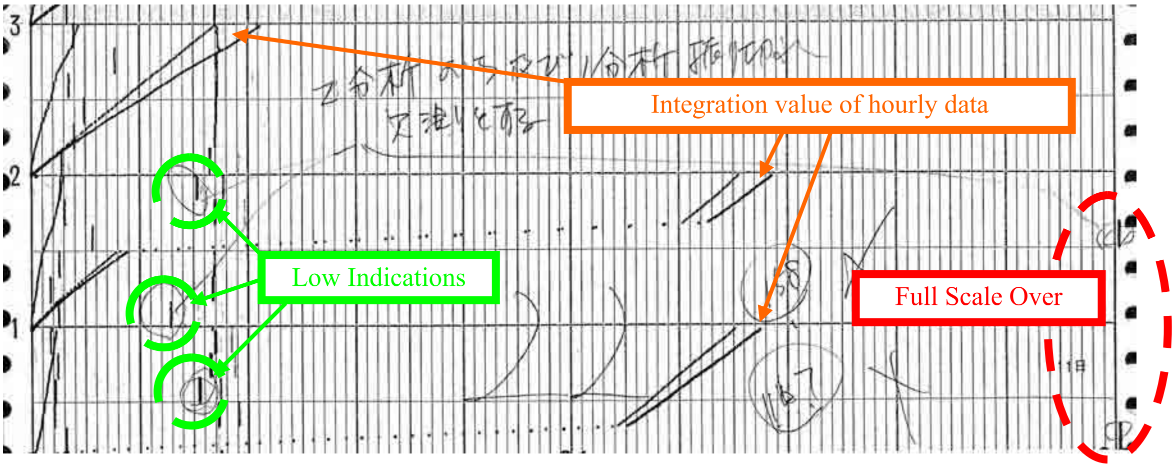


Figure 3.5-10 Example of Chart of Full Scale Over

d. Non-Continuity

Figure 3.5-11 shows an example where the hourly value has deviated a lot in a parallel move due to a mistaken zero calibration. Such a trouble occurs often, and this example illustrates a situation where the zero point has been lifted, however correction is possible.

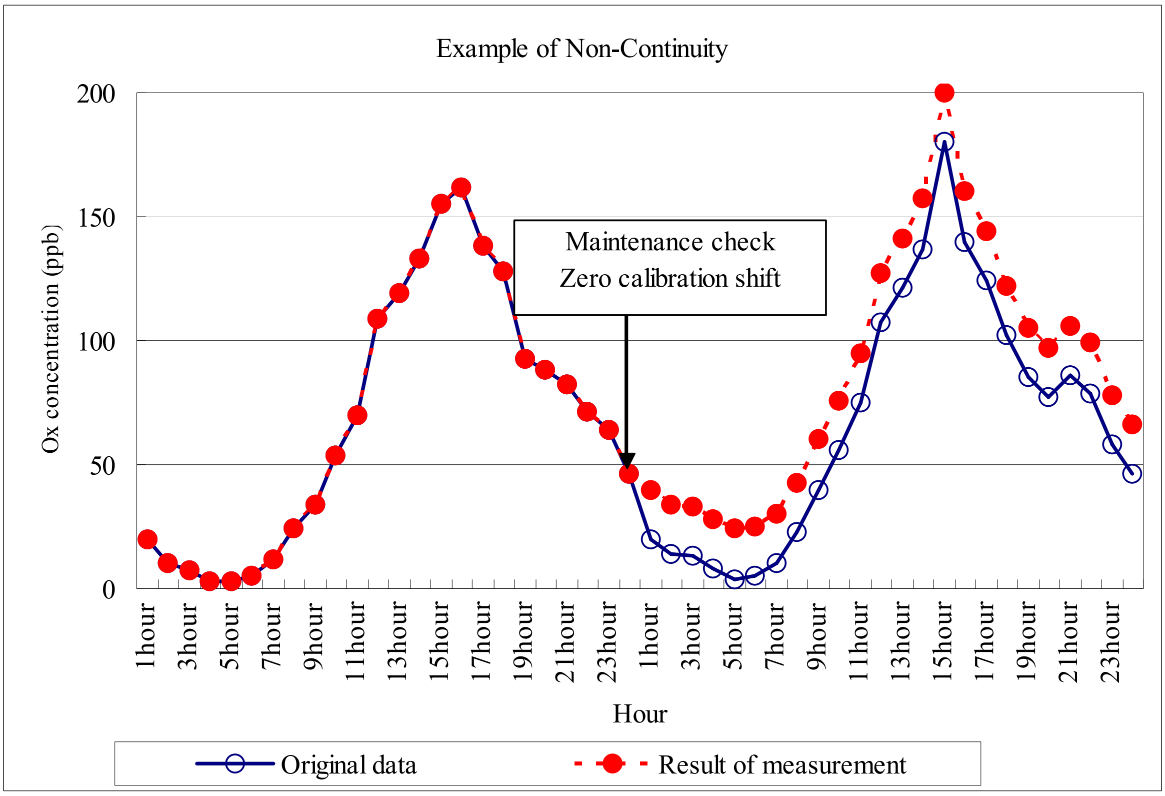


Figure 3.5-11 Example of Non-continuity

e. Relations with concentration and meteorology

The concentration is deeply related to the meteorology. That is why it is necessary to take the meteorology into account even when checking the daily fluctuations. The relation with the meteorology and concentration has also connection with the locations of the pollution source and the station monitoring that source. In other words it is necessary to grasp the relations between concentration and meteorology at every measurement station in order that the relations that are peculiar to every measurement station.

Figure 3.5-12 shows the relation of NOx with the wind direction. It is immediately clear that the concentrations of NO and NOx plunged as soon as the wind changed its direction suddenly from northwest to south after 11:00.

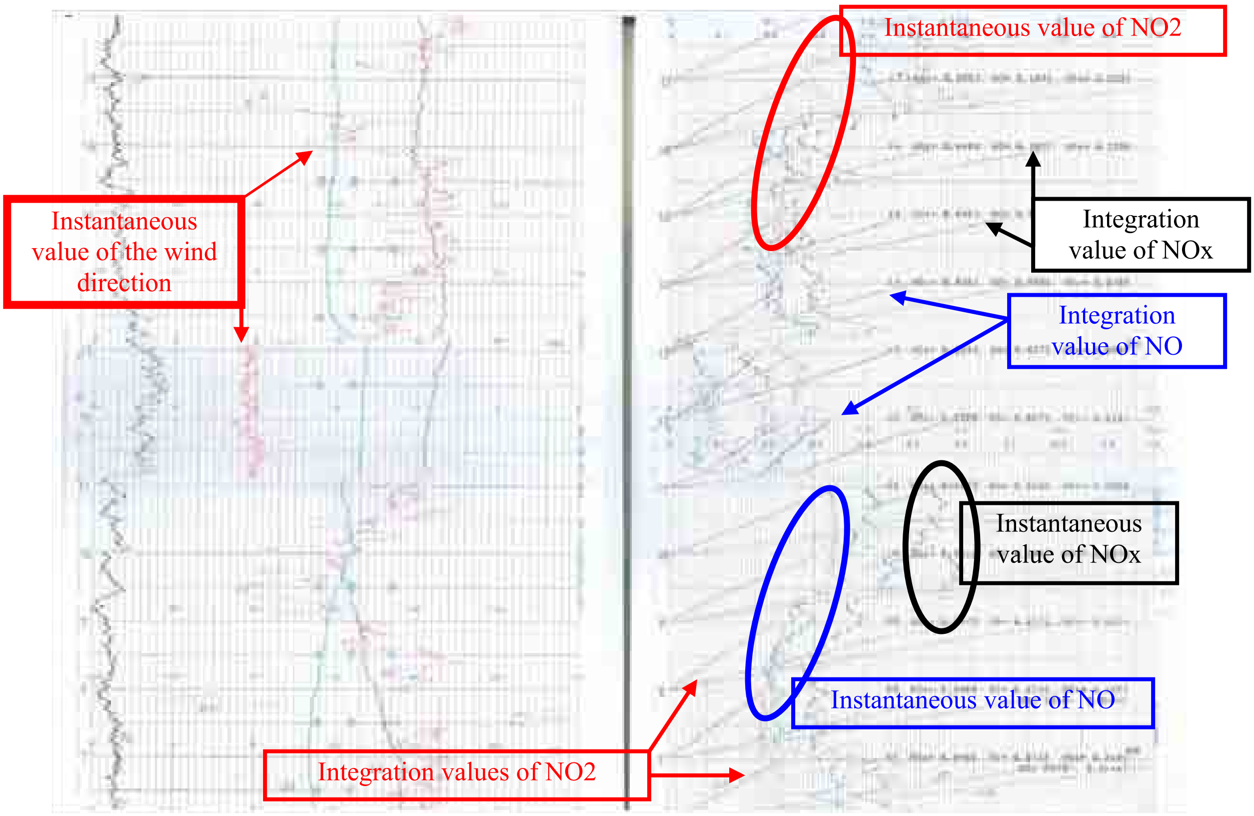
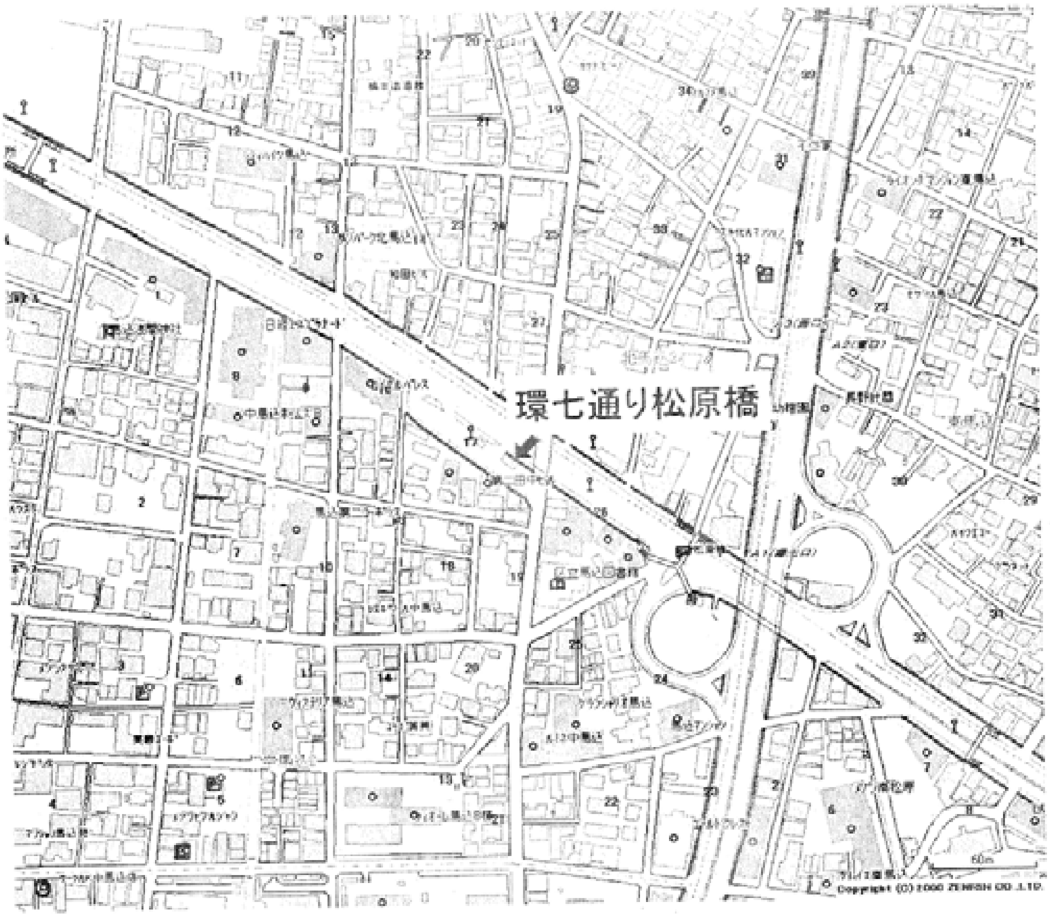


Figure 3.5-12 Example of Relations with NOx and Wind Direction

f. Relations with Neighboring Environment

Figure 3.5-13 and Figure 3.5-14 give the example of the Matsubarabashi station in the Tokyo Metropolitan Area, situated on the belt cyclic Route 7, where traffic is extremely heavy and is the main pollution source in the area. Because there is cyclic Route 7 (a pollution source) northeast seeing from the measurement station, at the time of wind from the northeast, concentration tends to rise.



Name of monitoring station	Matsubarabashi of cyclic Route 7
Adress	2-17 Nakamagome Oota-ku Tokyo
Position information	3m from cyclic Route 7 140m from Matsubarabashi crossing
Area code	Urban
Height of the sampling inlet	4m
Height of wind vane and anemometer	6.5m

Figure 3.5-13 Map of "Matsubarabashi" in Tokyo Metropolitan

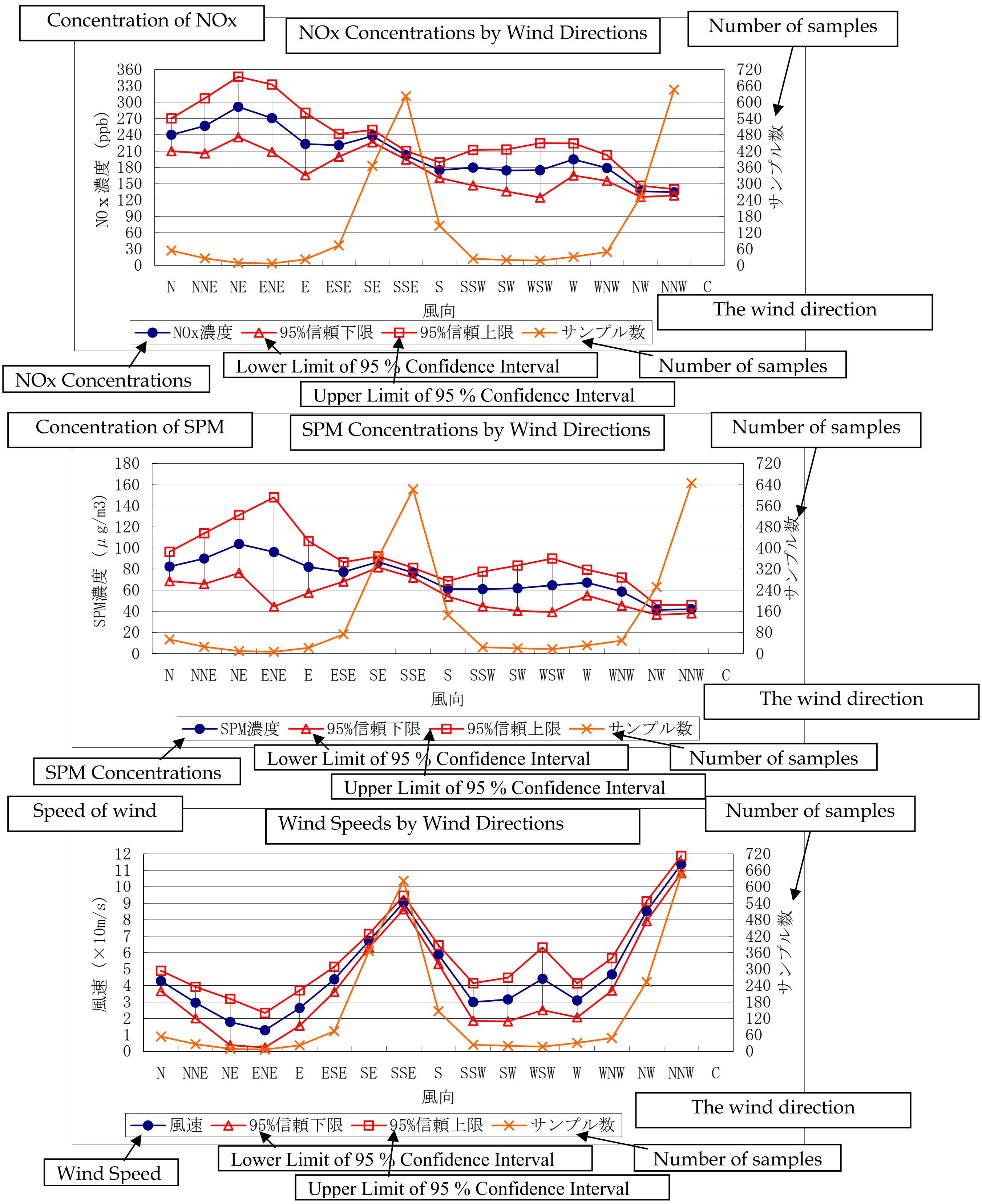


Figure 3.5-14 Example of Relations between Wind Direction, Wind Speed, NOx and SPM

2) Comprehensive certification work of data

In TMG, the data certification work goes as follows.

a. Comparison Error Flag and Chart Information

In TMG, chart information is compared with error flags. In addition, measured values are compared with chart information.

Table 3.5-15 Example of Comparison of Hourly Data and Error Flag in TMG

Date/time of measure.	2007/8/3	1:00					
Station no.	Station name	SO2	Ox	NO	NO2	NOx	SPM
101	Chiyoda-Kanda	2	KT 6	KT 1	KT 9	KT 10	36
102	Chuo-ku	KT 4	23	KT 1	KT 8	KT 9	48
103	Minato-ku 1		30	1	26	27	52
136	Minato-ku 2	10	26	1	30	31	42
104	Shinjuku	6	31	3	30	33	38
105	Bunkyo-ku	KN	KN	KN	KN	KN	KN
106	Edo-ku		KT 9	1	30	31	35
107	Shinagawa-ku 1		****	0	21	21	42
145	Shinagawa-ku 2	8	29				39

Note: The value is assumed ones.

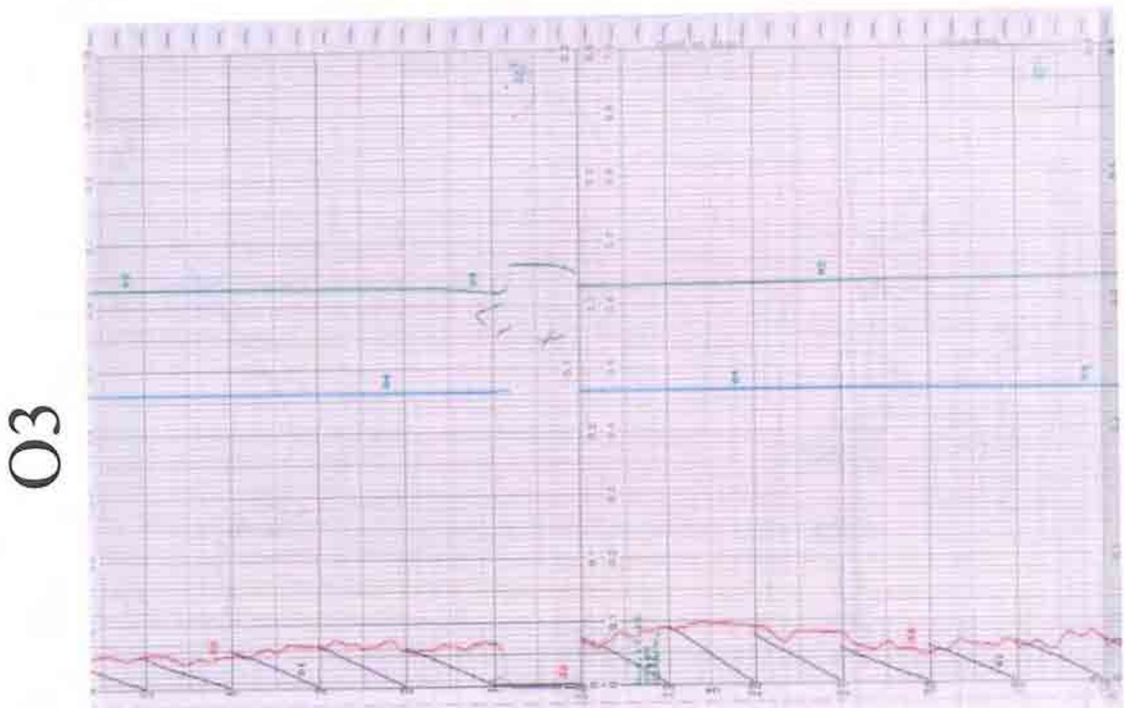
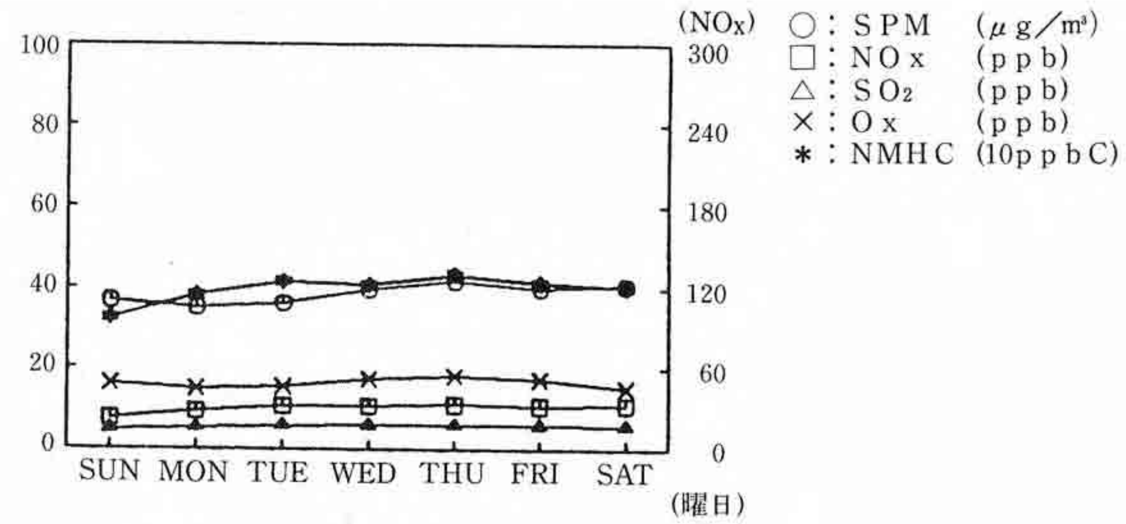


Figure 3.5-15 Example of the Chart 1 (CO)

b. Certification of Seasonal Fluctuation

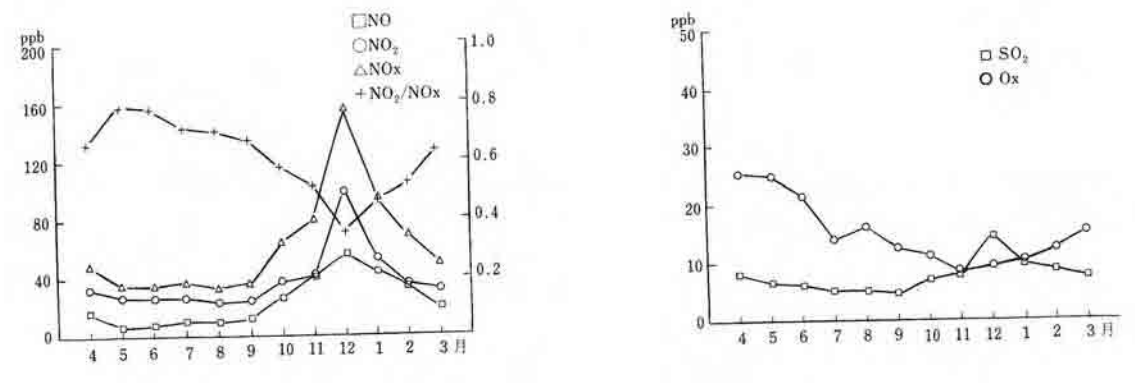
The operation of the main pollutant smoke source in the area doesn't need to generally change remarkably by a day distinction. The activities of pollutant sources like building heating and automobile traffic drastically change in each weekday. Therefore, at the measurement stations receiving these influences greatly, the weekly pattern is grasped and used to certification operation of measurement data.



Source: The pollution prediction manual of SPM – Ministry of Environment, Environment Maintenance Bureau

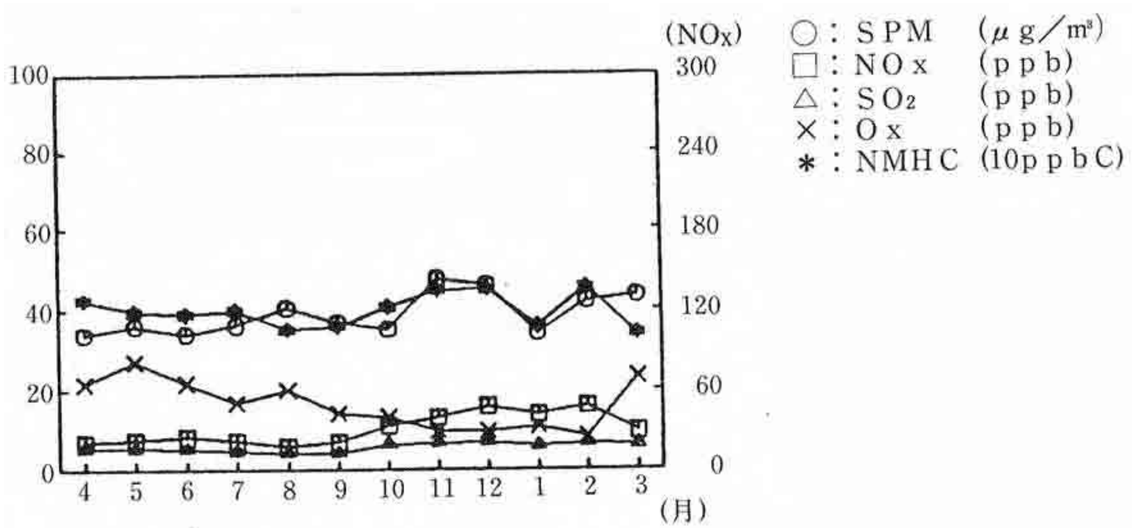
Figure 3.5-16 Example of the Average Concentration by Weekday

TMG executes data certification based on annual fluctuations and seasonal fluctuations. In the Japanese general trends, NOx shows a trend of high concentration in winter and low concentrations in summer concentrations.



Source: Manual of Total Emission of Nitrogen Oxides Regulations – Pollution Research and Measure Centre

Figure 3.5-17 Example of the Monthly Average Concentration of NOx



Source: The pollution prediction manual of SPM – Ministry of Environment, Environment Maintenance Bureau

Figure 3.5-18 Example of Monthly Average Concentration of SPM etc

c. Criteria of Processing Missing Values in Japan

In Japan, the checks to affect precision and characteristics of measuring devices are weekly patrol checks and periodic inspections carried out several times in a year. Weekly patrol checks are correction work for checking measurement precision of measurement instruments. Periodic inspections are correction work for checking measurement precision of measurement instruments and implementation of exchange work of deteriorated parts etc. On that occasion, the precision should be guaranteed in standard measurement width. When abnormality was discovered at the inspection, the countermeasures are shown as follows.

"Criteria of processing missing values" is used in order to judge whether abnormal hourly values obtained by continuous monitoring are within tolerance of measurement precision or not, and whether correction of the abnormal values are possible or not. Some concrete examples are shown as follows.

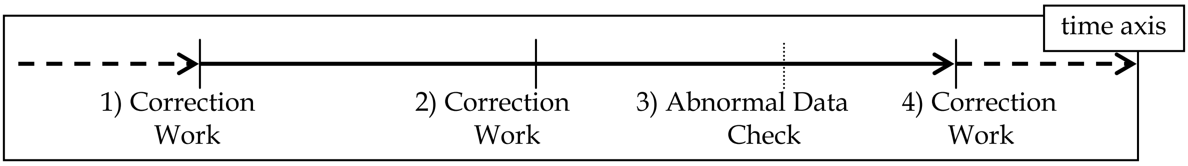


Figure 3.5-19 Conception Diagram of Operation of Monitoring station (timing of correction work)

The correction work of monitoring equipment is done regularly. On this occasion zero and span correction work is done by introducing the normal gas. For example, it is assumed that now station condition is the correction work of "2)" time of Figure 3.5-19.

If the result of this correction work is less than the lower limit value of "Criteria of Processing Missing Values", all the monitoring data between last correction work to this correction work (monitoring data between 1) and 2) of Figure 3.5-19 ; "1)-2)DATA") do not need correction. If the result of this correction work is more than the upper limit value of "Criteria of Processing Missing Values", "1)-2) DATA" are treated as "Missing Value", because the correction work of these data is inappropriate. If the result of this correction work is more than the lower limit value of "Criteria of Processing Missing Values" and less than the upper limit value of "Criteria of Processing Missing Values", "1)-2)DATA" are corrected, and become result of monitoring data.

For example, in the case that the abnormality (such as 3) of Figure 3.5-19) is identified definitely, data from the point in this time (monitoring data between 3) and 4) of Figure 3.5-19) are either corrected or are regarded "Missing Values", according to "Criteria of Processing Missing Values".

Table 3.5-16 Indication of Criteria of Processing Missing Values in Japan

Item	Sensitivity of instrument		Zero concentration	
	LLV	ULV	LLV	ULV
	Set Up Value	Set Up Value	Max scale Value	Max scale Value
SO_2	±4%	±10%	±2%	±4%
NO_x	±4%	±10%	±2%	±4%
O_x	±4%	±10%	±2%	±4%
CO	±4%	±10%	±1%	±2%
SPM	±4%	±10%	5μg/m^3(±1%)	10μg/m^3(±2%)
SPM	±4%	±10%	±2%	±4%

Note : These are the examples of very loose criteria. These are usually managed more strictly in Japan.
"Criteria of Processing Missing Values" are not determined as a law in Japan.
"Criteria of Processing Missing Values" is "the range of correction work" in other words.
: LLV; the lower limit value, ULV; the upper limit value

Source: Manual of Air Quality Monitoring NO.5 (MOE in Japan)

The first example is the case of “Sensitivity of instrument” of “Criteria of Processing Missing Values". For example, in the case that full scale is 1ppm, "Set Up Value" is 800ppb, that is, 80% of 1ppm. In this case, ±4% of "set up value" is ±32ppb. Therefore, if the normal gas data are within the range of 800±32ppb, these data become less than the lower limit value (LLV). Since these data are within the error range, these data do not need correction work. In this case, ±10% of "set up value" is ±80ppb. Therefore, if the normal gas are without the range of 800±80ppb, these data become more than the upper limit value (ULV). Since it is unsuitable to do the correction work, these data are treated as “Missing Values”. In case that these data are between 800±32ppb and 800±80ppb, it is suitable to do correction work.

The second example is the case of “Zero concentration” of “Criteria of Processing Missing Values". “Max scale Value” means full scale. For example, in the case that LLV is ±2% and full scale is 1ppm, if measurement value of zero gas is within the range of 0±20ppb, this value is within the error range. So the correction work is not necessary. In the case that ULV is ±4% and full scale is 1ppm, if measurement value of zero gas is out of the range of 0±40ppb, it is unsuitable to do the correction work. So the data of this case are treated as “Missing Value”. In the case that these data are between 0±20 ppb and 0±40 ppb, it is suitable to do correction work.

(2) Romanian Analytical Results

Data analysis results in Romania (a domain in which Ms.Cristea is the counterpart) are as following. With these results, the counterpart lectured in technical seminar held on July 10th, 2008 in the subject of "Analiza datelor din Rețeaua Națională de Monitorizare a Calității Aerului".

In addition, the counterpart provided the training programs for LEPA staff as a lecturer on a seminar held from February 25th to 26th, 2008. The contents of this training program included achievements, such as Japanese data screening example, etc. As a result, it may be stated that the capacity of the counterpart is developing, and the data management and analysis of Air Quality Monitoring in Romania is improved.

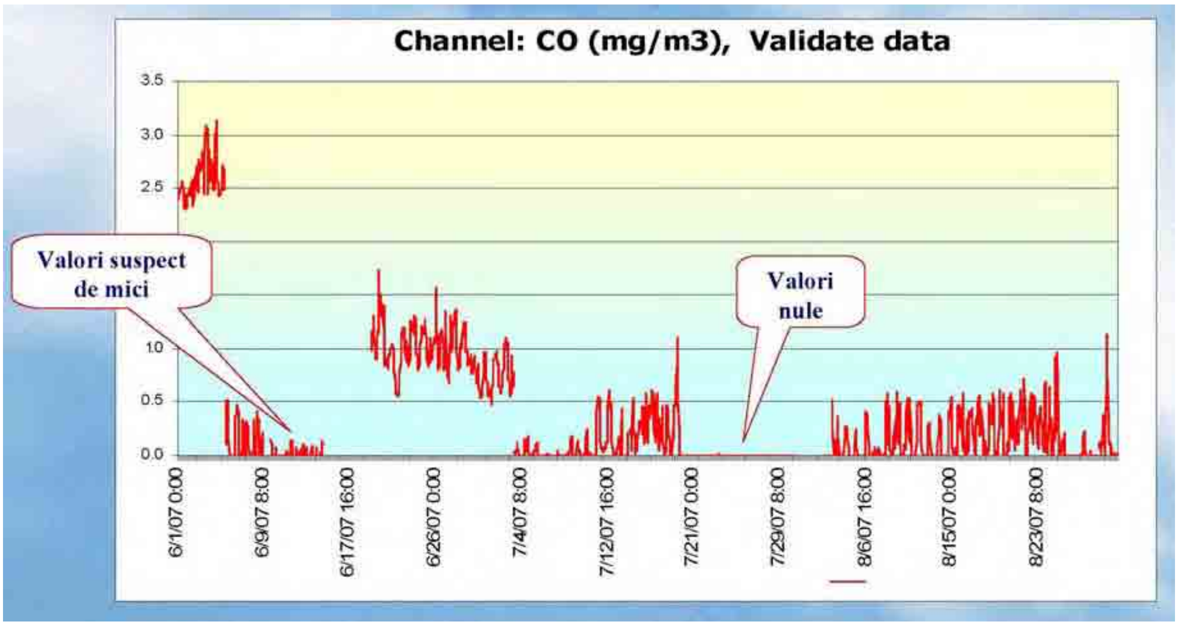


Figure 3.5-20 Example of Validation Data of CO

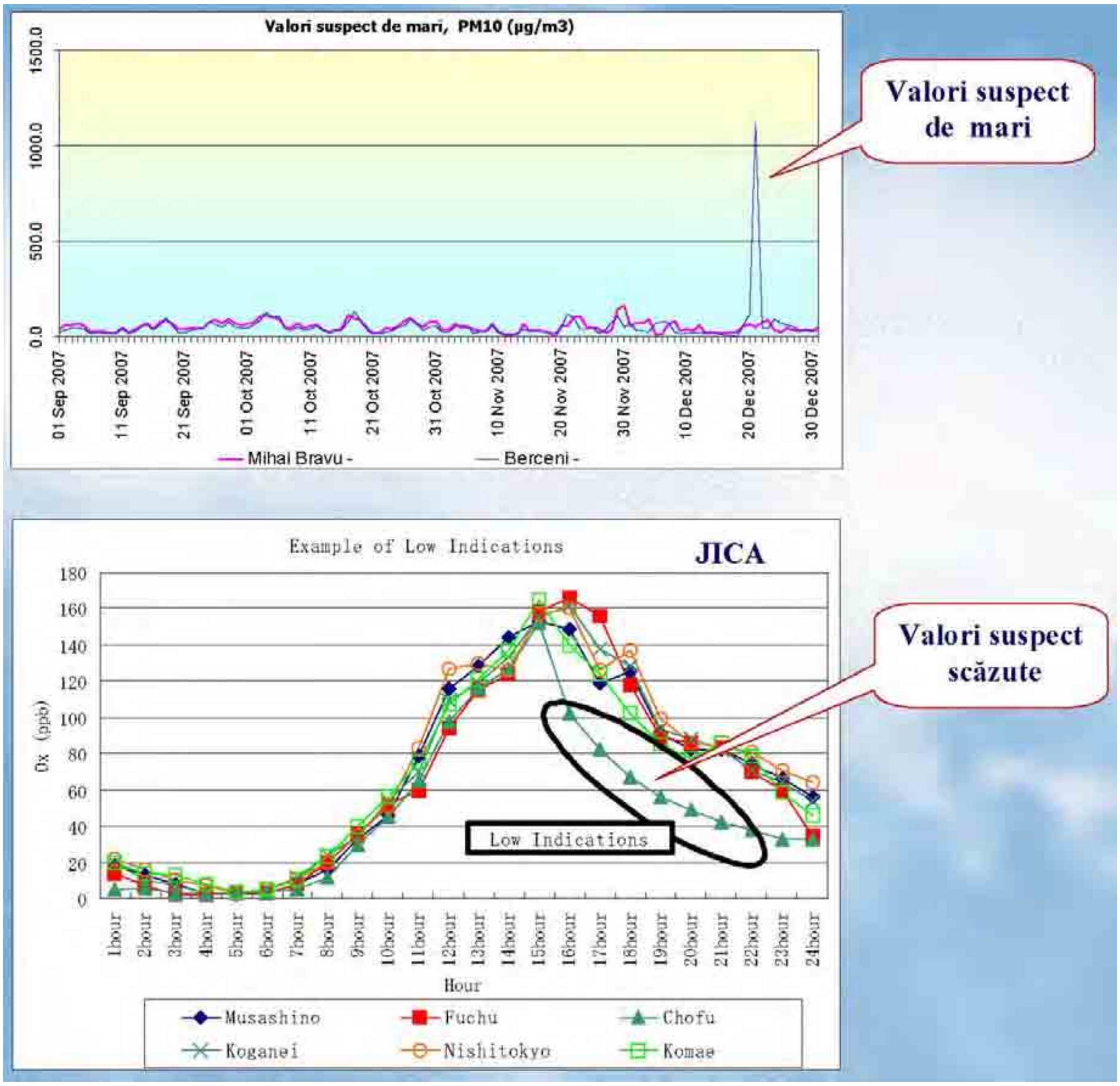


Figure 3.5-21 Example of High Indications inRomania and Low Indication in Japan

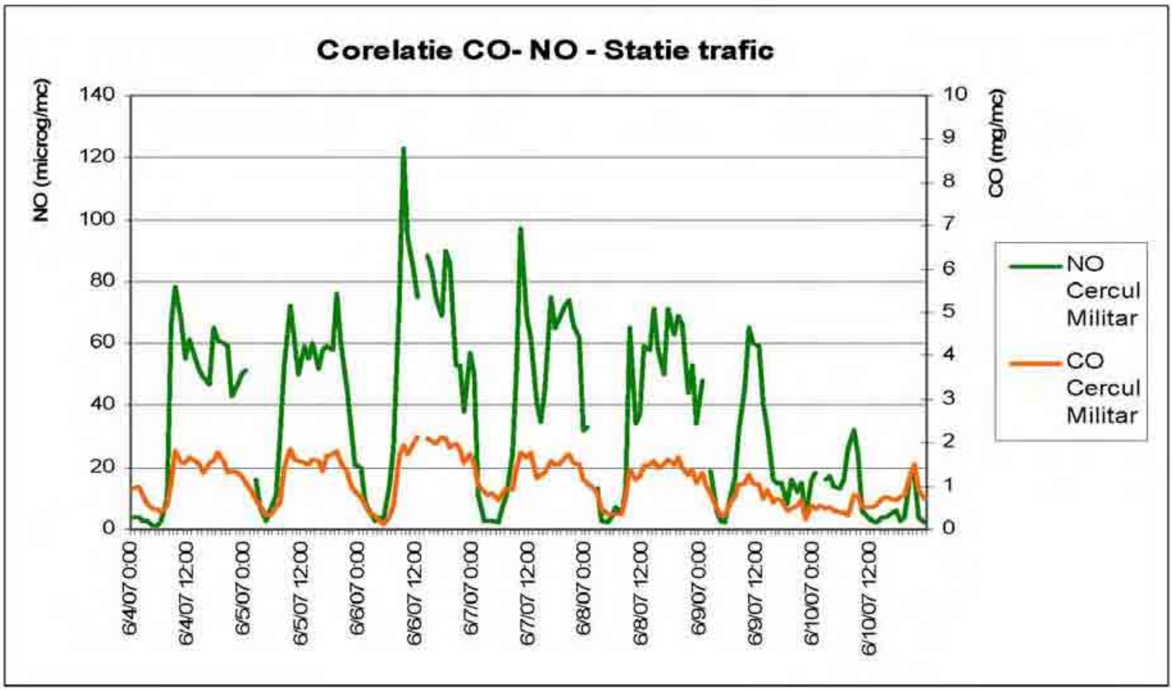


Figure 3.5-22 Example of Correlation of NO and CO at CERCUL MILITAR

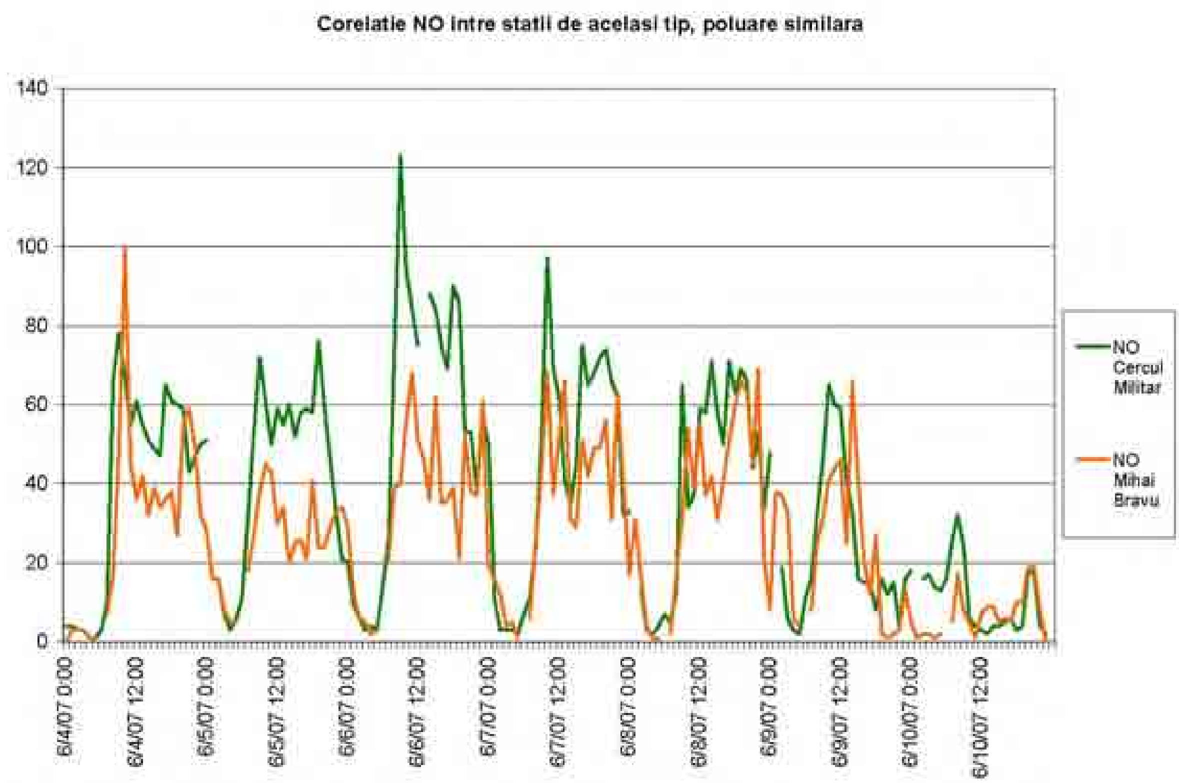


Figure 3.5-23 Example of Correlation between Similar Pollution Conditions at Similar Stations; CERCUL MILITAR and MIHAI BRAVU

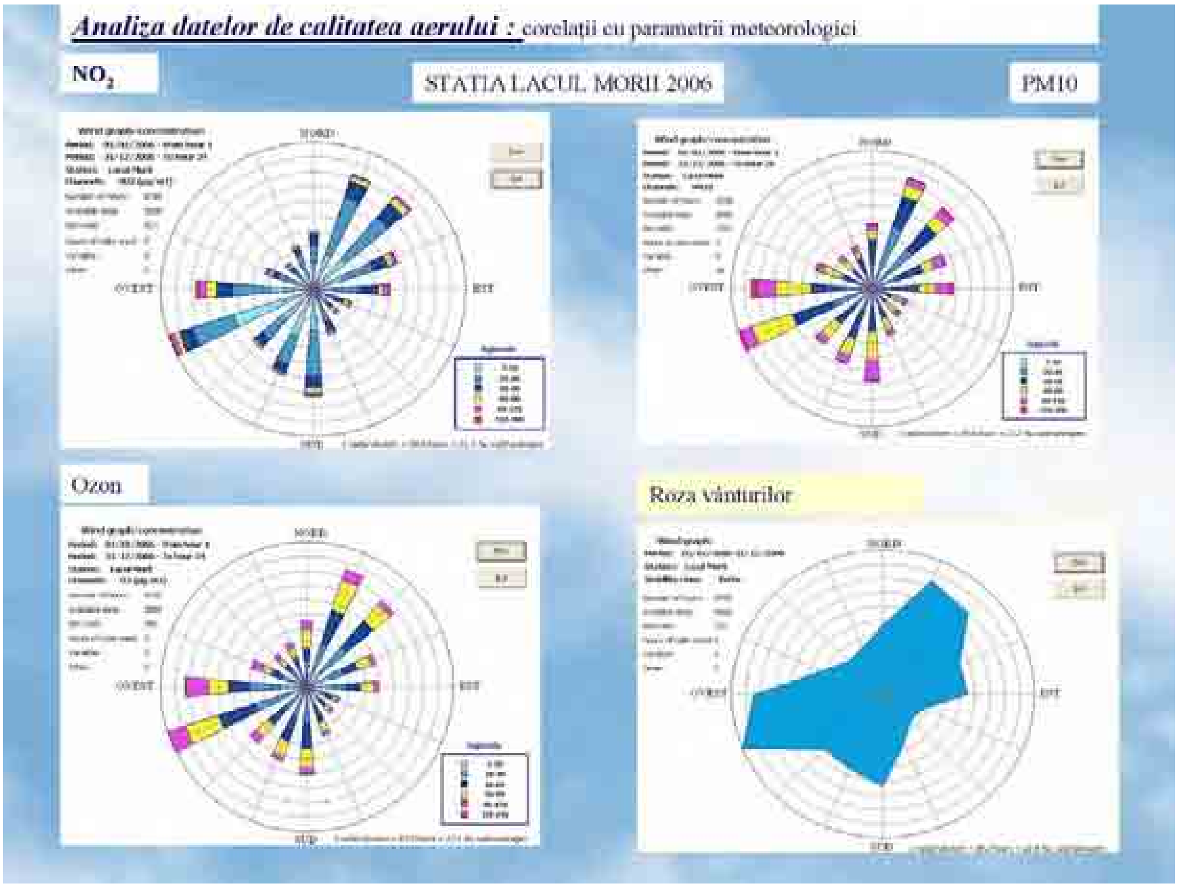


Figure 3.5-24 Example of Concentration Distribution by Wind Rose and Wind Rose at the LACUL MORII Station in 2006

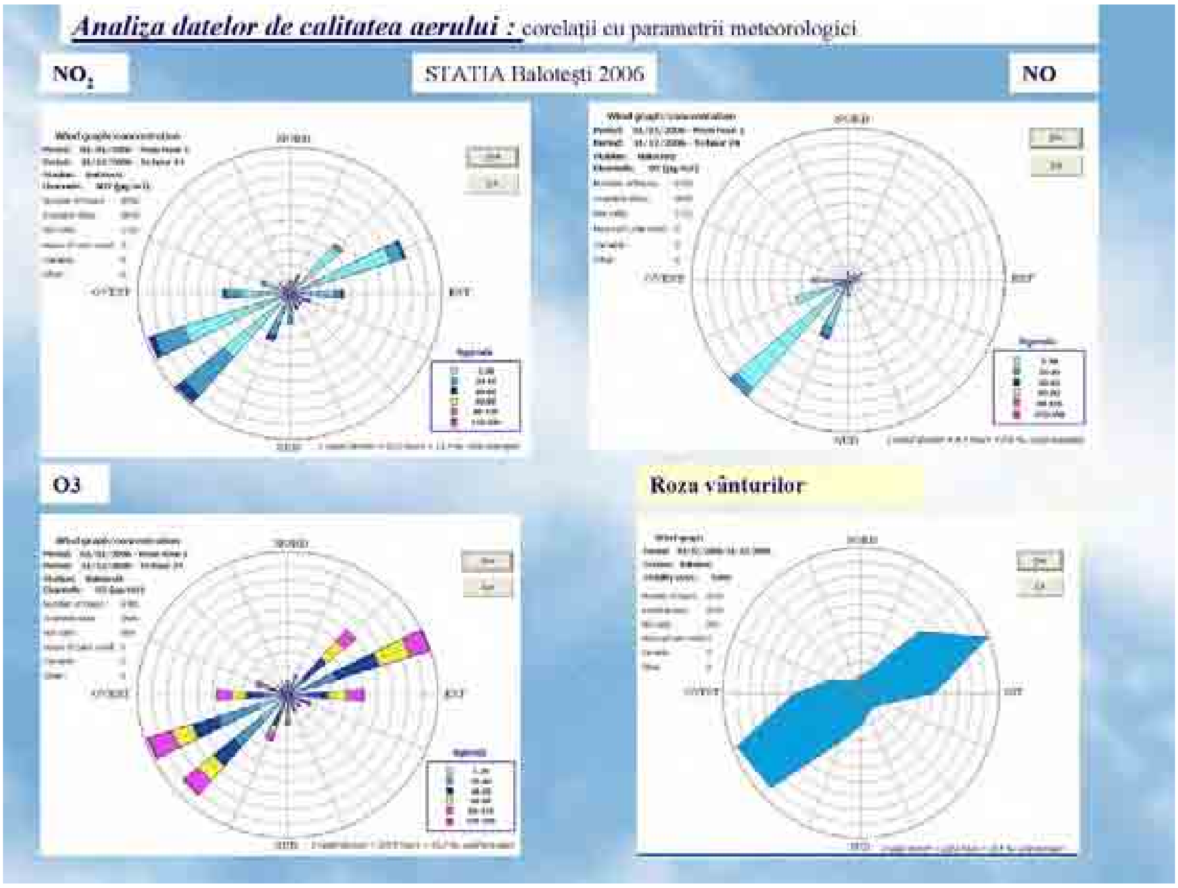


Figure 3.5-25 Example of Concentration Distribution by Wind Rose and Wind Rose at the BALOTESTI Station in 2006

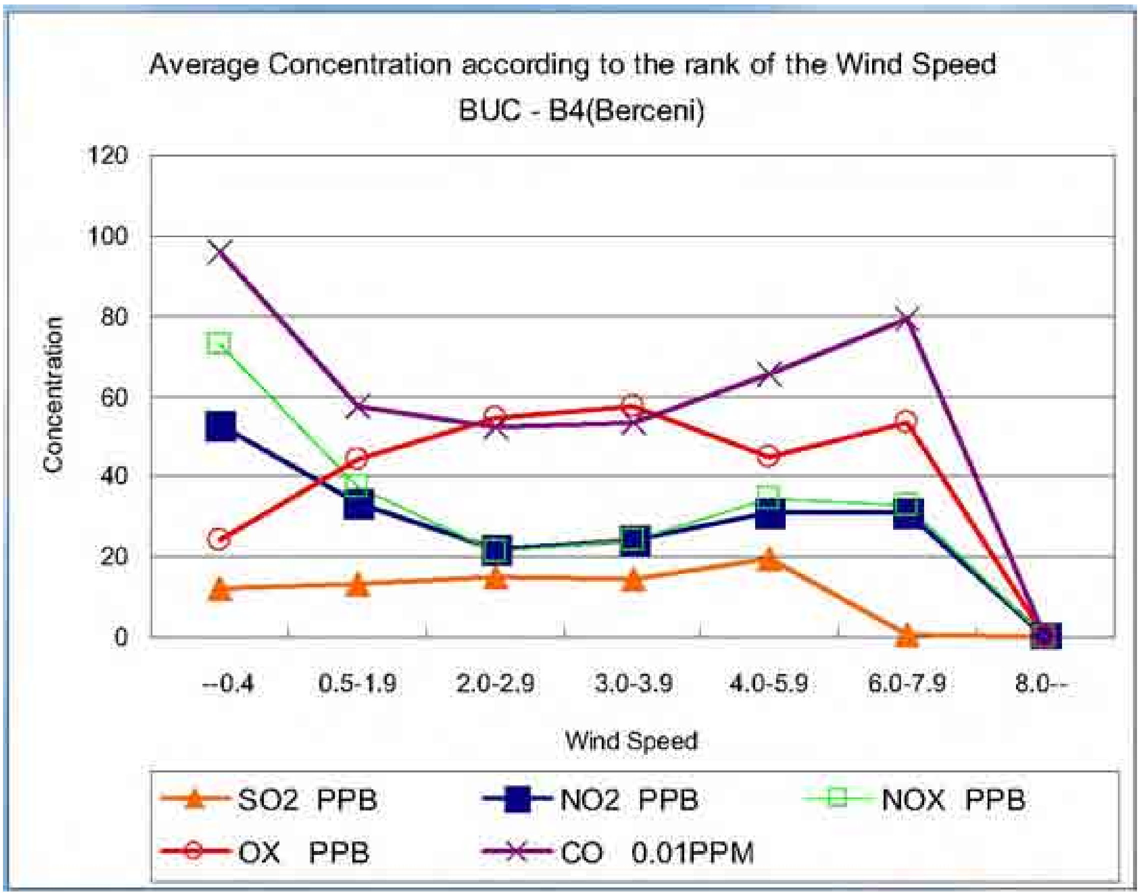


Figure 3.5-26 Example of the Average Concentration by Wind Speed Rank

(3) Japanese Analytical Method

The expert obtained air quality monitoring data of Romania from the counterpart. The expert analyzed these data with Japanese analysis method. Based on these results, the counterpart and the expert discussed the possibility of the Romanian original data management and analysis.

As a result, about meteorological analysis the expert pointed out Romanian original data management and data analysis to the counterpart.

Furthermore, the expert offered to the counterpart the program that he used for analysis.

- Example by Japanese analysis method (hourly concentration average, average concentration by weekday, monthly concentration average, concentration by the wind direction, average concentration by wind speed rank, average concentration by atmospheric stability rank, average concentration by humidity rank)
- The expert analyzed Romanian data with Japanese analysis method. As a result, in Romania there are hourly concentration average, average concentration by weekday, monthly concentration average, and concentration by wind direction. On the other hand, the expert suggested the counterpart to introduce and improve data analysis such as average concentration by wind speed rank, average concentration by atmospheric stability rank and average concentration by humidity rank.
- The expert technically transferred Japanese analysis method. The concrete content is a set of FORTRAN compiler, the source code of the FORTRAN program, the analysis result of Romanian data of 2006. The counterparts judged that these analysis method technologies were hard to be applied because the air quality monitoring system of Romania is built on the base of graphical user interface. It was hard for them to understand it and to manage it. Therefore the expert advised that the counterpart should understand what kind of analysis these analytical techniques performed. The expert thinks that counterparts could instruct and order the system development company, which is making the air quality monitoring system of Romania, to develop and add the analysis tools in the future.

Figure 3.5-27 shows an example of the average concentration by wind speed rank.

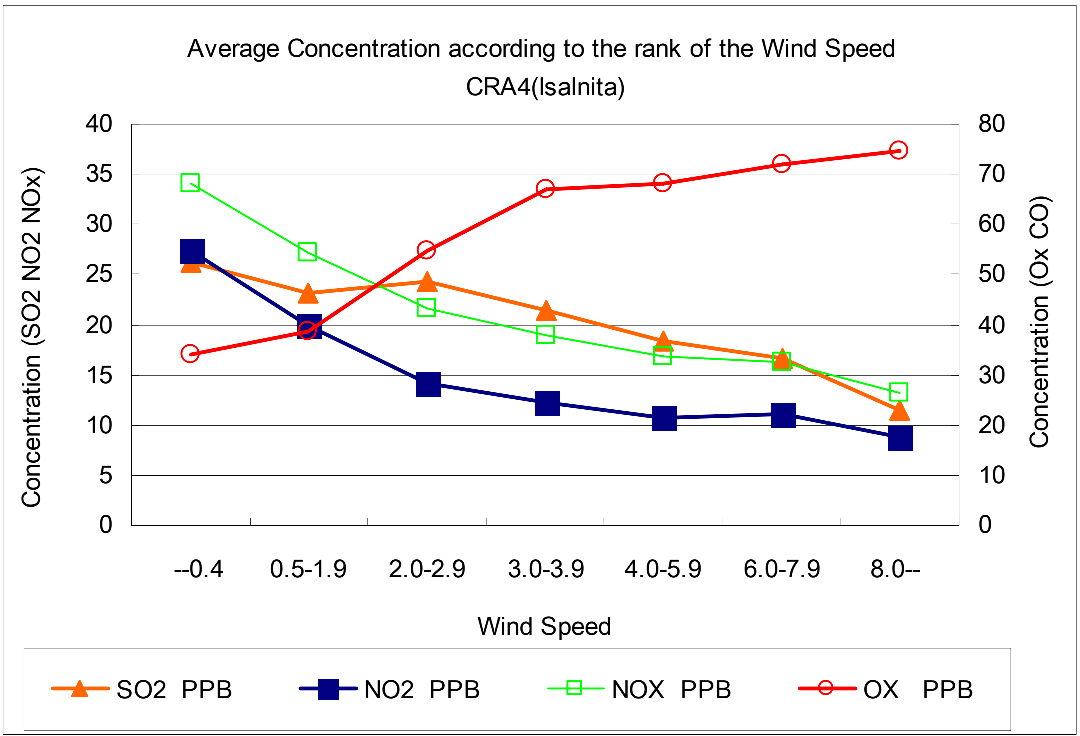


Figure 3.5-27 Example of the Average Concentration by Wind Speed Rank

Figure 3.5-28 shows an example of the average concentration by atmospheric stability rank.

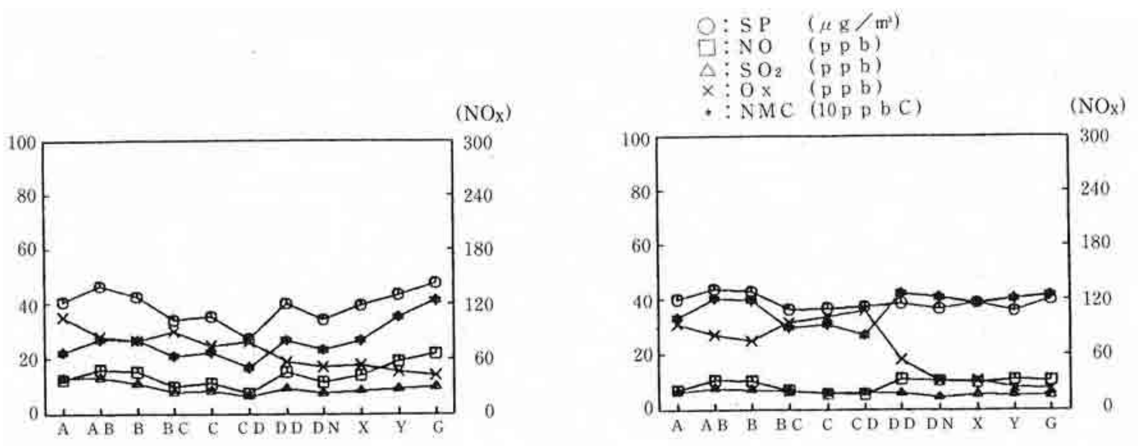


Figure 3.5-28 Example of the Average Concentration by Atmospheric Stability Rank

Figure 3.5-29 shows an example of the average concentration by humidity rank.

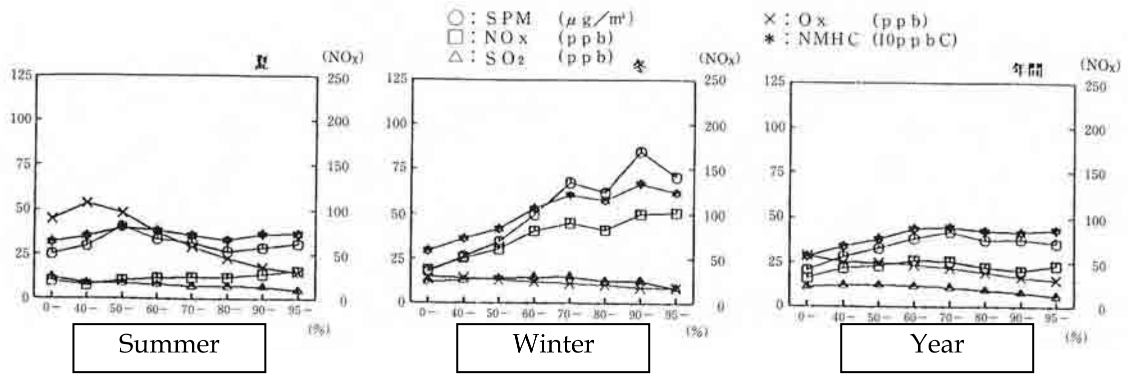


Figure 3.5-29 Example of the Average Concentration by Humidity Rank

3.6 Supporting Guideline Making for Air Quality Monitoring Strategic Plan (Output 5)

3.6.1 Activity

3.6.1.1 From the Beginning of the Project to Progress Report 1 (From January 2007 to October 2007)

The item named ‘Supporting guideline making for air quality monitoring strategic plan’ was listed up in the PDM, but the air quality monitoring strategic plan itself was not obtained at the beginning of the project.

The expert requested the existing monitoring plan from LEPAs to Ms. RUGINA, director of the MD, in charge of the monitoring plan. Ms. RUGINA collected and provided the mentoring plans of LEPAs of Bucharest, Ploiesti, and Dolj.

The activity plan including monitoring plan of database reporting directorate, monitoring synthesis department, Bucharest LEPA for the fiscal year of 2007 is shown in Table 3.6-1.

Table 3.6-1 Example of Monitoring Plan of Bucharest LEPA

	Objectives	Activity	Frequency/ Deadline	Remarks
1	EU directive on Air Quality, 1996/62/EC, and its daughter directives, 1999/30/EC, 2000/69/EC, 2002/3/EC Ministry order on air quality monitoring, 592/2002	a) Air quality monitoring by automated monitoring network Target pollutants: NO_2, SO_2, PM10, CO, O_3, benzene, lead, meteorological data Monitoring stations: 2 traffic stations (Mihai Bravu, Universitate) 3 industrial stations (Berceni, Titan, Militari) 1 urban station (Crangasi), 1 Suburban station (Magurele), 1 Rural station (Balotesti)	Continuous, Every day	Can be stored in special format for database by data collection and processing software 240,000 indices per year
		b) Data transmission	Continuous, Every day	
2	EU directive on reduction of pollutant emission from large combustion facilities	Making and update of air pollutant emission inventory	Once per year (one database) 15^{th} March	Plan to be submitted to NEPA

	2001/80/EC Ministry order 524/2000			
3	NEPA President decision 612/2005	a) Report for REPA and publishing on the Web about air quality	Every month, every six months, one year	12 times monthly reports, 2 times six months reports, 1 time annual report
		b) Making of state of air quality	Every year, 15th March	Format defined by NEPA
		c) Air quality monitoring and countermeasures by portable equipment	Anytime if necessary	In case of pollution or short-term monitoring campaign
4	Ministry order 1182/2002 NEPA president decision 612/2005	a) Daily report making on air quality in Bucharest according Ministry order 1182/2002	Ordinary, every day	
		b) Information transmission to MESD and NEPA in case of extreme concentration occurrence over caution or alert threshold levels	Ordinary	
		c) Update of homepage	Ordinary	
5	Government decision 543/2004	Air quality management plan making and implementation management	December 2007	
6	Ministry order 745/2002	Update of area list where limit value or limit value plus margin of tolerance is exceeded	November 2007	
7	Life Air Aware Plan	Transmission of emission and exposure data which are necessary for air pollution prediction	Ordinary, every day	

Monitoring plan of Ploiesti LEPA is shown in Table 3.6-2.

Table 3.6-2 Example of Monitoring Plan of Ploiesti LEPA

	Monitoring Points	Annual monitoring frequency	Monitoring items	Number of monitoring
Gaseous and particulate substances				
1	APM Headquarter	360 times	9 items (NH_3, NO_2, SO_2, O_3, H_2S, Phenol, Formaldehyde, H_2SO_4, PM10)	3240
2	Mol	360 times	5 items (NH_3, NO_2, SO_2, Formaldehyde, PM10)	1800

3	Corlatesti	360 times	7 items (NH_3, H_2S, SO_2, Formaldehyde, Phenol, H_2SO_4、PM10)	2520
4	RENEL	360 times	4 items (NH_3, NO_2, SO_2, PM10)	1440
5	ICERP	360 times	6 items (NH_3, NO_2, SO_2, Formaldehyde, H_2SO_4, PM10)	2160
6	Sp. Obstr. Ginecologie	360 times	5 items (H_2S, SO_2, Formaldehyde, H_2SO_4, PM10)	1800
7	Unit. 2 fire department	360 times	6 items (NH_3, H_2S, SO_2, Formaldehyde, H_2SO_4, PM10)	2160
8	Palatul Culturii	360 times	7 items (NH_3, H_2S, SO_2, NO_2, Formaldehyde, H_2SO_4, PM10)	2520
9	Brazi station	360 times	3 items（NO_2, SO_2, Phenol）	1080
10	Poliserv	360 times	6 items (NO_2, H_2S, SO_2, Formaldehyde, H_2SO_4, PM10)	2160
Heavy metals in suspended particulate matter				
1	APM headquarter	50 times (every week)	Pb, Cd, Zn	150
2	RENEL	50 times (every week)	Pb, Cd, Zn	150
3	ICERP	50 times (every week)	Pb, Cd, Zn	150
4	Palatul Culturii	50 times (every week)	Pb, Cd, Zn	150
O3 by automated monitor				
1	APM headquarter	300 times (every day)	O_3	300

Monitoring plan of Dolj is shown in Table 3.6-3.

Table 3.6-3 Example of Monitoring Plan of Dolj LEPA

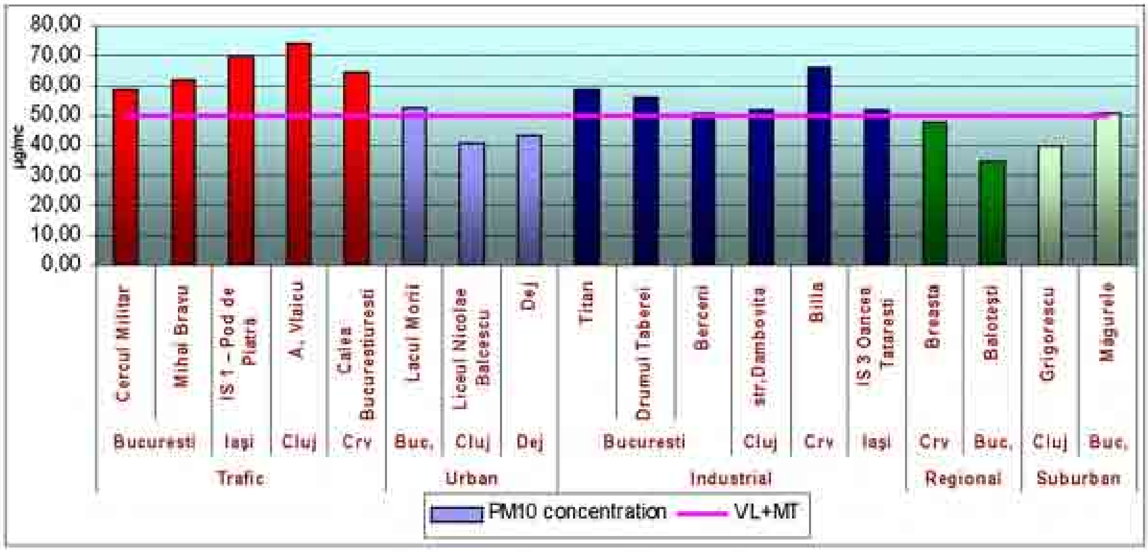
	Monitoring stations	Types of stations	Items
1	Calea Bucuresti	Traffic	SO_2, NO, NO_2, NO_x, CO, BTX[1)], PM10
2	Primarie	Urban	SO_2, NO, NO_2, NO_x, CO, BTX
3	Billa	Mix (Industrial + Traffic)	SO_2, NO, NO_2, NO_x, O_3 , PM10
4	Isalnita	Industrial	SO_2, NO, NO_2, NO_x, O_3
5	Breasta	Regional background	SO_2, NO, NO_2, NO_x, CO, O_3, PM10

1) BTX (Benzene, Toluene, Xylene)

A part of the format with which MD requested reports from LEPAs for annual environmental report is shown in Table 3.6-4, and an example of annual average of PM10 in annual environmental report of 2006 is shown in Figure 3.6-1.

Table 3.6-4 Example of Reporting Format (Air quality monitoring results)

County	City	Stations	Type of stations	Air pollutants	Number of monitoring	Annual average/ Daily average	Exceeding rate	Remarks



Note) Clu: Cluj Napoca, Buc: Bucharest, Crv:Craiova, VL: Limit value, MT: margin of tolerance

Figure 3.6-1 Annual Average of PM10 (From Annual Environmental Report of 2006)

The air quality monitoring system in Romania has drastically changed during the project implementation period. Only 23 of automated continuous monitoring stations were installed in limited cities like Bucharest, Cluj Napoca, Craiova and Iasi so far, and the automated stations are expanded to totally 117 in many cities during 2007 and 2008.

Similar drastic changes also occurred on monitoring methods. Major methods have been changed from the Romanian standards methods like STAS to the EU methods like CEN.

Then, the automated continuous monitoring network will have major roles in air quality monitoring in Romania from now on, and manual analysis methods suppose to be conducted for the pollutants for which automated monitoring methods seem to be inadequate from the technical viewpoints.

The items described in the monitoring plans and other necessary items to be included in the monitoring guideline were supposed as in Table 3.6-5.

Table 3.6-5 Items of Monitoring Guideline

	Items of Monitoring Guideline	Included (O) or Not included (-) in Monitoring Plans of 3 LEPAs
1	Target pollutants of monitoring	O
2	Frequency of monitoring	O
3	Accuracy of monitoring	-
4	Methods of monitoring	-
5	Number of monitoring stations	O
6	Types of monitoring stations	O
7	Positioning of stations in Macro-scale	-
8	Positioning of stations in Micro-scale	-
9	Considerations on stations positioning	-
10	Reporting format	O

3.6.1.2 To Progress Report 2 (To February 2008)

(1) The First Technical Seminar

The expert made the presentation titled "Air Quality Monitoring in Japan" at the 1st technical seminar held on 7th November, 2007. In Japan, the implementing bodies of air quality monitoring are defined as local prefectural governments in article 22 of Air Pollution Control Law as 'The governor of the prefecture shall monitor and survey from time to time the level of air pollution', 'The governor of prefecture shall report the results of monitoring and surveillance in section 1 to the Minister of Environment.' On the other hand, the national government determines processing standards on air quality monitoring conducted by the prefectures, and has the role of summarizing the results of air quality monitoring reported from each prefecture in whole country.

In Romania, each LEPA belongs to NEPA and environmental administration system differs from one in Japan. However, the processing standards in Japan determine the practical procedures of air quality monitoring by the prefectures, and is said to be corresponding to the guideline by which NEPA instructs each LEPA on air quality monitoring plan.

One of the purposes of the presentation is to promote the practical discussions on the guideline made for Romania by presentation of the similar standards in Japan. Furthermore, another purpose is to evoke the images of newly established network by introduction of air quality monitoring situation in Japan.

The contents of the processing standards are shown as follows.

I	Purpose of Air Quality Monitoring
II	Air Quality Monitoring of NOx, SPM etc
1.	Target Pollutants
2.	Number of Stations and their Positioning
(1)	Number of Stations
(2)	Positioning of Stations
(3)	Re-assessment of Stations
3.	Frequency of Monitoring
4.	Height of Sampling Inlet
5.	Monitoring Method
6.	Processing and Evaluation of Monitoring Data
(1)	Not Evaluated Monitoring Data
(2)	Evaluation of Monitoring Results
7.	Maintenance and Management
8.	Reporting of Results
III	Air Quality Monitoring of Hazardous Air Pollutants
1.	Target Pollutants
2.	Number of Monitoring Sites and their Positioning
(1)	Number of Sites
(2)	Selection of Monitoring Sites
(3)	Re-assessment of Monitoring Sites
(4)	Utilization of Existing Monitoring Stations
3.	Frequency of Monitoring
4.	Height of Sampling Inlet
5.	Monitoring Method
6.	Processing and Evaluation of Monitoring Data
(1)	Not Evaluated Monitoring Data
(2)	Calculation of Annual Average
(3)	Handling of Abnormal Data
7.	QA/QC
8.	Reporting of Results

At first, the purpose of air quality monitoring is explained and the later part is described in two divided chapters on the monitoring targets like NOx and SPM and so on by automated continuous monitors and the other monitoring targets like benzene and dichloromethane and so on by sampling and chemical analysis. Several items like number of stations or monitoring sites, height of sampling inlet and so on are common for both of the groups.

Considerations on number and positioning of stations or sites were explained in details. Estimation methods of number of stations are divided into two viewpoints of (1) whole country aspects and (2) regional aspects. In the estimation from (1) regional aspects, only qualitative consideration on natural and social conditions is described, but in the estimation from (2) whole country aspects, more quantitative estimation method based on some indicators is explained.

The estimation method of number of stations from whole country aspects is based on the following two indicators, and minimum number of the two types of estimations is adopted.

- One station per 75,000 inhabitants
- One station per 25 km2 of inhabited area sizes

After the number of the stations is calculated by the basic criteria, the number is calibrated by the consideration on the monitoring results of existing stations and characteristics of target pollutants.

Major criteria of the calibrations are as follows.

- The number of stations is reduced to a half of original number when concentrations of existing stations are low and between 30 to 70 % of air quality standards.
- The number of stations is reduced to one third of original number when concentrations of existing stations are very low and below 30 % of air quality standards.
- The number of stations for photochemical oxidants (Ox, almost equal to O3) is reduced to two thirds of original number in the prefectures without caution announcement for Ox.
- The number of stations for CO is reduced to a half of original number.
- The number of stations for Non-Methane Hydro-carbons (NMHC) is reduced to a half of original number.
- The number of stations for hazardous air pollutants is reduced to one third of original number.

Actual number of monitoring stations by pollutants of fiscal year 2003 is shown in Table 3.6-6.

Table 3.6-6 Actual Number of Stations in Japan (Fiscal Year of 2003)

Pollutants	SO_2	NO_2	SPM	CO	O_x	NMHC	Benzene
Number of stations	1493	1887	1926	408	1193	508	459
Number of stations per 75,000 inhabitants	0.88	1.12	1.14	0.24	0.70	0.30	0.27
Number of stations per 25 km2 inhabited area	0.30	0.38	0.39	0.08	0.24	0.10	0.09

The numbers of stations per 75,000 inhabitants for NO2 and SPM is more than 1 and the number of stations for SO2 is a little bit less than 1. The numbers of stations for O3, NMHC and benzene, which is one of hazardous air pollutants, are respectively about two thirds, one third, and one third. The number of stations for CO is a few and one fourths per 75,000 inhabitants, but it is related to the fact that air quality standards for CO have been satisfied since long before.

The numbers of monitoring stations in Japan are almost at the defined level by the processing standards at present, and it has taken long years to reach the present level (Figure 3.6-2).

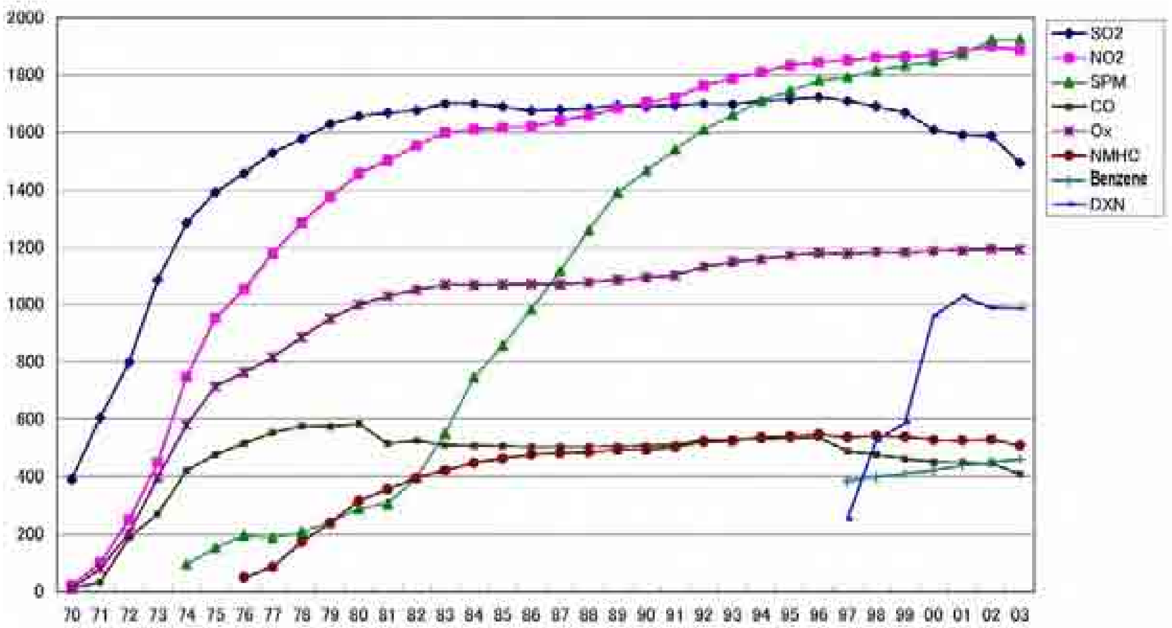


Figure 3.6-2 Trends of Stations Numbers in Japan

(2) The Second Technical Seminar

The processing standards of Japan presented in the first technical seminar included estimation method of stations number and considerations around monitoring stations, but practical positioning of stations in regional scales was not shown.

Then, practical positioning of stations was presented at the second seminar held on 21st February, 2008 as a part of the monitoring guideline.

Because air pollutant concentration changes in temporal and spatial manners, it is ideal to implement monitoring continuously in time and covering all of target area in space. Regarding several air pollutants, automated continuous monitoring equipment is unpracticed and continuous monitoring in time is possible. However, most of existing continuous monitoring equipment can only monitor concentrations around sampling inlet. On the other hand, because of the limitation of cost and man-power, practical number of monitoring stations which can be installed in target area is very limited.

Then, we should determine the numbers of monitoring stations in order to accurately monitor ambient air concentration with monitoring results of the limited numbers of the stations, and install them in suitable locations. Monitoring stations for general ambient air quality are located by this kind of consideration. According positioning of background monitoring stations and specific pollutant monitoring stations, the other methodology is necessary and mentioned separately.

Suitable positioning method presented at this seminar mainly utilizes simulation model and concept of suitable positioning of monitoring stations as follows.

The area with concentration deviation of certain temporal averages below the range of ΔC is represented by a monitoring value. This value is called “Area Representing Value” and the area represented by the value is called “Represented Area”. If each station can represent wide region as much as possible and target area can be divided into most suitable regions, the stations are said to have “Region Representativeness”. Positioning respective stations to have region representativeness is called “Suitable Monitoring Stations Positioning”.

3.6.1.3 Progress Report 3 and Guideline (To November 2008)

On the presentations at the first and second seminars by the experts, the counterparts, Ms. RUGINA, pointed out that these proposals on the guideline should keep consistency with the contents of the Ministry order No. 592/2002.

On the other hand, a new EU directive on ambient air quality and cleaner air for Europe was published on 21st May, 2008, and each member country is obliged to make the transposition by 11th June, 2010.

Therefore, the expert investigated the following materials one by one to keep consistency with the proposed guideline and the Romanian and the EU legislations, and make discussions with the counterparts.

- Ministry Order 592/2002
- Guidelines for Preliminary Assessment of Air Quality (IDAQ17)
- Preliminary Assessment of Air Quality in the Ploiesti Agglomeration (IDAQ21)
- Technical Assistance to Romania for Technical Preparation of Project “Improvement of the National Air Quality Monitoring Network Operated by the Ministry of Waters and Environmental Protection”, Volume I of II

At first, stipulated items of Ministry Order 592/2002 were checked. Ministry Order 592/2002 was transposed from three daughter directives, 1999/30/EC, 2000/69/EC, 2002/3/EC under the framework directive on air quality, 96/62/EC, and is very important law determining air quality monitoring implemented in Romania.

The pollutants targeted in the ministry order are SO_2, NO_2, NO_x, PM10, PM2.5, lead, benzene, CO, and O_3, and the details are stipulated in the ANNEX of the Normative Act. The contents of the annex are shown as follows.

ANNEX 1: Air quality thresholds (Limit values, margins of tolerance, target values, long term objectives, alert thresholds, information thresholds, upper assessment thresholds, lower assessment thresholds)
ANNEX 2: Location of sampling points (Macro-scale Siting, Micro-scale Siting)
ANNEX 3: Criteria for determining the minimum number of sampling points for fixed measurement
ANNEX 4: Data quality objectives, methods for determining the exceedances (uncertainty, minimum data capture etc)
ANNEX 5: Reference method
ANNEX 6: Ozone precursor
ANNEX 7: Reporting

Most of necessary items for air quality monitoring like criteria for the minimum number of sampling points, macro and micro scales siting, data quality objectives, reference method etc as well as target pollutants and limit values corresponding to the air quality standards, are stipulated in details. However, the reference methods were updated or newly determined according the technical advances after the ministry order was published.

Criteria for the minimum number of sampling points and reference methods should follow the ones stipulated in Romania and no item to be added in the guideline made in the project was found. However, only some considerations were described on stations siting especially in macro-scale and practical siting procedure was not clarified.

The description of "carries out the preliminary assessment in order to establish the fixed monitoring locations" is included in ARTICLE 4 of the ministry order, and the existence of the preliminary assessment guide is indicated. By the information from the counterpart, the preliminary assessment guide was made in the Phare project and investigations were implemented before installation of stations.

The expert found that the preliminary assessment guide and the reports of the investigations implemented by the guide were included in the technical assistance reports by Danish Environmental Protection Agency, and analyzed the contents of the reports.

- Guidelines for Preliminary Assessment of Air Quality (IDAQ17)
- Preliminary Assessment of Air Quality in the Ploiesti Agglomeration (IDAQ21)

However, the purpose of the preliminary assessment guide was judged as to make preliminary categorization of target areas and confirm the necessity of the fixed monitoring stations in area by each pollutant, and was not as to determine locations of stations. Actually, siting studies for designing a new air quality monitoring network was recommended in the preliminary assessment report for Ploiesti, and it was considered necessary to investigate other materials.

Furthermore, another technical assistance report on air quality monitoring network design was provided by the counterpart during the discussions, and the expert investigated the report, too.

- Technical Assistance to Romania for Technical Preparation of Project “Improvement of the National Air Quality Monitoring Network Operated by the Ministry of Waters and Environmental Protection”, Volume I of II

The investigation processes for installation of the present monitoring stations were found in this report.

- One urban background station, one suburban background station, at least one traffic-oriented station, and at least one industrial-oriented station were agreed during the designing of air quality monitoring network in each region.
- The methods using existing monitoring data or implementing monitoring campaign can be used for installation of monitoring network, but the method with simulation model (OML model) was preceded because of limits of existing data and time.
- The designing method of air quality monitoring network with simulation model is useful.

The method used was for existing stations installation, and existence of applicable simulation model in Romania was confirmed.

Furthermore, a new EU directive (2008/50/EC) on ambient air quality and cleaner air for Europe was published on 21st May, 2008, and each member country is obliged to make the transposition by 11th June, 2010, but the transposition was not decided at this moment.

Figure 3.6-3 Situation of the Activity of the Expert

3.6.2 Achievement

As results of activities, it was found that air quality monitoring in Romania is implemented based on the ministry order 592/2002, which was transposed from the EU directives, and most of the necessary items for air quality monitoring plan like target items, reference method, minimum number of stations, macro and micro scale siting methods and so on are determined in the ministry order.

However, practical procedures for macro-scale siting are not clarified and the suitable positioning method for monitoring stations used in Japan seems to be also useful for the guideline in Romania.

PM2.5 monitoring will be implemented in full scale soon in Romania and some considerations on monitoring of new target pollutants were added.

Furthermore, usage of simulation model for station positioning is useful, but it is supposed that accuracy of simulation model will be evaluated before use. Then, evaluation method of simulation model was also described.

The expert submitted final draft of the guideline to the counterpart in November 2008, and the draft was confirmed as final version of the guideline of the project.

The contents of the guideline are shown as follows.

1. Introduction
1.1 Purpose of Air Quality Monitoring
1.2 Target Pollutants
1.3 Categories of Air Quality Monitoring Stations
1.4 Basic Concept of Air Quality Monitoring Network
2. Number of Stations
3. Outline of Suitable Monitoring Stations Positioning
4. Suitable Monitoring Stations Positioning
4.1 Spatial Representativeness of Monitoring Data
4.2 Prediction of Ambient Air Concentration of Target Area
4.3 Consideration on Suitable Positioning of Ambient Air Quality Monitoring Stations
4.4 Consideration on Suitable Positioning of Specific Pollutant Source Monitoring Stations
5. Surroundings of Monitoring Stations
6. New Target Pollutants
7. Evaluation of Simulation Model

3.7 Support for Strengthening NRL Staff Capability of Training Program Planning and Implementation (Output 6)

3.7.1 Monitoring Equipment （Calibrator／Dilutor）

3.7.1.1 Activity

The work to open automatic air quality monitoring station in each major city in the country is progressing. Because the personnel who will be conducting the monitoring are inexperienced, it is important to train the local monitoring personnel before it is too late.

In the meantime, contractors who are working on constructing the monitoring facility are conducting this personnel training. Therefore it seems the situation is that the NRL's involvement is not desired at an early date.

Given this, it seems that for the NRL's training activity in LEPA, to "enforce the essentials concerning LEPA's ordinary work regarding maintenance and calibration" will suffice.

Because in other countries, a considerable number of monitoring networks are falling into measuring accuracy trouble due to insufficient training in the above essential points, the effect of the above training is felt not to be insignificant.

No more direct activity had been carried out as of June 2008, but the documents that were prepared in the course of the technical assistance could be utilized. The assistance for the training program was made in October 2008.

3.7.1.2 Achievement

A document outlining "compliance rules concerning LEPA's ordinary work regarding maintenance and calibration" was arranged. Further, the materials used in the seminars during the program can be used effectively. The arranged documents are shown in Table 3.7-1.

Table 3.7-1 Materials for Making the LEPA Training Program

No.	Reference materials
1	Maintenance log book
2	Instruction for the analyzer calibration
3	Basic Performance Test Records and Reports
4	Technical Seminar Presentation Materials

Point no.1 in the above table has been prepared. No.2 is an expository report translated into the Romanian language and requires revising. Concerning no.3, the description for the basic performance test included in the SOP for the diluting calibration system was utilized.

In the training conducted by agent, there is an item that is missed in the training for LEPA. This is the contract document with contractors. When the contractor undertakes a contract for periodical maintenance of the analyzers, there can be a situation whereby deficiencies in accuracy can be prevented by stipulating the detailed working procedures in the contract issued by the local government. Whether this is included in the training program or not is up to NRL. The expert advised NRL in October 2008 on the way how to instruct the LEPA technician by using these materials.

3.7.2 Atomic Absorption Spectrometer (AAS)

3.7.2.1 Activity

In the First Technical Seminar held on November 7, 2007, the expert explained the SREN 14902 standard for analyzing lead using the graphite atomic absorption photometer. In this opportunity, the experts could confirm that the LEPA staff members were interested in precision control such as the detection limit and the lower limit value for quantification, and quality control such as management of daily variations.

The experts visited the Giurgiu LEPA on June 18, 2008 and the Cluj Napoca LEPA on June 25, 2008, and the experts conducted there interview surveys about the situation of laboratory management, the technical level of analyses, the schedule for acquiring ISO 17025 accreditation, the training courses that NRL would provide for the LEPA, etc. The experts could confirm that the subject matter of the training courses that NRL would provide for the LEPA is precision management in analyzing lead using AAS according to a new standard, etc.

Based on these needs, we proposed to the counterparts that they would provide training courses on themes such as the method of decomposing samples using the microwave according to the new standard, and the method of preparing samples for testing at known concentrations and checking their precision using the addition and recovery test.

3.7.2.2 Achievement

In the Second and Third Technical Seminars, the NRL staff members explained to the LEPA staff members the points of concern regarding the SOP and the decomposition method for analysis of lead. Then, from September 28th to October 3rd 2008, five days, the training on the heavy metals analysis in the air was implemented together with the benzene analysis for the 24 members of staff who are working on 16 LEPA and 1 REPA. The training program is shown in Table 3.7-2.

In addition, the expert advised the NRL staff members in November to continue to implement training programs for the LEPA in and after 2009. Therefore, the outputs are achieved.

Table 3.7-2 Training Program

Date	Theme/Training Contents	Lecturer
29.Sep.2008 (Mon)	AAS-Flame method - Technique for reduction of background - Technique of Pb, Cd and Cu analysis in the environment	Mr.Mihai Balas(Ronex Prim)
	AAS-Flame method - Technique of sensitivity improvement - Analysis technique in the environment (Application)	
	Practice -Using AAS flame method	Mr.Mihai Balas(Ronex Prim) NRL staff
30.Sep.2008 (Tue)	AAS-Furnace method - Technique of Pb and Cd analysis in the environment	Mr.Mihai Balaş(Ronex Prim)
	Presentation of the filter sampling system for the PM10 monitoring in the air	NRL staff
	Practice - Using AAS Furnace method	MihaiBalas, NRL staff
01.Oct.2008 (Wed)	AAS-hydride generation method with cold vapor - Technique of As and Hg analysis in the environment	Mr.Mihai Balas(Ronex Prim)
02.Oct.2008 (Thu)	High decomposition technique using MW digestion system - Digestion of the cerfitied reference material (MRC)	Mr.Giulio Colnaghi, Mr.Costica Novac(Ronex Prim)
	Practice - Using MW digestion system	NRL staff
03 Oct. 2008 (Fri)	Solution of problem which happens with AAS analysis	Mr.Costica Novac, Mr.Mihai Balas(Ronexprim)

3.7.3 Ultra Violet Spectrophotometer(UV-VIS)

3.7.3.1 Activity

UV-VIS equipment which is one of the types of analysis equipment for basic and general purpose is used by all the LEPA, so training by NRL about it is not necessary.

On the other hand, many LEPAs have stated the intention on acquisition of the ISO 17025 accreditation. However, one of the requirements of ISO 17025, "Uncertainty of measurement" is very difficult for most of the laboratories to overcome. NRL took up the theme of uncertainty estimation in UV-VIS analyzing of ammonia according the standard procedure of public method "STAS 10812-76" of

Romania. The counterpart presented a part of it in the 3rd technical seminar in June, 2008.

So there was much need of on "Uncertainty of measurement", therefore the activity was furthermore advanced and the training materials were assembled.

3.7.3.2 Achievement

NRL took up the theme of uncertainty estimation for the LEPAs which are aiming the acquisition of ISO 17025 accreditation, and presented about it. NRL is starting to prepare the training program one by one.

3.7.4 Gas Chromatograph (GC)

3.7.4.1 Activity

The counterpart made some training materials for the LEPA personnel under assistance of the expert. The materials contain the pumped sampling of benzene, preparation of standard for the GC calibration, and tube conditioning, etc.

3.7.4.2 Achievement

In the first week of October 2008, the training on the benzene analysis was implemented together with the lead analysis training by AAS. The counterpart implemented the training on the details of the sampling pump according SR EN14662-1, tube alignment, diluting procedures of standard solutions for calibration curve, and usage of ATIS for making of calibration curve with five points. It was the first time for the most of staff from the LEPAs to watch the equipment, and the training was very useful for dissemination of the benzene analysis because the counterpart explained the structures of the equipment and how to use it.

Table 3.7-3 GC Training Program

Date	Theme/Training Contents	Lecturer
03 Oct. 2008 (Fri)	GC training for benzene analysis - Introduction and demonstration of NPL sampler for TENAX tube - Introduction of TEANX tube washing procedure - Introduction and demonstration of making standards (TENAX tube) for calibration curve with ATIS	Ms.Luminita Popescu（NRL）

3.7.5 Ion Chromatograph（IC）

3.7.5.1 Activity

No air laboratory of LEPAs owns IC equipment and conducts ion analysis. Then, NRL will not plan to implement the training on this item and the expert did not implement the supporting activity in this field.

Chapter 4

Record of Operation

4. Record of Operation

The plan of operation and the record of operation are shown from Figure 4-1 to Figure 4-5 together. Some activities were behind the plan of operation, but all of the activities were finally implemented.

(1) Supporting SOP Making (Output 1)

A little delay happened, but most of the planned activities were implemented.

The methods of air quality monitoring have changed from Romanian standards so far to the EU standards during the project implementation period, and it took much time to investigate and confirm the EU standards because they are very detailed and advanced.

Adding to that, NRL also received supports from a consultant on acquiring ISO17025 accreditation, and the structure of the SOPs were changed and much amount of re-writing became necessary, but the SOPs were completed around the end of the project.

Furthermore, the items like waste treatment procedures and safety and health control, which were agreed upon in the project, were not required by ISO17025 system and not included in the quality document system at the beginning, but these items were finally added.

(2) Supporting Capability Development (Output 2)

Much amount of OJT during long term was supposed for capability development of the counterparts in chemical analysis from the beginning of the project, and not so much deference existed between the plan and the actual activities.

The expert team proposed making of the monitoring activity implementation plan and implementation of regular monitoring based on the plan, and the Romanian side agreed on that. The monitoring implementation based one the plan also contributed to the capability development of the counterparts.

The implementation of cross check was feared because of limitation of NRL not keeping monitors by itself, but cross check was implemented in July 2008 at the station of Bucharest LEPA with the cooperation.

(3) Laboratory Management (Output 3)

NRL had a priority on acquiring ISO17025 accreditation, and the making of the quality documents was promoted from the beginning of the project, and the technical documents including SOPs were also completed around the end of the project.

(4) Monitoring Database (Output 4)

The automated continuous monitoring network was expanded drastically during the project implementation period, and the monitoring database system has been also newly constructed. Specifications of air quality monitoring in Romania became to follow the EU standards partially because Romania acceded the EU in January 2007. According these circumstances, it took much time to investigate the items for improvement by the project besides the items determined by the EU standards.

(5) Air Quality Monitoring Guideline (Output 5)

Romania joined to the EU and automated continuous monitoring network was expanded, and necessary items which are usually defined by air quality guideline were defined in details by the Romanian law transposed from the EU directives. It took much time to confirm and analyze the situations.

(6) Training Program (Output 6)

During the project implementation period, the Romanian standards of air quality monitoring have changed to the EU standards. Because the EU standards requested special equipment and advanced technical levels, training program was implemented around the end of the project.

Adding to the training programs, three times of seminars were implemented during the project under the cooperation of the experts and the counterparts to disseminate the contents of the SOPs and the guideline, and several technical information.

Outputs	Activities	Expected Results		Project Period							
				2007				2008			
				Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
1. Standard Operation Procedure [1] according to the EU and the Romanian standards relating Air Quality Monitoring [2] is developed and disseminated to LEPAs' laboratories	1.1 Define and clarify processes for preparing and developing SOP	Working process and schedule	Plan								
			Actual								
	1.2 Analyze the EU and the Romanian standards for preparation of SOP	List of monitoring and analysis methods for air quality	Plan								
			Actual								
	1.3 Decide the concept and contents of SOP	Contents and Format of SOP	Plan								
			Actual								
	1.4 Examine the reference methods through workshop/consultation meetings	Methods of monitoring and analysis for air quality	Plan								
			Actual								
	1.5 Compile the SOP for sampling, analysis, calibration, interpretation, data filing and reporting	SOPs	Plan								
			Actual								
	1.6 Prepare for dissemination seminars	Dissemination materials of Air Quality Monitoring and analysis for LEPAs	Plan								
			Actual								
	1.7 Implement Seminars on SOP for LEPAs' staff	Seminars	Plan								
			Actual								

Figure 4-1 Plan and Record of Operation (Output 1)

Outputs	Activities	Expected Results		2007				2008			
				Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
2. NRL performs Air Quality Monitoring correctly according to SOP	2-1 Implement training in theory for making Air Quality Monitoring plans, sampling, analysis, calibration, data interpretation, evaluation, data filing and reporting.	Training program. On the job training and off the job training	Plan								
			Actual								
	2-2 Implement On site On-the-job training in sampling, analysis, calibration, data interpretation, evaluation, data filing and reporting.	Training program. On the job training	Plan								
			Actual								
	2-3 Cross check programs for CO and O3 etc. are implemented.	Cross check report	Plan								
			Actual								

Figure 4-2 Plan and Record of Operation (Output 2)

Outputs	Activities	Expected Results		Project Period							
				2007				2008			
				Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
3. NRL equipment is properly maintained and managed by laboratory staff themselves with aim of acquisition of accreditation of ISO17025	3-1 Assess management procedures and conditions of equipment, spare parts, reagents, liquid and solid laboratory waste, safety and health control, documents and files	Assessment reports for the following items -Equipment -Spare parts -Chemical reagents -Other consumables -Liquid and solid waste -Safety and health control system -Documentation system	Plan								
			Actual								
	3-2 Compile the laboratory o/m manual for equipment, spare parts preparation, reagents storage and treatment, liquid and solid laboratory waste treatment, safety and health control, and document system	Quality manuals for the following items -Equipment -Spare parts -Chemical reagents -Other consumables -Liquid and solid waste -Safety and health control system -Documentation system	Plan								
			Actual								
	3-3 Implement On-the-job trainings based on the o/m manual	Record of implementation	Plan								
			Actual								
	3-4 Prepare a NRL budget plan for Air Quality Monitoring	NRL budget plan	Plan								
			Actual								

Figure 4-3 Plan and Record of Operation (Output 3)

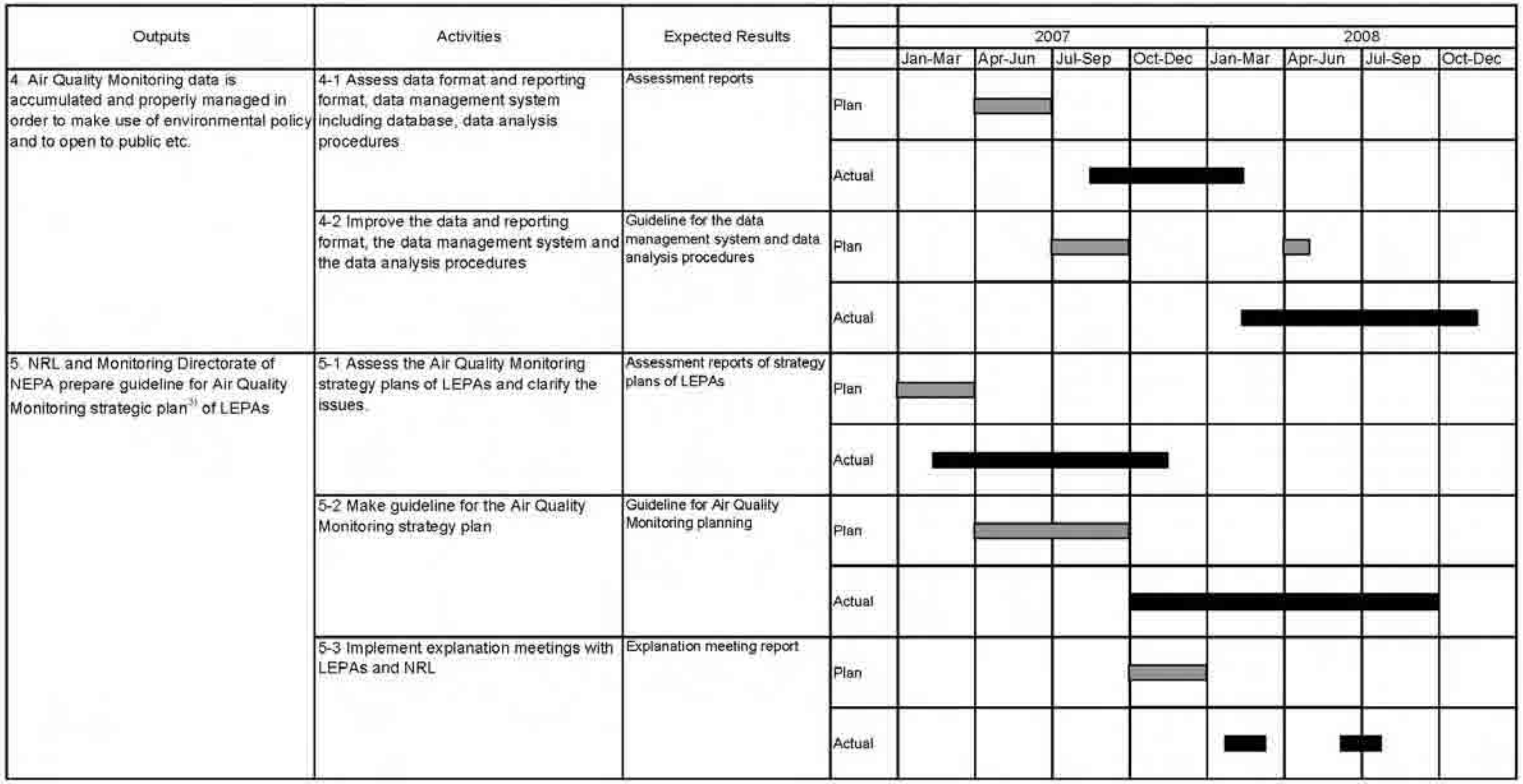


Figure 4-4 Plan and Record of Operation (Output 4 and 5)

Outputs	Activities	Expected Results		2007 Jan-Mar	2007 Apr-Jun	2007 Jul-Sep	2007 Oct-Dec	2008 Jan-Mar	2008 Apr-Jun	2008 Jul-Sep	2008 Oct-Dec
6. NRL staff is able to organize training programs for LEPA staff	6-1 Training Needs Assessment for LEPA staff is implemented	Report of Training Needs Assessment	Plan	■							
			Actual							■	
	6-2 Training program is formulated	Training program	Plan	■							
			Actual							■	■
	6-3 Training materials are prepared	Training materials	Plan		■	■					
			Actual							■	■
	6-4 Training is implemented	On the job training and off the job training	Plan				■	■	■		■
			Actual								■
	6-5 Evaluation of the training is conducted	Evaluation report of C/P training Improved programs and materials	Plan				■	■	■	■	
			Actual								■

Figure 4-5 Plan and Record of Operation (Output 6)

Chapter 5

Inputs for the Project

5. Inputs for the Project

5.1 Related Persons of the Japanese and the Romanian Sides

Major attendants of JCC meetings are shown in Table 5.1-1 and the names of the Japanese experts and the Romanian counterparts in each field are shown in Table 5.1-2.

The experts ordinarily worked at the project expert office in NRL as an activity center during their stays in Romania, and implemented technical cooperation with their counterparts.

The JCC meetings were held timely and the progresses of the project were explained by the progress reports which the expert team and the counterpart team made together, and the participants had discussions to promote the project smoothly.

Table 5.1-1 Major Participants of the JCC Meetings

The Romanian Side	The Japanese Side
Project Director: Mr. Attila KORODI (State of Secretary, Ministry of Environment and Water Management(MEWM)), (until March 2007) Mr. Silviu STOICA (State of Secretary, Ministry of Environment and Sustainable Development(MESD)), (from April 2007) Project Manager: Mr. Ioan GHERHES (President, National Environment Protection Agency (NEPA)), (until March 2007) Mr. Zoltan Levente NAGY (President, National Environment Protection Agency (NEPA)), (from April 2007) Project Coordinator from MEWM（MESD）: Ms. Dorina MOCANU (Director, Atmospheric Protection Directorate of MEWM/MESD) Project Coordinator from NEPA: Ms. Corina LUPU (General Director, Monitoring, Coordination and Synthesis General Department of NEPA)	JICA/JOCV Romania Office: Mr. Fumio MIYAGAWA (Resident Representative) Ms. Mirela IOANA (Program Coordinator) (until March 2008) Ms. Mihaela SIGHINAS (Program Coordinator) (from April 2008) JICA Headquarter: Mr. Kenichi TANAKA (Senior Adviser) Mr. Masami MIZUGUCHI (Senior Adviser) Ms. Naoko KAMEI (Program Officer) (until September 2007) Ms. Naoko YAGO (Program Officer) (from January 2008) JICA Expert Team: Mr. Akeo FUKAYAMA (Team Leader/Air Quality Monitoring) And other six experts

Table 5.1-2 Japanese Experts and Romanian Counterparts

Working Field	The Romanian Counterparts	The Japanese Experts
Chief Adviser/ Air Quality Monitoring	Ms. Crina HOTOIU Ms. Iulia NEACSU Ms. Corina RUGINA Ms. Patricia LUNGU Ms. Antonia DUMITRESCU (Jan.2007-Mar.2008) Mr. Vlad Ioan GHIUTA TARALUNGA (Jan.2007-Jly.2008)	Mr. Akeo FUKAYAMA
Monitoring Equipment	Ms. Violeta BALACEANU Ms. Elena TIGARIDIS	Mr. Toshiharu OCHI
Laboratory Management	Ms. Rodica MURESAN (Jan.2007-Mar.2008) Ms. Iulia NEACSU Ms. Adrian ZLATAN (Jul. 2008-)	Dr. Mitsuru FUJIMURA
Laboratory Equipment (AAS)	Ms. Cristina NEGULESCU (Jan.2007-Mar.2007) Ms. Mioara SERBAN Mr.Cristian CAPITANESC (Sep.2007-) Ms.Mirela TARBASANU (Sep.2007-Feb.2008) Ms.Cristina NEDESCU (Apr.2008-)	Mr. Natsuji SAWAKI

Laboratory Equipment (UV-VIS)	Ms. Alina ILIE Ms.Adriana ZLATAN (Dec.2007-)	Mr. Natsuji SAWAKI
Laboratory Equipment (GC)	Ms. Luminita POPESCU	Ms. Naomi MAEDA
Laboratory Equipment (IC)	Ms. Alina ILIE	Ms. Naomi MAEDA
Monitoring Data Base	Ms. Corina CRISTEA Ms. Mihaela CALIN (Jan.2007-Feb.2007) Ms. Corina RUGINA Ms. Patricia LUNGU Ms. Antonia DUMITRESCU (Jan.2007-Mar.2008) Mr. Vlad Ioan GHIUTA TARALUNGA (Jan.2007-Jly.2008)	Mr.Fumihiko KUWAHARA
Coordinator	Ms. Rodica MURESAN (Jan.2007-Mar.2008)	Mr. Atsushi MURAI

5.2 Dispatch Period of JICA Experts

The dispatch period of JICA experts during the project are shown in Figure 5.2-1.

The experts had close communications with the counterparts to implement maximum technical cooperation under the limited dispatches, and made arrangements to avoid the overlapping with other tasks and summer holidays.

	Field	Name	Affiliation	Dispatch (days) JFY2006 (1–3) / JFY2007 (4–3) / JFY2008 (4–12)	JFY2006 Romania	JFY2006 Japan	JFY2007 Romania	JFY2007 Japan	JFY2008 Romania	JFY2008 Japan	Total Romania	Total Japan
Activity in Romania	Chief Adviser/Air Quality Monitoring	Mr. Akeo FUKAYAMA	SUR	(51) / (28+(7)), (15), (72), (25) / (45), (45)	1.70		4.67		3.00		9.37	
	Monitoring Equipment	Mr. Toshiharu OCHI	GB	(26) / (30) / (30), (30)	0.87		1.00		2.00		3.87	
	Laboratory Management	Dr. Mitsuru FUJIMURA	GB	(7) / (60), (58), (16) / (22), (23)	0.23		4.47		1.50		6.20	
	Laboratory Equipment(AAS)	Mr. Natsuji SAWAKI	SUR	(59) / (15), (22), (36), (25) / (30), (30)	1.97		3.27		2.00		7.24	
	Laboratory Equipment（GC）	Ms. Naoko MAEDA	GB	(50) / (30), (15), (59) / (30), (15)	1.67		3.47		1.50		6.64	
	Monitoring Database	Mr. Fumihiko KUWAHARA	SUR	(8) / (15), (22), (15) / (15), (30)	0.27		1.73		1.50		3.50	
					6.71		18.61		11.50		36.82	
	Coordinator	Mr. Atsushi MURAI	SUR	(23) / (30) / (15)	(0.77)		(1.00)		(0.50)			
Activity in Japan	Chief Adviser/Air Quality Monitoring	Mr. Akeo FUKAYAMA	SUR	(3), (1) / (2), (3) / (2), (3)		0.13		0.17		0.17		0.47
	Monitoring Equipment	Mr. Toshiharu OCHI	GB	(3), (2) / (2)		0.17		0.07		0.00		0.24
	Laboratory Management	Dr. Mitsuru FUJIMURA	GB	(3) / (2), (3)		0.00		0.10		0.17		0.27
	Laboratory Equipment(AAS)	Mr. Natsuji SAWAKI	SUR			0.00		0.00		0.00		0.00
	Laboratory Equipment（GC）	Ms. Naoko MAEDA	GB			0.00		0.00		0.00		0.00
	Monitoring Database	Mr. Fumihiko KUWAHARA	SUR			0.00		0.00		0.00		0.00
						0.30		0.34		0.34		0.98
Report				P/D, P1, PR/R1, P2, P/D, P/R1, P/R2, PR/R2, P3, P/R3, F/R, PR/R3								
Seminar				SOPs Seminar1, SOPs Seminar2, Guideline Seminar1, SOPs Seminar3, Guideline Seminar2, Project Summarizing Seminar								
Activity and Total Month				First / Second / Third; Activity in Japan	6.71	0.30	18.61	0.34	11.50	0.34	36.82	0.98
					(0.77)	(0.00)	(1.00)	(0.00)	(0.50)	(0.00)	(2.27)	(0.00)
					7.01		18.95		11.84		37.80	
					(0.77)		(1.00)		(0.50)		(2.27)	

Legend :
- JFY Japanese Fiscal Year
- ■ Activity in Romania
- □ Activity in Japan
- P Project Implementation Plan (Fisical Year of Japan)
- P/D Project Documents
- PR/R Project Result Report(Fisical Year of JAPAN)
- P/R Progress Report
- F/R Final Report
- SUR SUURI-KEIKAKU.CO.,LTD.
- GB GREEN BLUE CORPORATION

Figure 5.2-1 Dispatch Period of the JICA Experts

5.3 Technical Seminars

Three times of the technical seminars were held during the project implementation period in order to disseminate the SOPs and the air quality monitoring guideline etc.

The contents of the seminars are shown from Table 5.3-1 to Table 5.3-3.

Table 5.3-1 Contents of the First Technical Seminar

Held on 7th November 2007

	Title of the Presentation	Presenter
1	Outlines of the JICA-NEPA Joint Project	Ms. Crina HOTOIU
2	Introductory presentation of the Air Quality Monitoring System in Japan	Mr. Akeo FUKAYAMA
3	Guidelines of the Laboratory Management System on ISO/IEC17025 Standard	Dr. Mitsuru FUJIMURA
4	RENAR Requirements for ISO17025 Accreditation	Ms. Rodica MURESAN
5	Calibration of the Automated Monitoring Equipment	Ms. Violeta BALACEANU
6	Explanations about SR EN 14902 on Lead Analysis by GF-AAS	Mr. Natsuji SAWAKI
7	NO2 and SO2 Passive Sample Analysis by IC Method	Ms. Alina ILIE

Table 5.3-2 Contents of the Second Technical Seminar

Held on 21st February 2008

	Title of the Presentation	Presenter
1	The Elaboration of the Operational Procedure Project for the Measurement of the Benzene Concentration in the Ambient Air	Ms. Luminita POPESCU
2	Characteristics and Comparison of Gas Chromatograph Detectors	Ms. Naomi MAEDA
3	Specific Operational Procedure for the Determination Through AAS of the Concentration of Lead in the PM 10 Filter Digestion Solution, According to SR EN 14902: 2007	Ms. Cristian CAPITANESCU
4	Monitoring Data Management in Japan	Mr. Fumihiko KUWAHARA
5	Proposal on Guideline for Air Quality Monitoring Plan	Mr. Akeo FUKAYAMA
6	Training Course in Japan	Ms. Iulia NEACSU
7	Technical Cooperation Project by JICA	Mr. Kenichi TANAKA

Table 5.3-3 Contents of the Third Technical Seminar

Held on 10th July 2008

	Title of the Presentation	Presenter
1	Recovery Test of Pb Analysis with AAS	Ms. Cristian CAPITANESCU
2	Sampling and Absorbent Tube Injector Devices for the Measurement of the Benzene Concentration in the Ambient Air	Ms. Luminita POPESCU
3	Uncertainty Estimation of NH3 Analysis with UV-VIS	Ms. Alina ILIE
4	QA/QC of Automated Air Quality Monitoring	Mr. Toshiharu OCHI
5	Analysis of Automated Continuous Air Quality Monitoring Data in Romania	Ms. Corina CRISTEA
6	Discussions on Proposal of Guideline for Air Quality Monitoring Plan	Mr. Vlad Ioan GHIUTA and Mr. Akeo FUKAYAMA

The project homepage (**http://www.anpm.ro/content.aspx?id=62**, confirmed as of 1st December 2008) was opened under the homepage of NEPA where the project activities and the seminar presentations are published and can be browsed by everyone. It is expected that the outputs form the project are widely disseminated in Romania.

5.4 Training Course in Japan

Two times of training courses were implemented in Japan during the project implementation period. The training course titled “Laboratory management and air quality analysis” for three laboratory staff was implemented in the second fiscal year, and the course titled “Environmental Administration” for one administrative officer was implemented in the third fiscal year.

5.4.1 Training Course on Laboratory Management and Air Quality Analysis

Outline of the training course of “Laboratory management and air quality analysis” is shown in Table 5.4-1.

Table 5.4-1 Outline of “Laboratory Management and Air Quality Analysis”

Title	“Laboratory management and air quality analysis”
Trainees	(1)Ms. Iuliana NEACSU Chief of air laboratory, experience of GC analysis etc in LEPA, technical manager of ISO17025 system (2) Ms. Rodica MURESAN Experience as consultant of quality management, quality manager of ISO17025 system (3) Ms. Luminita POPESCU In charge of GC analysis, experience of pesticides analysis at pharmaceutical company
Training Period	From 17^{th} November to 1^{st} December 2007

The purposes of the training were as follows.

(1) “Benzene analysis by GC”: To learn different methods of benzene analysis and extract merit, demerit and improvement of your own analysis method implemented in your laboratory
(2) “QA/QC of chemical analysis”: To learn QA/QC of chemical analysis implemented in governmental and private laboratories in Japan and utilize the information to prepare for acquiring ISO17025 accreditation which you are promoting at present
(3) “Role of environmental laboratory”: To learn tasks implemented by environmental laboratories in Japan and reconfirm roles and positions of NRL in Romania and improve relationships with and contributions to the environmental administration

The training schedule is shown in Table 5.4-2, and numbers in the right end column show the relationships to the purposes.

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Table 5.4-2 Schedule of Training Course of "Laboratory Management and Air Quality Analysis"

Date		Morning/Afternoon	Lecturer/Place	Contents	Purpose
17th Nov.	Sat.	Whole day	-	Flight: Bucharest→Amsterdam→	-
18th Nov.	Sun.	Whole day	-	Narita→Tokyo International Center (TIC)	-
19th Nov.	Mon.	Morning	TIC	Orientation	-
		Afternoon	Mr. Saji WATANABE National Environmental Research and Training Institute (NETI)	Orientation for training	(1)(2)(3)
20th Nov.	Tue.	Whole day	Ditto	Lecture: Details of GC analysis method etc	(1)(2)
21st Nov.	Wed.	Whole day	Ditto	Lecture: Sampling method, uncertainty Practice: GC-FID analysis, manual injection etc Visit: Dioxin analysis facility	(1)(2)
22nd Nov.	Thu.	Whole day	Ditto	Lecture: Gas standard making, calculation method Practice: Pre-treatment, blanks etc	(1)(2)
23rd Nov.	Fri.	Whole day	Ms. Naomi MAEDA Green Blue Corporation	Lecture: Integrated QA/QC Visit: General laboratory equipment, analytical equipment etc	(2)
24th Nov.	Sat.	Whole day	-	Compilation of materials	-
25th Nov.	Sun.	Whole day	-	Compilation of materials	-
26th Nov.	Mon.	Whole day	Mr. Naoto MINAGAWA Ms. Naomi MAEDA Green Blue Corporation	Lecture: uncertainty, laboratory standards, traceability etc Practice: Thermal desorption sampling method Visit: Canister sampling method, passive sampler	(1)(2)
27th Nov.	Tue.	Morning	Ms. Yuko SASAKI Ms. Minako YAMAZAKI Tokyo Metropolitan Research Institute for Environmental Protection	Lecture: Securement system of credibility(Good Laboratory Practice), heat island etc Visit: Dioxin analysis room etc	(2)(3)
		Afternoon	Mr. Toshiharu AOKI Tokyo Metropolitan Government	Lecture: Air quality monitoring system, operation of air quality monitoring etc	(2)(3)
28th Nov.	Wed.	Morning	Mr. Hisao NIHEI SUURI-KEIKAKU CO., LTD.	Lecture: History of air pollution control in Tokyo etc	(3)
		Afternoon	Mr. Keichiro HIRANO Yokohama City Research Institute for Environmental Science	Lecture: Meanings and issues of proficiency test etc Visit: Proficiency test room for monitors etc	(1)(2)
29th Nov.	Thu.	Morning	Dr. Mitsuru FUJIMURA Green Blue Corporation	Visit: Air quality monitoring station (Matsubara-bashi)	(2)
		Afternoon	Ditto	Lecture: Verification of automated continuous monitoring data etc	(2)
30th Nov.	Fri.	Morning	Mr. Akeo FUKAYAMA, Mr. Fumihiko KUWAHARA SUURI-KEIKAKU CO., LTD. (SUR)	Lecture: Automated continuous monitoring data and ISO etc	(2)
		Afternoon	Mr. Hidenori KUMAGAI (JICA), Mr. Tadayuki SUZUKI (JICA), Mr. Atsuto ONODERA (JICE), Ms. Madoka ARAI (JICE) Mr. Akeo FUKAYAMA (SUR), Ms. NEACSU, Ms. MURESAN, Ms. POPESCU	Evaluation meeting: Beneficial and non-beneficial training contents, utilization of training outputs	(1)(2)(3)
1st Dec.	Sat.	Whole day	-	Transportation: TIC→Narita→Amsterdam→Bucharest	-

5.4.2 Training Course on Environmental Administration

Outline of the training course of "Environmental administration" is shown in Table 5.4-3.

Table 5.4-3 Outline of "Environmental Administration"

Title	"Environmental administration"
Trainee	Ms. Corina LUPU General Director, Monitoring, Coordination and Synthesis Department of NEPA
Training Period	From 6th September to 13th September 2008

The purposes of the training were as follows.

(1)"Utilization of air quality monitoring data to environmental administration": To learn experience of Japan in collection and analysis of much amount of air quality monitoring data and utilization to environmental administration, and investigate utilization in Romania

(2)"Coordination between the national and the local governments in air quality monitoring": To learn cooperation of the Ministry of Environment, local governments, and laboratories in Japan and understand characteristics of the environmental administration in Romania compared with the one in Japan, and investigate the improvement. Especially, to hear from the roles of the Ministry of Environment and local governments and think about the cooperation between your department and MESD

(3)"Local characteristics of air quality monitoring": To visit a few local governments and analyze common features and local characteristics

(4)"Proficiency test of automated continuous monitors": To learn top level of proficiency test system of automated continuous monitors in Japan for reference and investigate on construction of traceability system of air quality monitoring system in Romania

(5)"Training program of local governmental staff": To visit training institution where training program on air quality monitoring capability for local governmental staff in Japan and obtain information on training program to be implemented by your laboratory for reference

(6)"Hazardous air pollutants monitoring": To learn Japanese examples for reference on hazardous air pollutants monitoring which will be implemented in the near future in Romania

The training schedule is shown in Table 5.4-4, and numbers in the right end column show the relationships to the purposes.

Table 5.4-4 Schedule of Training Course of "Environmental Administration"

Date		Morning/Afternoon	Lecturer/Place	Contents	Purpose
6th Sep.	Sat.	Whole day	-	Transportation: Bucharest→Frankfurt→	-
7th Sep.	Sun.	Whole day	-	Narita→Tokyo International Center (TIC)	-
8th Sep.	Mon.	Morning	Mr. Shoji ISHIDA (JICE), Ms. Yuko SOMEYA (JICE) Mr. Kengo KURODA (JICE), Mr. Akeo FUKAYAMA (SUR) Ms. LUPU Tokyo International Center	Orientation	-
		Afternoon	Mr. Junichi SHIRAISHI Mr. Teruyoshi HAYAMIZU Mr. Hideaki TEDUKA Mr. Michinori SENBA The Ministry of Environment	Courtesy Call Lecture: Air quality monitoring situation in Japan, especially, cooperation between the Ministry of Environment and local governments, roles of air quality monitoring in environmental administration in the past etc	(1)(2)
9th Sep.	Tue.	Whole day	Mr. Seiji WATANABE National Environmental Research and Training Institute (NETI)	Visit: General chemical analysis training room, Dioxin analysis training room Lecture: Making and implementation of training program, hazardous air pollutants monitoring methods etc	(5)(6)
10th Sep.	Wed.	Afternoon	Mr. Kosuke UMAKOSHI Mr. Yoshiaki NISHII Osaka City Government	Lecture: Air quality monitoring situation, roles of air quality monitoring in environmental administration in the past, air pollution characteristics of Osaka city etc	(1)(2)(3)
11th Sep.	Thu.	Afternoon	Mr. Koichiro HIRANO Yokohama City Research Institute for Environmental Science	Lecture: Meanings and issues of proficiency test, experience of test and research etc Visit: Proficiency test room for monitors etc	(4)
12th Sep.	Fri.	Morning	Mr. Toshiro SEKINE, Mr. Masayuki SEKI Kawasaki City Pollution Monitoring Center Mr. Toshiaki INOUE Kawasaki City Environmental Technique Information Center	Lecture: Air quality monitoring situation, roles of air quality monitoring in environmental administration in the past etc Visit (From top of the building): Spatial relationships of Keihin Industrial area and Kawasaki city	(1)(2)(3)
		Afternoon	Mr. Akeo FUKAYAMA SUURI-KEIKAKU CO., LTD (SUR)	Material collection: Check and collection of training materials	(1)-(6)
		Afternoon	Mr. Hidenori KUMAGAI (JICA), Ms. Naoko YAGO (JICA), Mr. Shoji ISHIDA (JICE), Ms. Yuko SOMEYA (JICE) Mr. Kengo KURODA (JICE), Mr. Akeo FUKAYAMA (SUR) Ms. LUPU	Evaluation meeting: Beneficial and non-beneficial training contents, utilization of training outputs	(1)-(6)
13th Sep.	Sat.	Whole day	-	Transportation: TIC→Narita→Frankfurt→Bucharest	-

5.5 Equipment Provided by JICA Project

Table 5.5-1 Equipment Provided by JICA Project

No	Date of Receive	Equipment	Manufacturer	Model	Q'ty	Total Price (Ron)	Total Price (Yen)	Present location	Institution	Relation with PDM
1	Feb.2007	Projector	BENQ	MP721	1	3,669.40	170,550	Expert Room	NRL	1-2
2	Mar.2007	Shaker	VELP Italia	Vortex Wizard	1	1,728.44		Pretreatment room	NRL	2-1
3	Mar.2007	Thermometer	OMNILAB	0-100,0-200	4	337.87		Pretreatment room	NRL	2-1
4	Mar.2007	Gas Banner	OMNILAB	Bunsen	2	225.24		Pretreatment room	NRL	2-1
5	Mar.2007	Hotplate/Magnetic Stirrer (Single)	VELP Italia	AREX	1	1,902.50		Pretreatment room	NRL	2-1
6	Mar.2007	Analytical Column for GC	J&W	DB-5MS 25mx0.20x0.33	2	€1,030.54		GC,IC Analysis room	NRL	2-1
7	Mar.2007	Analytical Column for GC	J&W	DB-1MS 30mx0.25x0.25	2	€1,247.12		GC,IC Analysis room	NRL	2-1
8	Mar.2007	Analytical Column for GC	J&W	DB-35MS 30mx0.25x0.25	1	€623.56		GC,IC Analysis room	NRL	2-1
9	Mar.2007	Maintenance kit for GC	Agilent	Flow meter, tool etc	1	€2,281.23		GC,IC Analysis room	NRL	2-1
10	Mar.2007	Temperature and Pressure Sensor for MW	Milestone	Temperature Sensor and pressure sensor	1	€5,416.77		Pretreatment room	NRL	2-1
11	Mar.2007	Certificate Standard weight	CIBE	1mg-200g	1	€1,796.90		Balance room	NRL	2-1
12	Mar.2007	Analytical Column for IC	Metrohm	MetrosepA Supp 4 250	1	€1,310.19		GC,IC Analysis	NRL	2-1

				MetrosepA Supp 4/5GC				room		
13	Mar.2007	Laboratory pH/Conductivity Meter	Thermo-Orion	InoLab 720	1	€1,713.60		Pretreatment room	NRL	2-1
14	Mar.2007	Technical Balance	KERN	ABJ220 - 4M	1	€1,643.39		Balance room	NRL	2-1
15	Mar.2007	Analytical Balance	KERN	EW1500 - 2M	1	€719.95		Balance room	NRL	2-1
16	Mar.2007	Urban Dust	NIST	1649A	2	€999.60		Storage cabinet	NRL	2-1
17	Jun.2007	Drying Oven	Memmert	Universal Ovens UFE500	1	6,862.12		Pretreatment room	NRL	2-1
18	Sep.2007	Wet Sampler	Desaga	GS312	1	€7,212.59		Pretreatment room	NRL	2-1
19	Sep.2007	Passive Sampler	Ogawa-shokai	Cylindrical Type Sampler	1		82,000	GC,IC Analysis room	NRL	2-1
20	Sep.2007	Passive Sampler	Ito-Rica	Handy SONOX	1		65,910	GC,IC Analysis room	NRL	2-1
21	Nov.2007	Standard Flow Meter	BIOS	Dry Cal ML-500	1		2,725,000	Calibration room	NRL	2-1
22	Nov.2007	Fly Ash	BCR	BCR038	2	€690.20		Storage cabinet	NRL	2-1
23	Nov.2007	Hot Plate	Gestigkeit	HE-1	1	€749.70		Pretreatment room	NRL	2-1
24	Dec.2007	Accessory kit for Injector-Related Equipment	Swagelok	Joint, Wrench, tool etc	1		37,498	Pretreatment room	NRL	2-1
25	Jan.2008	Current and Voltage Meter	Sanwa	CD771	1		7,200	Expert Room	NRL	3-1
26	Jan.2008	Passive Sampler	Radiello	For NO2SO2 20pk	4	€3,541.44		GC,IC Analysis room	NRL	2-1
27	Jan.2008	Passive Sampler	Radiello	For O3 20pk	2	€1,770.72		GC,IC Analysis room	NRL	2-1
28	Jan.2008	Passive Sampler	Radiello	For NH3 20pk	2	€1,861.16		GC,IC Analysis room	NRL	2-1
29	Jan.2008	Injector-Related Equipment for GC Analysis	Supelco	ATIS Adsorbent Tube Injector System	1	€2,320.50		Pretreatment room	NRL	2-1

30	Jan.2008	Visual Fortran Compiler	Intel	Visual Fortran Compiler 10.1 Standard	1		73,310	Expert Room	NRL	4-2-
31	Feb.2008	N2 Cylinder and regulator for injector	Linde	Nitrogen5.0 and regulator for N2 gas	1	2,355.44		Pretreatment room	NRL	2-1
32	Feb.2008	Benzene Standard Solution	NIST	NIST3000 2.5mlx2pk	1	€452.20		Storage cabinet	NRL	2-1
33	Feb.2008	Toluene Standard Solution	NIST	NIST3001 2.5mlx2pk	1	€452.20		Storage cabinet	NRL	2-1
34	Feb.2008	Hydride Generation System	Thermo	Thermo AAS Solaar VP100	1	€13,424.39		AAS Analysis room	NRL	2-1
35	Feb.2008	Cathodes Lamp for AAS	Thermo	Thermo AAS Solaar Series for As analysis	1	€417.69		AAS Analysis room	NRL	2-1
36	Feb.2008	Cathodes Lamp for AAS	Thermo	Thermo AAS Solaar Series for Pb analysis	1	€386.75		AAS Analysis room	NRL	2-1
37	Feb.2008	Deuterium Lamp for AAS	Thermo	Thermo AAS Solaar Series	1	€759.22		AAS Analysis room	NRL	2-1
38	Feb.2008	Graphite Tube	Thermo	Thermo AAS Solaar Series (Normal 10pk)	1	€758.03		AAS Analysis room	NRL	2-1
38	Feb.2008	Graphite Tube	Thermo	Thermo AAS Solaar Series (High Denticy 10pk)	1	€929.39		AAS Analysis room	NRL	2-1
38	Feb.2008	Graphite Tube	Thermo	Thermo AAS Solaar Series (ELC10pk)	1	€1,098.37		AAS Analysis room	NRL	2-1
39	Mar.2008	Reagents for GC and AAS	Merck	Magnesium per-chlorate etc	1	€665.06		Storage cabinet	NRL	2-1
40	Mar.2008	Standard Flow Meter for PM10 Sampler	TCR Tecora	Delta Cal	1	€3,236.80		AAS Analysis room	NRL	2-1
41	Mar.2008	Nitrogen Gas Cylinder for GC	Linde	Nitrogen5.0	1	667.54		GC,IC Analysis room	NRL	2-1
42	Mar.2008	Air Gas Cylinder for GC	Linde	Air5.0 HC free	1	1,252.77		GC,IC Analysis room	NRL	2-1
43	Mar.2008	Argon gas Cylinder for AAS	Linde	Argon 5.0	1	804.62		AAS Analysis room	NRL	2-1

44	Mar.2008	Regulator for Air and N2	Linde	Regulator for N2 gas	2	3,121.32		GC,IC Analysis room	NRL	2-1
45	Mar.2008	Tenax Tube	Markes	Universal Thermal Tube for C2 - C20 10pk	3	£ 1,000		GC,IC Analysis room	NRL	2-1
46	Mar.2008	Cap for Tenax Tube	Markes	DiffLokcaps 10pk	8	£ 1,185		GC,IC Analysis room	NRL	2-1
47	Mar.2008	Cap for Tenax Tube	Markes	Cap for transportation and storage 20pk	4	£ 185		GC,IC Analysis room	NRL	2-1
48	Mar.2008	BTX Standard	Markes	TA 25 ng BTX	1	£ 750		GC,IC Analysis room	NRL	2-1
49	Mar.2008	Constant Flow Sampler	NPL	NPL Pump	1	£ 7,475		Pretreatment room	NRL	2-1
50	May.2008	Chart Type Recorder	CHINO	EL3000	1		112,300	Calibration room	NRL	2-1

5.6 Local Activity Cost

The local activity costs by each fiscal year are shown in Table 5.6-1.

Table 5.6-1 Local Activity Cost by Each Fiscal Year

	Major Budget Item	IFY2006			IFY2007			IFY2008			Total		
		EURO	RON	YEN	EURO	RON	YEN	EURO	RON	YEN	EURO	RON	YEN
1	Employment Cost(Interpreter, and Typist)	4,631.00	0.00	731,066	17,941.00	0.00	2,924,844	4,653.50	0.00	526,852	27,225.50	0.00	4,182,762
2	Consumable supplies Cost				0.00	1,543.52	78,681	0.00	0.00	0	0.00	1,543.52	78,681
3	Travel Expense (Include Driver's Fee and Car Rental)	3,311.50	0.00	521,500				694.00	40.37	115,501	4,005.50	40.37	637,001
4	Correspondence and Carry Cost	0.00	0.00	0	0.00	0.00	15,200	0.00	0.00	0	0.00	0.00	15,200
5	Preparation Document and Materials Cost	0.00	117.19	5,500	800.00	150.00	134,894	416.00	588.50	89,283	1,216.00	855.69	229,677
6	Rent and Hire Cost				0.00	0.00	1,272,876	4,752.50	0.00	689,456	4,752.50	0.00	1,962,332
7	Local Training Cost				7,813.75	7,210.20	327,979	2,960.78	100.00	422,369	10,774.53	7,310.20	750,348
8	Incidental Cost	1,000.00	5,856.00	431,512			0	0.00	0.00	0	1,000.00	5,856.00	431,512
9	Machinery and Equipment Provided by Japan	18,782.85	7,663.44	3,329,000	40,726.41	15,063.81	12,457,293	0.00	0.00	124,530	59,509.26	22,727.25	15,910,823
10	Other Transportation Cost							0.00	0.00	0	0.00	0.00	0
11	Preparation Report Cost							0.00	0.00	607,500	0.00	0.00	607,500
12	Conference Cost							0.00	88.80	3,137	0.00	88.80	3,137
Total in LocalCurrency		27,725.35	13,636.63		67,281.16	23,967.53		13,476.78	817.67		108,483.29	38,421.83	
Total in Japanese Yen				5,018,578			17,211,767			2,578,628			24,808,973

5.7 Inputs from Romanian Side

Adding to the counterparts as human resource inputs, the Romanian side provided the office space and some furniture and purchased necessary equipment and consumables by themselves.

5.7.1 Office Space and Furniture

The expert team used the office space in NRL as project office and the furniture provided by the counterparts during their stays in Romania.

Undertakings provided were as follows.

- Office space of around 25.5m2 equipped with electricity supply and air conditioning
- Desks, chairs, and bookshelves for seven experts, typist, and interpreter
- Telephone and facsimile line without charge and each one set of telephone and facsimile machines
- IP addresses for high speed LAN
- One color laser printer
- Use of photocopy machine and scanning services on demand

The expert team expresses great thanks to the counterpart team and the Romanian side for providing one room among the limited laboratory spaces. The experts can concentrated on technical cooperation in comfortable and effective way during the stays in Romania.

5.7.2 The Other Preparation

The Romanian side purchased UV-VIS just before the starting of the project, and chemical hood and connecting ducts were installed to prevent suffering from toxic gas during analysis. Gas cylinder racks were installed to prevent the turnover accident. The rack for automatic analyzer, a suction pump, and additional adsorbent were installed for smooth operation.

Adding to the equipment above, the Romanian side prepared glassware and consumables necessary for the project, and also implemented arrangement and repairs of several sets of equipment.

The views and the function of the laboratory were drastically changed and improved during the project period by the efforts of the Romanian side.

Chapter 6

Recommendations

6. Recommendations

Finally, the purposes and the outputs of the project have been mostly achieved, and the achievements have mainly come from the extraordinary efforts of the counterpart team as well as the supports from the expert team. The expert team expresses the deepest gratitude for unmeasured cooperation and greatly appreciates the efforts.

The expert team makes the following recommendations to expand the achievements by the project to make good use of them to the activities from now on.

1. Improvement of SOPs and Expansion of Scopes: The several SOPs were completed by the project, and it is desirable to add the improvements found during the implementations of analyses and make them more useful. It seems to be necessary to expand the targets to the other analysis methods besides the ones in this time. The making and improvement of SOPs are closely related to the leveling up of analysis capability and quality control, and both of them will be ideally improved in parallel manner.
2. Continuous Improvement of Capability: The monitoring activity implementation plan was made in the project and certain numbers of samples were analyzed every month, and the expert team thinks that analysis of certain number of samples is necessary for establishing the specific analysis method. The expert team recommends leveling up of analysis techniques of the staff by implementation of monitoring if necessary. The expert team also hopes that the monitoring necessity by NRL is recognized and necessary preparations for the monitoring like consumables etc is implemented under annual monitoring plan.
3. ISO17025 Accreditation and Expansion: The expert team realizes that most of the quality and the technical documents necessary for the acquisition of accreditation of ISO17025 were prepared during the project implementation period, and hopes the acquisition by NRL in near future. If NRL acquires the accreditation for the scopes at present, it will be recommended that NRL expands the scopes of accreditation systematically.
4. Laboratory Management and QA/QC: Quality control of analysis and tests will be implemented and the systems to guarantee quality of its results will be constructed and activities will be continued under the system by NRL. It is important to understand the concept of uncertainty of measurement, and totally assure and control quality of whole processes of analysis and tests.
5. Screening and Utilization of Monitoring Data: The automatic continuous monitoring network of air quality with 117 stations will be operated in full scale soon, and huge amount of monitoring data, which were not obtained in the past, will be collected and stored. The screening of abnormal data for automatic continuous monitoring is difficult work, and one of the helpful and effective methods is utilization of the stored raw data and the statistical values

obtained by the analysis of them. The expert team recommends the systematic analysis of the monitoring data, and storage and utilization of the statistical values for the screening. The examples of screening and analysis method of monitoring data in Japan were introduced in the project, and the expert team hopes that NRL and MD will use them as reference.

6. Re-consideration of Monitoring: The expert team recommends re-considerations of present monitoring items and locations of stations after certain period like five years or so. The reason of the re-consideration is because there is a possibility of air pollution structure change after time going. Utilization of pollutant source inventory and simulation model is effective, and their preparation in parallel by organization or directorate in charge is also recommended. Generally, it is said that verification of simulation model results and understanding of air pollution structure through it are good utilizations of monitoring data. One of the methods for re-consideration is explained in the guideline, and the expert team hopes that it will be used by MD, NRL and the others as reference.
7. Dissemination to and Cooperation with LEPAs: The technical seminars and the training program to LEPA staff were implemented during the project period, and the expert team hopes NRL and MD to advance activities of technical transfer and dissemination to LEPA staff and strengthen the cooperative relationships with them. Holding seminars and programs at local authorities seems to be one of effective alternatives.
8. Necessary Equipment: The expert team also thinks that equipment necessary for increasing capability and instructing LEPA staff will be tried to purchase under certain budget plan. For an example, NRL does not own automatic continuous monitor at present, but the expert team considers it is desirable to own monitors and learn about operations and maintenances of them. The expert team thinks also that audit system of air quality monitoring network of LEPAs by NRL is worth considering. Calibrator/Dilutor and monitors with high performances are necessary for NRL to stand at high level position of traceability system of air quality monitoring.
9. National Monitoring Station/Site: Principally, local governments are responsible for implementation of air quality monitoring in Japan, but the Ministry of Environment also manages several national monitoring stations. It is recommended and one of very effective alternatives that some national monitoring stations/sites are established and use as reference stations or the places for research and development of new monitoring method.

The expert team reviews the successes of the project, and strongly hopes that the Romanian side will think about the recommendations above, and implement them in possible scope and manner.

List of Appendix

Appendix 1 Record of Discussion and Minutes of Meeting

Appendix 2 List of Annex

Appendix 1

Record of Discussion and Minutes of Meeting

COPY

RECORD OF DISCUSSION
BETWEEN
JAPAN INTERNATIONAL COOPERATION AGENCY AND
THE ROMANIAN MINISTRY OF ENVIRONMENT
AND WATERS MANAGEMENT
AND NATIONAL ENVIRONMENTAL PROTECTION AGENCY
ON JAPANESE TECHNICAL COOPERATION PROJECT FOR
THE PROJECT FOR STRENGTHENING THE AIR QUALITY MONITORING
CAPABILITY OF THE NATIONAL REFERENCE LABORATORY OF
THE NATIONAL ENVIRONMENTAL PROTECTION AGENCY IN ROMANIA

Based on the Minutes of Meeting signed on July 11th, 2006, between the Romanian authorities concerned and the Second Preparatory Study Team organized by Japan International Cooperation Agency (hereinafter referred to as "JICA"), Resident Representative of JICA/JOCV Romania Office and the Romanian authorities concerned had a series of discussions on desirable measures to be taken by JICA and Romanian Government for successful implementation of the Project for Strengthening The Air Quality Monitoring Capability of The National Reference Laboratory of National Environmental Protection Agency in Romania (hereinafter referred to as "the Project").

As a result of these discussions, the undersigned Romanian Authorities concerned and Resident Representative of JICA/JOCV Romania Office agreed the matters referred to in the document attached hereto.

Bucharest, November 1, 2006

Mr. MIYAGAWA Fumio Resident Representative JICA/JOCV Romania Office Japan International Cooperation Agency (JICA)	Mr. Attila KORODI Secretary of State Ministry of Environment and Waters Management of Romania (MEWM)
	Mr. Ioan GHERHEŞ President National Environmental Protection Agency (NEPA), MEWM

ATTACHED DOCUMENT

I. COOPERATION BETWEEN BOTH GOVERNMENTS

1. The Government of Romania will implement the Project in cooperation with JICA.

2. The Project will be implemented in accordance with the Master Plan which is given in Annex-I.

II. MEASURES TO BE TAKEN BY THE GOVERNMENT OF ROMANIA

1. The Government of Romania will take necessary measures to ensure that the self-reliant operation of the project will be sustained during and after the period of Japanese technical cooperation, through full and active involvement in the Project of all related authorities, beneficiary groups and institutions.

2. The Government of Romania will take necessary measures to ensure that the technologies and knowledge acquired by the Romanian nationals as a result of Japanese technical cooperation will contribute to the sustainable development of Romania.

3. The Government of Romania will grant in Romania privileges, exemptions and benefits to the Japanese experts referred in Annex-II and their families, according to Romanian laws.

4. The Government of Romania through National Environmental Protection Agency will take necessary measures to receive and use equipment provided through JICA, and also equipment, machinery and materials carried by the Japanese experts which are given in Annex-III.

5. The Government of Romania will take necessary measures to ensure that the knowledge and experience acquired by the Romanian personnel from technical training in Japan will be utilized effectively in the implementation of the Project.

6. The Government of Romania will provide the services of Romanian counterpart personnel as listed in Annex-IV.

7. The Government of Romania will provide the buildings and facilities as listed in Annex-V.

8. In accordance with the laws and regulations in force in Romania, the Government of Romania will take necessary measures to supply or replace at its own expense machinery, equipment, instruments, vehicles, tools, spare parts and any other materials necessary for the implementation of the Project other than the Equipment provided by JICA under III-2 below.

9. In accordance with the laws and regulations in force in Romania, the Government of Romania will take necessary measures to meet the running expenses necessary for the implementation of the Project.

III. MEASURES TO BE TAKEN BY JICA

1. DISPATCH OF JAPANESE EXPERTS TEAM

JICA will provide the services of the Japanese experts. The fields of the experts are shown in Annex-II.

2. PROVISION OF MACHINERY AND EQUIPMENT

JICA will provide machinery, equipment and other materials (hereinafter referred to as "the Equipment") necessary for the implementation of the Project within the budget allocated for the technical cooperation. The list of the Equipment is shown in Annex-III. The details and contents of the equipment will be discussed between the Romanian and the Japanese sides.

IV. ADMINISTRATION OF THE PROJECT

1. Secretary of State of the Ministry of Environment and Waters Management as the Project Director will bear overall responsibility for the administration of the Project.

2. President of the National Environmental Protection Agency (NEPA) as the Project Manager will be responsible for the managerial and technical matters of the Project.

3. The JICA Experts Team will provide necessary recommendations and advice to the Project Director and the Project Manager on any matters pertaining to the

implementation of the Project.

4. The JICA Experts Team will provide necessary technical guidance and advice to the Romanian counterpart personnel on technical matters pertaining to the implementation of the Project.

5. The Joint Coordinating Committee (hereinafter referred to as "JCC"), which consists of both the Romanian side and the Japanese side, will be established for the effective and successful implementation of technical cooperation of the Project. The Meeting of the JCC will be held at least once a year or whenever necessity arises. The functions and composition are described in Annex-VI.

V. JOINT EVALUATION

Evaluation of the Project will be conducted jointly by the Romanian authorities concerned and JICA during the last six months of the cooperation term in order to examine the level of achievement.

VI. CLAIMS AGAINST JICA EXPERTS

The Government of Romania undertakes to bear claims, if any arises, against the JICA experts engaged in technical cooperation for the Project resulting from, occurring in the course of, or otherwise connected with the discharge of their official functions in Romania except for those arising from the willful misconduct or gross negligence of the Japanese experts.

VII. MEASURES TO PROMOTE UNDERSTANDING AND SUPPORT FOR THE PROJECT

For the purpose of promoting support for the Project among the people of Romania, the Government of Romania will take appropriate measures, such as web pages, to make the Project widely known to the people of Romania.

VIII. TERM OF COOPERATION

The duration of technical cooperation for the Project under this Attached Document will be two (2) years from Januraty, 2007

IX. MUTUAL CONSULTATION

There will be mutual consultation between JICA and Romanian Government on any major issues arising from, or in connection with, this Attached Document.

LIST OF ANNEX

ANNEX-I MASTER PLAN

ANNEX-II LIST OF JAPANESE EXPERTS

ANNEX-III LIST OF MACHINERY AND EQUIPMENT

ANNEX-IV LIST OF ROMANIAN COUNTERPART

ANNEX-V LIST OF LAND, BUILDING AND FACILITIES

ANNEX-VI JOINT COORDINATING COMMITTEE

ANNEX-1 MASTER PLAN

Overall Goal

1. Air Quality Monitoring System with reliable accuracy is introduced and disseminated to all LEPAs for monitoring the national air quality level.

Project Purpose

To strengthen the Air Quality Monitoring capability of the Monitoring, Synthesis and Coordination General Directorate of NEPA (the National Reference Laboratory (NRL) and Monitoring Directorate), and supporting ability to LEPAs

Output of the Project

1. Standard Operation Procedure according to the EU and the Romanian standards relating Air Quality Monitoring is developed and disseminated to LEPAs' laboratories
2. NRL performs Air Quality Monitoring correctly according to SOP
3. NRL equipment is properly maintained and managed by laboratory staff themselves with aim of acquisition of accreditation of ISO17025
4. Air Quality Monitoring data is accumulated and properly managed in order to make use of environmental policy and to open to public etc.
5. NRL and Monitoring Directorate of NEPA prepare guideline for Air Quality Monitoring strategic plan of LEPAs
6. NRL staff is able to organize training programs for LEPA staff

Activities of the Project

1.1 Define and clarify processes for preparing and developing SOP
1.2 Analyze the EU and the Romanian standards for preparation of SOP
1.3 Decide the concepts and contents of SOP
1.4 Examine the reference methods through workshops/consultation meetings
1.5 Compile the SOP for sampling, analysis, calibrations, data interpretation, data filing and reporting
1.6 Prepare for dissemination seminars
1.7 Implement seminars on SOP for LEPAs' staff

2-1 Implement training in theory for making Air Quality Monitoring plans, sampling, analysis, calibration, data interpretation, evaluation, data filing and reporting.
2-2 Implement On-the-job training in sampling, analysis, calibration, data interpretation,

6-5 Evaluation of the training is conducted

ANNEX-II LIST OF JAPANESE EXPERTS

The experts, who will be in charge of the following fields, will be dispatched:

1) Team Leader/Air Quality Monitoring
2) Monitoring Equipment
3) Laboratory Management
4) Laboratory Equipment (AAS)
5) Laboratory Equipment (GC)
6) Monitoring Database

ANNEX-III LIST OF MACHINERY AND EQUIPMENT

The following equipment, if necessary, will be provided for the implementation of the Project. The detailed contents, specification and quantity of the following equipment will be subject to budget approval.

1. Supplementary equipment for analysis of air quality.
2. Supplementary calibration equipment for air quality monitoring station

ANNEX-IV LIST OF ROMANIAN COUNTERPART

(1) Project Director:

Secretary of State of the Ministry of Environment and Waters Management (MEWM)

(2) Project Manager:

President of the National Environmental Protection Agency (NEPA)

(3) Coordinator:

General Director of the Monitoring, Synthesis and Coordination General Directorate of National Environmental Protection Agency (NEPA) – Ms. Corina Lupu

(4) Counterpart personnel

【NEPA – NRL】

1)	Leader:	Ms.Crina Hotoiu
2)	Laboratory Management:	Ms. Iulia Neacsu Ms. Rodica Muresan
3)	Laboratory Equipment (AAS):	Ms. Cristina Negulescu Ms. Mioara Serban
4)	Laboratory Equipment (GC):	Ms. Popescu Luminita Ms. Adriana Mrejeru
5)	Laboratory Equipment (Ion Chromatography):	Ms. Ilie Alina Ms. Mihaela Feraru
6)	Laboratory Calibration:	Mr. Cristian Capitanescu
7)	Laboratory Database:	Ms. Corina Cristea

【NEPA - Monitoring Directorate】

1)	Sub-leader and Monitoring Equipment:	Ms. Corina Rugina
2)	Monitoring Database:	Ms. Patricia Lungu Ms. Antonia Dumitrescu Ms. Vlad Ghiuta Taralunga

ANNEX-V LIST OF LAND, BUILDINGS AND FACILITIES

The following will be prepared by the Government of Romania for the implementation of the Project.

1. The land, buildings and facilities necessary for the implementation of the Project, including electricity, water supply and air conditioning facilities. The principal facilities which are necessary to implement the Project are as follows:

a. Japanese experts' room with telecommunication facilities and furniture

b. Meeting room

ANNEX-VI JOINT COORDINATING COMMITTEE

1. Functions

(1) To formulate the annual operational work plan of the Project based on the schedule of implementation within the framework of the Record of Discussions (R/D),

(2) To review the overall progress and achievements of the Project,

(3) To work out the modification of activities depending on the necessity, and

(4) To review and exchange opinions on major issues arising during the implementation of the Project.

2. Composition

(1) Chairperson

Secretary of State of the Ministry of Environment and Water Management (Project Director)

(2) Members

Romanian side

- Representatives of the NEPA (Project Manager)
- Representatives of REPA, LEPA (relating EU PHARE PROJECT)
- Representatives of the NEG

(As Guest Representatives)

- A representative from the Ministry of Administration and Internal Affairs
- A representative from the Ministry of Economy and Trade
- A representative from the Ministry of Health
- A representative from the Ministry of Agriculture, Forests and Rural Development
- Representatives of other relating Ministries and Agencies (if necessary)

Japanese side

- Japanese Experts
- Representatives of JICA/JOCV Romania Office
- Members of JICA advisory team, to be dispatched when necessary

Note: Official(s) of the Embassy of Japan in Romania and Representatives of European Commission in Romania may attend the Joint Coordinating Committee as observer(s).

COPY

MINUTES OF MEETINGS
BETWEEN
JAPAN INTERNATIONAL COOPERATION AGENCY
AND
THE ROMANIAN MINISTRY OF ENVIRONMENT AND WATERS MANAGEMENT
AND NATIONAL ENVIRONMENTAL PROTECTION AGENCY
ON THE PROJECT FOR STRENGTHENING THE AIR QUALITY MONITORING CAPABILITY OF THE NATIONAL REFERENCE LABORATORY OF THE NATIONAL ENVIRONMENTAL PROTECTION AGENCY IN ROMANIA

Japan International Cooperation Agency (hereinafter referred to as "JICA") had a series of discussions and exchange of views, through the Resident Representative of JICA/JOCV Romania Office, with the Romanian Authorities concerned on desirable measures to be taken by JICA and Romanian Government for successful implementation of the Project for Strengthening The Air Quality Monitoring Capability of The National Reference Laboratory of National Environmental Protection Agency in Romania (hereinafter referred to as "the Project").

As a result of discussions, the Romanian Authorities concerned and JICA agreed to summarize the matters referred to in the document attached hereto as a supplement to the Record of Discussions (hereinafter referred to as "R/D").

Bucharest, November 1, 2006

Mr. MIYAGAWA Fumio
Resident Representative
JICA/JOCV Romania Office
Japan International Cooperation Agency
(JICA)

Mr. Attila KORODI
Secretary of State
Ministry of Environment and Waters
Management of Romania (MEWM)

Mr. Ioan GHERHES
President
National Environmental Protection
Agency (NEPA), MEWM

Issues for special consideration

I. PROJECT DESIGN MATRIX (PDM) and PLAN OF OPERATION

The Japanese side explained that the PDM is to be introduced for the efficient and effective management and evaluation of the Project. Both sides agreed to adopt the PDM to the Project as shown in the Annex-I. Plan of Operation based on the PDM is shown in the Annex-II. The PDM will be finalized in the first Joint Coordinating Committee which is to be held shortly after the commencement of the Project.

II. INFORMATION DISCLOSURE

Both sides agreed that information disclosure shall be implemented by MEWM, NEPA and JICA. JICA explained that information disclosure is necessary as this shall confirm the alternatives with the participation of the stakeholders early on in the conduct of the Project. JICA also emphasized that JICA will make the reports concerning the Project open to the public.

III. Coordination with the PHARE 2004 Programme

Under the PHARE 2004 Programme, "Implementation and Enforcement of the Environmental Acquis Focused on Air Quality" and "Implementation and Enforcement of the Environmental Acquis at National Level and Coordination of the Other 8 Regional Twinning Projects." Twinning Projects started in 2005 at REPA Cluj and NEPA, respectively, with the aim of strengthening the institutional capacities at national, regional and local levels, and supporting Romanian environmental authorities in implementing, monitoring and enforcing transposed environmental legislation. It is essential that the Project should be pursued under close coordination with the EU Twinning Projects.

ANNEX I	PROJECT DESIGN MATRIX
ANNEX II	PLAN OF OPERATIONS

ANNEX-VII Project Design Matrix (PDM) ver.7 Oct 10th 2006

Project Title: The Project for Strengthening the Air Quality Monitoring Capability of the National Reference Laboratory of National Environmental Protection Agency in Romania

Duration of the Project 2 years *Target Area: Romania*

Target Group: The Monitoring, Synthesis and Coordination General Directorate of National Environmental Protection Agency (NEPA)

Narrative Summary	Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal of the Project			
1. Air Quality Monitoring System with reliable accuracy is introduced and disseminated to all LEPAs for monitoring the national air quality level.	1. All LEPAs perform Air Quality Monitoring on regular basis according to the monitoring strategic plan formulated by themselves by 3 years after the completion of the project 2. Results of the Air Quality Monitoring is continuously issued and opened to public as an annual report by NEPA	1. Regular Air Quality Monitoring reports submitted by ALL LEPAs 2. Annual Report issued by NEPA	1. The Romanian government keeps it's policy support for NRL 2. NRL is able to obtain technical assistance from EU/other donors after termination of the project
Purpose of the Project			
To strengthen the Air Quality Monitoring[1] capability of the Monitoring, Synthesis and Coordination General Directorate of NEPA (the National Reference Laboratory (NRL) and Monitoring Directorate), and supporting ability to LEPAs	1 NRL's Supporting Mechanism for LEPAs is ready to work 2 NRL can perform the Air Quality Monitoring according to the EU and the Romanian standards. 3 NRL can conduct organized and authorized training program	1. Supporting program for LEPAs 2. Report of the Air Quality Monitoring 3. Training materials, programs, and plans developed by NRL	1. The Romanian government keeps it's policy support for NRL
Outputs from the Project			
1. Standard Operation Procedure (SOP) according to the EU and the Romanian standards relating Air Quality Monitoring is developed and disseminated to LEPAs' laboratories	1-1 SOPs[2] according to the EU and the Romanian standards authorized by NEPA 1-2 Seminars/Workshops for LEPAs about SOP are held by NRL	1-1 SOP documents 1-2 Report of the seminars/workshops	
2. NRL performs Air Quality Monitoring correctly according to SOP	2-1 Air Quality samples are properly collected and analyzed based on SOP during the project implementation period 2-2 Air Quality Parameters are properly analyzed and calibrated based on SOP during the project implementation period. 2-3 Cross check for the basic parameters (ex. CO and O3) are introduced	2-1 Observation of sampling activities based on the checklist 2-2 Observation and data check based on the checklist 2-3 Cross check report	Execution instructions are promulgated

Narrative Summary	Verifiable Indicators	Means of Verification	Important Assumptions
3. NRL equipment is properly maintained and managed by laboratory staff themselves with aim of acquisition of accreditation of ISO17025	3-1 All NRL staff maintain the equipment regularly 3-2 Spare parts and consumable materials management system is established during the project implementation period 3-3 Chemical reagents are properly stored and cared according to the operation and maintenance (o/m) manual during the project implementation period 3-4 Liquid and solid wastes from laboratory are properly treated according to the o/m manual during the project implementation period 3-5 Safety and health control system is established 3-6 Documentation system is established 3-7 NRL prepares it's budget plan for Air Quality Monitoring	3-1 Maintenance record book 3-2 Spare parts and consumable materials list 3-3 O/m record 3-4 O/m record 3-5 Safety and health control record 3-6 Documentation and files 3-7 Annual budget of NRL	
4. Air Quality Monitoring data is accumulated and properly managed in order to make use of environmental policy and to open to public etc.	4-1 Data format and reporting format for Air Quality Monitoring are improved 4-2 Data management and analysis of Air Quality Monitoring is improved	4-1 Data format and reporting format 4-2 Compilation and analyzed results of Air Quality Monitoring Data	
5. NRL and Monitoring Directorate of NEPA prepare guideline for Air Quality Monitoring strategic plan[2)] of LEPAs	5-1 Guideline for Air Quality Monitoring strategic plan is prepared 5-2 Explanation meeting of Guideline for Air Quality Monitoring strategic plan is held	5-1 Guideline for Air Quality Monitoring strategic plan 5-2 Explanation meeting report	
6. NRL staff is able to organize training programs for LEPA staff	6-1 Training program is developed on needs assessment 6-2 Training materials are prepared 6-3 Training by NRL staff themselves is implemented	6-1 Training program based on needs assessment 6-2 Training materials 6-3 Training record	

Activities of the Project	Input of the Project Japanese Side	Inputs of the Project Romanian Side	Important Assumptions
1.1 Define and clarify processes for preparing and developing SOP 1.2 Analyze the EU and the Romanian standards for preparation of SOP 1.3 Decide the concepts and contents of SOP 1.4 Examine the reference methods through workshops/consultation meetings 1.5 Compile the SOP for sampling, analysis, calibrations, data interpretation, data filing and reporting 1.6 Prepare for dissemination seminars 1.7 Implement seminars on SOP for LEPAs' staff 2-1 Implement training in theory for making Air Quality Monitoring plans, sampling, analysis, calibration, data interpretation, evaluation, data filing and reporting 2-2 Implement On site On-the-job training in sampling, analysis, calibration, data interpretation, evaluation, data filing and reporting. 2-3 Cross check programs for CO and O3 etc. are implemented 3-1 Assess management procedures and conditions of equipment, spare parts, reagents, liquid and solid laboratory waste, safety and health control, documents and files 3-2 Compile the laboratory o/m manual[4] for equipment, spare parts preparation, reagents storage and treatment, liquid and solid laboratory waste treatment, safety and health control, and document system 3-3 Implement On-the-job trainings based on the o/m manual 3-4 Prepare a NRL budget plan for Air Quality Monitoring	Japanese Side Inputs (1) Dispatch of Experts Team (2) Provision of necessary equipment (3) Training for NRL and Monitoring Directorate staff in Romania (4) Training for NRL staff in Japan	Romanian Side Inputs: (1) Land, building, laboratories, office space and other necessary facilities for the project. (2) Assignment of counterparts and administrative personnel (3) Running expenses for the implementation of the project including consumables, fuels, training costs etc.	NRL and Monitoring Directorate staff trained by the project keep working at the same organization. Suppliers timely provide spare parts and reagents for the equipment.

4-1 Assess data format and reporting format, data management system including database, data analysis procedures 4-2 Improve the data and reporting format, the data management system and the data analysis procedures 5-1 Assess the Air Quality Monitoring strategy plans of LEPAs and clarify the issues. 5-2 Make guideline for the Air Quality Monitoring strategy plan 5-3 Implement explanation meetings with LEPAs and NRL 6-1 Training Needs Assessment for LEPA staff is implemented 6-2 Training program is formulated 6-3 Training materials are prepared 6-4 Training is implemented 6-5 Evaluation of the training is conducted			**Pre-conditions** 1. Appropriate number of laboratory staff who have chemical background are assigned in the laboratory. 2. Adequate waste water treatment of NRL shall be prepared

Notes

1) In this PDM, The "Air Quality Monitoring" means analytical sampling / measurement, automatic monitoring calibration, data management of automatic and analytical monitoring.

2) Strategic Plan is a monitoring plan made by LEPAs including location of sampling points, parameters and other factors of Air Quality Monitoring

3) SOPs includes calibration for SO_2, NO, NO_2, NOx, CO, O_3, analytical sampling/measurement for SO_2, NO_2, Benzene, PM10, PM2.5, Pb, H_2S, NH_3

Abbreviations

SOP: Standard Operation Procedures

o/m manual: Operation and Maintenance manual

Project Title: The Project for Strengthening the Air Quality Monitoring Capability of the National Reference Laboratory of National Environmental Protection Agency in Romania

Duration of the Project: 2 years
Target Area: Romania
Target Group: The Monitoring, Synthesis and Coordination General Directorate of National Environmental Protection Agency (NEPA)
Project Purpose: To strengthen the Air Quality Monitoring (analytical sampling / measurement, automatic monitoring calibration, data management of automatic and analytical monitoring) capability of the Monitoring, Synthesis and Coordination General Directorate of NEPA (the National Reference Laboratory (NRL) and Monitoring Directorate), and supporting ability to LEPAs

Outputs	Activities	Expected Results	Japanese Experts	Romanian C/P	Schedule								
					2006	2007				2008			
					Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
Pre Conditions	1. Appropriate number of laboratory staff who have chemical background are assigned in the laboratory	C/P staff with required background	-Team Leader/Air Quality Monitoring	-C/P Leader									
	2. Adequate waste water treatment of NRL shall be prepared	Treatment of laboratory waste water	-Team Leader/Air Quality Monitoring	-C/P Leader									
1. Standard Operation Procedure[1] according to the EU and the Romanian standards relating Air Quality Monitoring[2] is developed and disseminated to LEPAs' laboratories	1.1 Define and clarify processes for preparing and developing SOP	Working process and schedule	-Team Leader/Air Quality Monitoring -Monitoring Equipment -Laboratory Management	-Monitoring Equipment									
	1.2 Analyze the EU and the Romanian standards for preparation of SOP	List of monitoring and analysis methods for air quality	-Monitoring Equipment -Laboratory Management -Laboratory Equipment (AAS) -Laboratory Equipment (GC)	-Monitoring Equipment -Laboratory Management -Laboratory Equipment (AAS) -Laboratory Equipment (GC)									
	1.3 Decide the concept and contents of SOP	Contents and Format of SOP	-Team Leader/Air Quality Monitoring -Monitoring Equipment -Laboratory Management	-C/P Leader -Laboratory Management									

	1.4 Examine the reference methods through workshop/consultation meetings	Methods of monitoring and analysis for air quality	-Monitoring Equipment -Laboratory Management Laboratory Equipment (AAS) -Laboratory Equipment (GC)	-Monitoring Equipment -Laboratory Management -Laboratory Equipment (AAS) -Laboratory Equipment (GC)			■						
	1.5 Compile the SOP for sampling, analysis calibration, interpretation, data filing and reporting	SOPs	-Monitoring Equipment -Laboratory Management -Laboratory Equipment (AAS) -Laboratory Equipment (GC)	-Monitoring Equipment -Laboratory Management -Laboratory Equipment (AAS) -Laboratory Equipment (GC)			■	■					
	1.6 Prepare for dissemination seminars	Dissemination materials of Air Quality Monitoring and analysis for LEPAs	-Monitoring Equipment -Laboratory Management -Laboratory Equipment (AAS) -Laboratory Equipment (GC)	-Monitoring Equipment -Laboratory Management -Laboratory Equipment (AAS) -Laboratory Equipment (GC)				■	■				
	1.7 Implement Seminars on SOP for LEPAs' staff	Seminars	-Team Leader/Air Quality -Monitoring Equipment Laboratory Management Laboratory Equipment (AAS)-Laboratory Equipment (GC)	-C/P Leader Monitoring Equipment -Laboratory Management -Laboratory Equipment (AAS) -Laboratory Equipment (GC)					■	■			
2. NRL performs Air Quality Monitoring correctly according to SOP	2.1 Implement training in theory for making Air Quality Monitoring plans, sampling analysis calibration data interpretation, evaluation data filing and reporting.	Training program. On the job training and off the job training	-Monitoring Equipment -Laboratory Management -Laboratory Equipment (AAS) -Laboratory Equipment (GC)	Monitoring Equipment -Laboratory Management -Laboratory Equipment (AAS) -Laboratory Equipment (GC)			■	■	■	■	■		

	2-2 implement On site On-the-job training in sampling analysis, calibration, data interpretation evaluation, data filing and reporting	Training program, On the job training	-Monitoring Equipment -Laboratory Management -Laboratory Equipment (AAS) -Laboratory Equipment (GC)	-Monitoring Equipment -Laboratory Management -Laboratory Equipment (AAS) -Laboratory Equipment (GC)			■	■	■	■	■		
	2-3 Cross check programs for CO and O3 etc. are implemented.	Cross check report	-Team Leader/Air Quality -Monitoring Equipment -Laboratory Management	-C/P Leader -Monitoring Equipment -Laboratory Management					■		■		■
3. NRL equipment is properly maintained and managed by laboratory staff themselves with aim of acquisition of accreditation of ISO17025	3-1 Assess management procedures and conditions of equipment, spare parts, reagents, liquid and solid laboratory waste, safety and health control, documents and files	Assessment reports for the following items -Equipment -Spare parts -Chemical reagents -Other consumables -Liquid and solid waste -Safety and health control system -Documentation system	-Team Leader/Air Quality -Monitoring Equipment -Laboratory Management -Monitoring Data Management	- C/P Leader -Laboratory Management -Monitoring Data Management		■							
	3-2 Compile the laboratory o/m manual for equipment, spare parts preparation, reagents storage and treatment, liquid and solid laboratory waste treatment, safety and health control, and document system	Quality manuals for the following items -Equipment -Spare parts -Chemical reagents -Other consumables -Liquid and solid waste -Safety and health control system -Documentation system	-Team Leader/Air Quality -Monitoring Equipment -Laboratory Management -Monitoring Data Management	- C/P Leader -Laboratory Management -Monitoring Data Management			■	■					
	3-3 Implement On-the-job trainings based on the o/m manual	Record of implementation	-Team Leader/Air Quality -Monitoring Equipment -Laboratory Management -Monitoring Data Management	- C/P Leader -Laboratory Management -Monitoring Data Management				■	■		■	■	■
	3-4 Prepare a NRL budget plan for Air Quality Monitoring.	NRL budget plan	-Team Leader	C/P Leader		■	■	■	■				

4. Air Quality Monitoring data is accumulated and properly managed in order to make use of environmental policy and to open to public etc.	4-1 Assess data format and reporting format, data management system including database, data analysis procedures	Assessment reports	-Team Leader/Air Quality Monitoring -Monitoring Equipment -Laboratory Management -Monitoring Data Management	-C/P Leader -Monitoring Equipment -Monitoring Data Management			■						
	4-2 Improve the data and reporting format, the data management system and the data analysis procedures	Guideline for the data management system and data analysis procedures	-Team Leader/Air Quality Monitoring -Monitoring Equipment -Monitoring Data Management	-C/P Leader -Monitoring Equipment -Monitoring Data Management				■			■		
5. NRL and Monitoring Directorate of NEPA prepare guideline for Air Quality Monitoring strategic plan[3] of LEPAs	5-1 Assess the Air Quality Monitoring strategy plans of LEPAs and clarify the issues.	Assessment reports of strategy plans of LEPAs	-Team Leader/Air Quality Monitoring - Monitoring equipment -Laboratory Equipment	-C/P Leader -Monitoring Equipment -Laboratory Management		■							
	5-2 Make guideline for the Air Quality Monitoring strategy plan	Guideline for Air Quality Monitoring planning	-Team Leader/Air Quality Monitoring -Monitoring Equipment -Laboratory Management	-C/P Leader -Monitoring Equipment -Laboratory Management			■	■					
	5-3 Implement explanation meetings with LEPAs and NRL	Explanation meeting report	-Team Leader/Air Quality Monitoring -Monitoring equipment -Laboratory Management	-C/P Leader -Monitoring Equipment -Laboratory Management					■				
6. NRL staff is able to organize training programs for LEPA staff	6-1 Training Needs Assessment for LEPA staff is implemented	Report of Training Needs Assessment	-Team Leader -Monitoring Equipment -Laboratory Management	-C/P Leader -Laboratory Management		■							

	6-2 Training program is formulated	Training program	-Team Leader -Monitoring Equipment / Laboratory Management	-C/P Leader -Laboratory Management		■							
	6-3 Training materials are prepared	Training materials	-Monitoring Equipment -Laboratory Management -Laboratory Equipment (AAS) -Laboratory Equipment (GC) -Monitoring Data Management	-Monitoring Equipment -Laboratory Management -Laboratory Equipment (AAS) -Laboratory Equipment (GC) - Monitoring Data Management			■	■					
	6-4 Training is implemented	On the job training and off the job training	-Monitoring Equipment / Laboratory Management -Laboratory Equipment (AAS) -Laboratory Equipment (GC) -Monitoring Data Management	-Monitoring Equipment -Laboratory Management -Laboratory Equipment (AAS) -Laboratory Equipment (GC) - Monitoring Data Management					■	■	■		■
	6-5 Evaluation of the training is conducted	Evaluation report of C/P training improved programs and materials	-Monitoring Equipment -Laboratory Management -Laboratory Equipment (AAS) -Laboratory Equipment (GC) -Monitoring Data Management	-Monitoring Equipment -Laboratory Management -Laboratory Equipment (AAS) -Laboratory Equipment (GC) - Monitoring Data Management					■	■	■	■	

Notes

1) SOPs includes calibration for SO2, NO, NO2, NOx, CO, O3, analytical sampling/measurement for SO2, NO2, Benzene, PM10, PM2.5, Pb, H2S, NH3.

2) In this PDM, The "Air Quality Monitoring" means analytical sampling / measurement, automatic monitoring calibration, data management of automatic and analytical monitoring.

3) Strategic Plan is a monitoring plan made by LEPAs including location of sampling points, parameters and other factors of Air Quality Monitoring

Abbreviations

SOP: Standard Operation Procedures

o/m manual: Operation and Maintenance manual

MINUTES OF MEETING BETWEEN
JAPAN INTERNATIONAL COOPERATION AGENCY AND
THE ROMANIAN MINISTRY OF ENVIRONMENT
AND WATER MANAGEMENT AND
NATIONAL ENVIRONMENTAL PROTECTION AGENCY ON
JAPANESE TECHNICAL COOPERATION FOR
THE PROJECT FOR STRENGTHENING THE AIR QUALITY MONITORING
CAPABILITY OF NATIONAL REFERENCE LABORATORY OF NATIONAL
ENVIRONMENTAL PROTECTION AGENCY IN ROMANIA

The Japanese Project Consultation Team (hereinafter referred to as "the Team") organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA") visited Romania from January 15, 2007 to January 24, 2007 for the purpose of building a basic consensus about the Project Document and schedule of "the Project for Strengthening the Air Quality Monitoring Capability of National Reference Laboratory of National Environmental Protection Agency in Romania" (hereinafter referred to as "the Project").

During its stay in Romania, the Team exchanged views and had a series of discussions with Ministry of Environment and Waters Management (hereinafter referred to as "MEWM"), and National Environmental Protection Agency (hereinafter referred to as "NEPA") based on the Project Document submitted by the JICA Expert Team. As a result of discussions, and in accordance with the provisions of the Record of Discussions between Japanese Preparatory Study Team and the Authorities concerned of the Government of Romania signed on November 1, 2006 (hereinafter referred to as "the R/D"), both Japanese and Romanian sides agreed on the basic policy of the Project and matters referred to in the document attached hereto.

Bucharest, January 23, 2007

田中研一

Mr. TANAKA Kenichi
Leader, Project Consultation Team,
Japan International Cooperation Agency
(JICA)

Mr. Attila KORODI
Secretary of State
Ministry of Environment and Water Management of Romania (MEWM)
Bucharest, January 29, 2007

深山暁生

Mr. FUKAYAMA Akeo
Chief Advisor
JICA Expert Team

Mr. Ioan GHERHEŞ
President
National Environmental Protection Agency (NEPA)

THE ATTACHED DOCUMENT

I. PROJECT DOCUMENT

Both sides agreed, in principle, on the contents of the Project Document. Some detail parts of the document shall be revised and finalized by the First Joint Coordinating Committee.

II. THE FIRST JOINT COORDINATING COMMITTEE (JCC)

The 1st JCC shall be held at the beginning of March, 2007.

III. TENTATIVE DETAILED SCHEDULE PLAN OF OPERATION (PO)

	Assign		2007												2008											
	Expert	C/P	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
The First Fiscal Year of JICA : January 2007-March 2007																										
The first field services																										
(1) Joint Coordinating Committee	◎	○																								
(1) Explanation and Discussion of Project Document	◎	○																								
(1-1) Equipment Purchasement	◎	○																								
(2) Collection of Baseline Data	◎	○																								
(3) SOP Making	◎	○																								
(4) Support for Strengthening for NRL Staff Capability of Air Quality Monitoring	◎	○																								
(5) Support for Acquisition of Accreditation of ISO17025	◎	○																								
(6) Evaluation of Present Condition of MD on Data Management	◎	○																								
(7) Support for Guidelines Making on LEPAs Air Quality Monitoring Strategic Plan	◎	○																								
The Second Fiscal Year of JICA : April,2007-March,2008																										
The second field services																										
(8) Joint Coordinating Committee	◎	○																								
(8-1) Equipment Purchasement	◎	○																								
(9) Support for SOP Making	○	○																								
(10) Support for Strengthening for NRL Staff Capability of Air Quality Monitoring	○	○																								
(11) Support for Acquisition of Accreditation of ISO17025	○	○																								
(12) Support for Strengthening MD Staff Capability of Data Management	○	○																								
(13) Support for Guidelines Making on LEPAs Air Quality Monitoring Strategic Plan	○	○																								
(14) Support for Strengthening NRL Staff Capability of Training Program Planning and Implementation	○	○																								
(15) Joint Coordinating Committee	◎	○																								
The Third Fiscal Year of JICA : April,2008-December,2008																										
The second field services																										
(16) Joint Coordinating Committee	◎	○																								
(17) Support for SOP Making and Dissemination	○	◎																								
(18) Support for Strengthening for NRL Staff Capability of Air Quality Monitoring	○	◎																								
(19) Support for Acquisition of Accreditation of ISO17025	○	◎																								
(20) Support for Strengthening MD Staff Capability of Data Management	○	◎																								
(21) Support for Guidelines Making and Dissemination on LEPAs Air Quality Monitoring Strategic Plan	○	◎																								
(22) Support for Strengthening NRL Staff Capability of Training Program Planning and Implementation	○	◎																								
Seminar	◎	○																								
Report	◎																									
A.Fukayama Chief Adviser/Air Quality Monitoring																										
T.Ochi Monitoring Equipment (Automatic Monitoring)																										
M.Fujimura Laboratory Management																										
N.Sawaki Laboratory Equipment (AAS)																										
N.Maeda Laboratory Equipment (GC)																										
F.Kuwahara Monitoring Data Base																										
A.Murai Coordinator																										
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
			2007												2008											

Legend: MD Monitoring Direct ◎ Primary ○ Support ▇ Activity in Rumania

IV. ASSIGNED STAFF AND JICA EXPERTS

Project Director: Mr. Attila KORODI

Secretary of State of the Ministry of Environment and Waters Management (MEWM)

Project Manager: Mr. Ioan GHERHEŞ

President of the National Environmental Protection Agency (NEPA)

Project Coordinator from the MEWM:

Ms. Dorina MOCANU

Chief of Atmospheric Protection Department

Project Coordinator from the NEPA:

Ms. Corina LUPU

General Director of Monitoring, Synthesis and Coordination General Directorate

No.	Field	NEPA Assigned Staff	JICA Expert team
1.	Chief Advisor/Air Quality Monitoring	Ms. Crina HOTOIU Ms. Corina RUGINA Ms. Iulia NEACSU	FUKAYAMA Akeo
2.	Monitoring Equipment	Ms. Violeta BALACEANU Ms. Elena TIGARIDIS	OCHI Toshiharu
3.	Laboratory Management	Ms. Rodica MURESAN Ms. Iulia NEACSU	FUJIMURA Mitsuru
4.	Laboratory Equipment (AAS, UV-VIS)	Ms. Cristina NEGULESCU Ms. Mioara SERBAN Ms. Alina ILIE	SAWAKI Natsuji
5.	Laboratory Equipment (GC, IC)	Ms. Luminita POPESCU Ms. Alina ILIE	MAEDA Naomi

6.	Monitoring Database	Ms. Corina CRISTEA Ms. Corina RUGINA Ms. Antonia DUMITRESCU Ms. Patricia LUNGU Mr. Vlad Ioan GHIUTA TARALUNGA Ms. Mihaela CALIN	KUWAHARA Fumihiko
7.	Administrator	Ms. Rodica MURESAN	MURAI Atsushi

V. OTHERS

1. The Romanian Undertakings

The Romanian C/Ps will be responsible for providing the following items for smooth and fruitful project implementation.

1 -1. Human Resources

During the stay of the Japanese expert team in Romania, it is desirable that C/Ps to each field will be full time assigned.

The Romanian C/Ps will support the expert team to connect and communicate with REPAs, LEPAs, and the other related organizations, at least one C/Ps will accompany the expert team in principle.

The tasks, procedures or training items necessary for the project implementation will be implemented by the C/Ps themselves in case of absence of the expert team.

1- 2 . Materials and Information

Materials and information necessary for the project implementation will be provided to the expert team with free of charge in principle.

The necessary materials and information assumed by the JICA experts are the Romanian and EU standard methods, manuals of equipment, and existing SOPs.

1- 3 . Budget Preparation

Necessary budget for operational cost such as chemical reagents, consumables, and glass wares etc. will be prepared in advance.

The cost for accompanying to the other organizations or local agencies etc. and participants from LEPAs to seminar or workshops etc. will be prepared by the Romanian side.

2. Importance of ISO17025

Mr. Ioan GHERHEŞ mentioned that acquisition of ISO17025 is a very important issue for NEPA and strongly requested the JICA expert team to provide technical assistance focusing on this matter.

Japanese side explained the necessity of several phases for ISO17025 acquisition and expressed its desire to make efforts to support NEPA in the preparation stage of this matter.

3. Submitting Schedule of the Reports

Both JICA experts and Romanian counterparts will summarize their activities in the Progress Reports/Final Report every six months and submit them to the parties involved two weeks before the JCC meetings.

The schedule of the submission of each reports is as follows :

Project Document:	January 2007
Progress Report 1:	September 2007
Progress Report 2:	March 2008
Progress Report 3:	September 2008
Final Report:	December 2008

MINUTES OF MEETING
ON
THE FIRST JOINT COORDINATING COMMITTEE
OF
THE PROJECT FOR STRENGTHENING THE AIR QUALITY MONITORING CAPABILITY OF THE NATIONAL REFERENCE LABORATORY OF THE NATIONAL ENVIRONMENTAL PROTECTION AGENCY IN ROMANIA

MINISTRY OF ENVIRONMENT AND SUSTAINABLE DEVELOPMENT
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

Bucharest, May 30, 2007

Mr. Silviu STOICA
Secretary of State
Ministry of Environment and Sustainable Development (MESD)

Mr. Fumio MIYAGAWA
Resident Representative
JICA/JOCV Romania Office

Mr. Akeo FUKAYAMA
Chief Adviser
JICA Expert Team

In accordance with the Minutes of Meeting for "The Project for Strengthening the Air Quality Monitoring Capability of National Reference Laboratory of National Environmental Protection Agency in Romania" (hereinafter referred to as "the Project") agreed upon by the Ministry of Environment and Waters Management, the National Environmental Protection Agency (NEPA) and Japan International Cooperation Agency (JICA) on January 23, 2007, the revised and finalized version of the Project Document (PD) was discussed and approved during the 1st Joint Coordinating Committee (JCC). The list of attendees is attached as Annex.

The main points discussed were:

1. Opening

Mr. Silviu Stoica, Secretary of State, stressed the importance of communication and active involvement on both sides, emphasizing the central role that the good cooperation between NEPA and the Japanese expert team will play in the good implementation of the Project.

2. Presentation of Project Document (PD)

Mr. Akeo Fukayama submitted to Ministry of Environment and Sustainable Development and representatives of NEPA, REPA Pitesti, LEPA Bucuresti, LEPA Arges, LEPA Giurgiu, LEPA Calarasi, LEPA Teleorman and LEPA Ilfov the revised and finalized Project Document and explained the changes which occurred since the inception of the Project. The Romanian side appreciated the efforts of the JICA Expert Team in concluding the PD and expressed its interest in making all the necessary effort to ensure good implementation of the Project.

3. Comments from the participants

The presentation was followed by brief discussions on the content of the PD and the main components of the Project. The main comments referred to:

- the LEPA/ REPA involvement in the Project;
- the possibility of enhancing the cooperation between the NEPA and Japanese expert team in order to assure that, at the end of the Project, NRL equipment is properly maintained and managed by laboratory staff themselves with aim of acquisition of ISO 17025 accreditation;

- non-inclusion of simulation and inventory in the Project.

The two sides agreed to consider these aspects and discuss further on these issues in the future.

4. Approval of Project Document

The PD was approved by all participants.The next JCC meeting was scheduled to take place in September, 2007.

ANNEX: LIST OF ATTENDEES

ROMANIAN SIDE

Ministry of Environment and Sustainable Development

Mr. Silviu STOICA	Secretary of State
Ms. Dorina MOCANU	Head of Atmosphere Protection Directorate
Ms. Ecaterina SZABO	Councilor, Atmosphere Protection Directorate

National Environmental Protection Agency

Ms. Corina LUPU	General Director, Monitoring, Coordination and Synthesis
Ms. Crina HOTOIU	Director, National Reference Laboratory
Ms. Corina RUGINA	Director, Monitoring Department

Regional Environmental Protection Agency Pitesti

Ms. Carmen DIMA	Councilor, Monitoring, Synthesis and Coordination

Local Environmental Protection Agency Bucuresti

Ms. Mariana CRANGAS	Laboratory Chief

Local Environmental Protection Agency Arges

Ms. Violeta PETCAN	Councilor, Monitoring, Synthesis and Coordination
Ms. Camelia POPESCU	Councilor, Monitoring, Synthesis and Coordination

Local Environmental Protection Agency Giurgiu

Ms. Florentina SPANU	Councilor

Local Environmental Protection Agency Calarasi

Ms. Elena ADRIAN	Head of Monitoring, Synthesis and Coordination Unit

Local Environmental Protection Agency Teleorman

Ms. Cristina PAUN	Councilor

Local Environmental Protection Agency Ilfov

Ms. Sanda CIOROIU	Superior Councilor

<u>JAPANESE SIDE</u>

JICA expert team

Mr. Akeo FUKAYAMA	Chief Adviser

JICA/JOCV Romania Office

Mr. Fumio MIYAGAWA	Resident Representative
Ms. Mirela IOANA	Program Coordinator

MINUTES OF MEETING
ON
THE SECOND JOINT COORDINATING COMMITTEE
OF
THE PROJECT FOR STRENGTHENING THE AIR QUALITY MONITORING CAPABILITY OF THE NATIONAL REFERENCE LABORATORY OF THE NATIONAL ENVIRONMENTAL PROTECTION AGENCY IN ROMANIA

MINISTRY OF ENVIRONMENT AND SUSTAINABLE DEVELOPMENT
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

Bucharest, October 9, 2007

On behalf of Mr. Silviu STOICA
Secretary of State
Ms. Dorina MOCANU
Director of Atmospheric Protection Directorate
Ministry of Environment and Sustainable Development

Mr. Fumio MIYAGAWA
Resident Representative
JICA/JOCV Romania Office

Mr. Zoltán Levente NAGY
President
National Environment Protection Agency

Mr. Akeo FUKAYAMA
Chief Adviser
JICA Expert Team

In accordance with the Minutes of Meeting of the first Joint Coordinating Committee (JCC) for "The Project for Strengthening the Air Quality Monitoring Capability of National Reference Laboratory of National Environmental Protection Agency in Romania" (hereinafter referred to as "the Project") agreed upon by the Ministry of Environment and Sustainable Development (MESD), the National Environmental Protection Agency (NEPA) and Japan International Cooperation Agency (JICA) on May 30, 2007, the First Progress Report (P/R1) was discussed and approved during the 2nd JCC. On this occasion, Mr. Kenichi TANAKA, JICA Senior Advisor, has been dispatched as project consultation expert. The list of attendees is attached as Annex.

The main points discussed and conclusions were:

1. Opening

Ms. Dorina MOCANU, Director of Atmospheric Protection Directorate of MESD, greeted the participants and expressed the appreciation of MESD to the cooperation of the Japanese experts and the Romanian counterparts by now.

Mr. Zoltán Levente NAGY, President of NEPA, expressed the gratitude of NEPA to the collaboration within the project.

Ms. Corina LUPU, General Director of Monitoring, Coordination and Synthesis of NEPA, expressed the wish for the success of the project and the thanks to Mr. TANAKA for his two years' stay in Romania in the past.

Mr. Fumio MIYAGAWA, Representative of JICA Romania office, expressed the wish for good collaboration during the project.

Mr. Kenichi TANAKA, JICA Senior Adviser, expressed the wish for smooth implementation and the success of the project.

2. Presentation of The First Progress Report (P/R1)

Mr. Akeo FUKAYAMA submitted and explained the First Progress Report (P/R1) to the representatives from MESD and NEPA. Both the Japanese and the Romanian sides confirmed and appreciated the efforts and the achievements made by the JICA experts and the Romanian counterparts during the project period so far.

3. Comments from the Participants

The presentation was followed by discussions on the contents of the project activities.

The main comments referred to:

- Ms. Dorina MOCANU of MESD commented on the table referring to the stage of making the SOPs and the other documents related to the air monitoring equipment and pointed out the lack of some documents for portable calibrator and O_3 generator.
- Mr. Fukayama pointed out that the purchasing of mercury analyzer is not a high priority for the project, mainly due to the fact the EU standard for the mercury measurement in ambient air is not decided at present. In this respect, instead of this equipment, was proposed a new list of necessary equipment within the project.
- Ms. Dorina MOCANU of MESD and Ms. Corina LUPU of NEPA commented on the proposals submitted by the Japanese expert team and pointed out the needs for purchasing adequate and prior equipment within the project.

Both the sides agreed to push forward the project taking into considerations these aspects and to improve the activities for more success.

4. Approval of The First Progress Report

The P/R1 was approved by all participants, and the next JCC meeting was scheduled to take place in late February or early March, 2008.

The Japanese side expressed the hope to welcome Mr. STOICA as the chairman on the next JCC meeting.

5. Conclusions

As the results of the discussions at the meeting, both sides reached the following conclusions.

- The Japanese expert team confirmed that they will re-check the necessity of documents for portable calibrator and O_3 generator and make the documents, if necessary.
- Both the Japanese and Romanian sides confirmed that one of the main purposes of the project is capacity development of the counterparts and agreed that there exist more necessary equipment other than mercury meter for the sake of more effective and accurate analysis.
- Both the Japanese and Romanian sides agreed that purchase of mercury meter is canceled and the budget will be applied to purchase of other equipment with high priority.

- The new list of equipment will be decided by discussion between the Japanese experts and the Romanian counterparts and be approved, as soon as possible, by both sides.
- Both of the sides agreed on and confirmed more close cooperation for smooth progress of the project.

ANNEX: LIST OF ATTENDEES

ROMANIAN SIDE

Ministry of Environment and Sustainable Development

Ms. Dorina MOCANU	Director of Atmosphere Protection Directorate
Ms. Ecaterina SZABO	Councilor, Atmosphere Protection Directorate

National Environmental Protection Agency

Mr. Zoltán Levente NAGY	President
Ms. Corina LUPU	General Director, Monitoring, Coordination and Synthesis
Ms. Crina HOTOIU	Director, National Reference Laboratory
Ms. Corina RUGINA	Director, Monitoring Department
Ms. Iulia NEACSU	Chief, Air Laboratory of NRL

JAPANESE SIDE

JICA expert team

Mr. Akeo FUKAYAMA	Chief Adviser
Mr. Mitsuru FUJIMURA	Expert in charge of Laboratory Management
Mr. Natsuji SAWAKI	Expert in charge of Laboratory Equipment (AAS, UV-VIS)
Mr. Atsushi MURAI	Coordinator of Expert Team

JICA/JOCV Romania Office

Mr. Fumio MIYAGAWA	Resident Representative
Ms. Mirela IOANA	Program Coordinator

JICA Headquarters

Mr. Kenichi TANAKA	JICA Senior Adviser

MINUTES OF MEETING
ON
THE THIRD JOINT COORDINATING COMMITTEE
OF
THE PROJECT FOR STRENGTHENING THE AIR QUALITY MONITORING CAPABILITY OF THE NATIONAL REFERENCE LABORATORY OF THE NATIONAL ENVIRONMENTAL PROTECTION AGENCY IN ROMANIA

MINISTRY OF ENVIRONMENT AND SUSTAINABLE DEVELOPMENT
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

Bucharest, February 22, 2008

Mr. Silviu STOICA Secretary of State Ministry of Environment and Sustainable Development	Mr. Fumio MIYAGAWA Resident Representative JICA/JOCV Romania Office
Mr. Zoltán Levente NAGY President National Environment Protection Agency	深山暁生 Mr. Akeo FUKAYAMA Chief Adviser JICA Expert Team

In accordance with the Minutes of Meeting of the first Joint Coordinating Committee (JCC) for "The Project for Strengthening the Air Quality Monitoring Capability of National Reference Laboratory of National Environmental Protection Agency in Romania" (hereinafter referred to as "the Project") agreed upon by the Ministry of Environment and Sustainable Development (MESD), the National Environmental Protection Agency (NEPA) and Japan International Cooperation Agency (JICA) on May 30, 2007, the Second Progress Report (P/R2) was discussed and approved during the 3rd JCC. On this occasion, Mr. Kenichi TANAKA, JICA Senior Advisor, has been dispatched as project consultation expert. The list of attendees is attached as Annex.

The main points discussed and conclusions were:

1. Opening

Ms. Silviu STOICA, Secretary of State of MESD, greeted the participants and expressed the wish to confirm the progress and make a discussion on present issues to be solved in this meeting.

Mr. Zoltán Levente NAGY, President of NEPA, expressed the understanding of the limited period of the project and pointed out the necessity of confirmation of the progress.

Mr. Fumio MIYAGAWA, Representative of JICA Romania office, announced that the evaluation of the project is scheduled in October.

Mr. Kenichi TANAKA, JICA Senior Adviser, expressed the wish for substantial discussions to solve the present issues.

Ms. Naoko YAGO, JICA Program Officer, expressed the wish for maximum achievement by possible activities.

2. Presentation of the Second Progress Report (P/R2)

Mr. Akeo FUKAYAMA submitted and explained the Second Progress Report (P/R2) to the representatives from MESD and NEPA. Both the Japanese and the Romanian sides confirmed and appreciated the efforts and the achievements made by the JICA experts and the Romanian counterparts during the project period so far.

3. Approval of the Second Progress Report(PR2)

The P/R2 was approved by all participants.

4. Discussions to Improve Project Implementation

Mr. FUKAYAMA expressed the understanding of the expert team that more practices of analysis are necessary for SOPs and capacity development of the counterparts, and proposed that detailed working plan with signatures of responsible persons of both sides should be elaborated.

Ms. LUPU introduced the conclusion of the meeting in the morning that the experts and the counterparts agreed on 10 samples of analysis per month and the detailed plan will be made within 2 weeks. She also announced that the procedure for recruiting another chemist has begun and expressed her hope that a suitable person would be hired soon.

Mr. FUKAYAMA mentioned on the situation that the present capabilities of the respective counterparts differ and the technical requirements of EU standards are relatively high.

Ms. NEACSU made comments that the EU standards are recently introduced in Romania, and the implementation by the standards with QA/QC processes is very difficult. She also pointed out limitation of pump during cold winter season below zero degree.

Mr. STOICA expressed that concrete assignment of staffs and detailed plan in all laboratory activities are necessary.

Mr. TANAKA mentioned that clarified plan with assignments of each staff will be helpful for project purpose achievement. He also added the detailed plan could steer the project in favorable direction, and 10 samples per month shall be implemented.

Ms. YAGO commented on the importance to motivate all the laboratory staff.

Mr. STOICA agreed on the opinion by Mr. TANAKA and mentioned that the plan shall include necessary items like tasks, persons in charge, deadlines, and expected that the managers can arrange their staff to achieve these tasks.

Mr. NAGY also agreed on making of the detailed plan and added necessity of periodical reporting.

5. Conclusions

As the results of the discussions at the meeting, both sides reached the following conclusions.

- Both sides agreed that the detailed plan of each analysis for 10 samples of analysis per month will be made by the experts and the counterparts within two weeks.

- The next JCC meeting was scheduled to be hold in May or June, 2008. Mr. STOICA expressed his wish to attend the next JCC meeting.

ANNEX: LIST OF ATTENDEES

ROMANIAN SIDE

Ministry of Environment and Sustainable Development

Mr. Silviu STOICA	Secretary of State
Ms. Dorina MOCANU	Director of Atmosphere Protection Directorate
Ms. Ecaterina SZABO	Councilor, Atmosphere Protection Directorate

National Environmental Protection Agency

Mr. Zoltán Levente NAGY	President
Ms. Corina LUPU	General Director, Monitoring, Coordination and Synthesis
Ms. Crina HOTOIU	Director, National Reference Laboratory
Ms. Corina RUGINA	Director, Monitoring Department
Ms. Iuliana NEACSU	Chief, Air Laboratory of NRL

JAPANESE SIDE

JICA expert team

Mr. Akeo FUKAYAMA	Chief Adviser
Mr. Mitsuru FUJIMURA	Expert in charge of Laboratory Management
Mr. Natsuji SAWAKI	Expert in charge of Laboratory Equipment (AAS, UV-VIS)
Ms. Naomi MAEDA	Expert in charge of Laboratory Equipment (GC, IC)
Mr. Fumihiko KUWAHARA	Expert in charge of Monitoring Database

JICA/JOCV Romania Office

Mr. Fumio MIYAGAWA	Resident Representative
Ms. Mirela IOANA	Program Coordinator

JICA Headquarters

Mr. Kenichi TANAKA	JICA Senior Adviser
Ms. Naoko YAGO	JICA Senior Program Officer

MINUTES OF MEETING
ON
THE THIRD JOINT COORDINATING COMMITTEE
OF
THE PROJECT FOR STRENGTHENING THE AIR QUALITY MONITORING CAPABILITY OF THE NATIONAL REFERENCE LABORATORY OF THE NATIONAL ENVIRONMENTAL PROTECTION AGENCY IN ROMANIA

MINISTRY OF ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

Bucharest, July 14, 2008

Ms. Dorina MOCANU
Director
Atmosphere Protection Directorate
Ministry of Environment and Sustainable Development

Mr. Fumio MIYAGAWA
Resident Representative
JICA/JOCV Romania Office

Ms. Corina LUPU
General Director,
Monitoring, Coordination and Synthesis General Department
National Protection Environmental Agency

Mr. Akeo FUKAYAMA
Chief Adviser
JICA Expert Team

In accordance with the Minutes of Meeting of the first Joint Coordinating Committee (JCC) for "The Project for Strengthening the Air Quality Monitoring Capability of National Reference Laboratory of National Environmental Protection Agency in Romania" (hereinafter referred to as "the Project") agreed upon by the Ministry of Environment and Sustainable Development (MESD), the National Environmental Protection Agency (NEPA) and Japan International Cooperation Agency (JICA) on May 30, 2007, the Third Progress Report (P/R3) was discussed and approved during the 4th JCC meeting.

The main points discussed and conclusions were:

1. Opening

Ms. Dorina MOCANU, Director of Atmosphere Protection Directorate of Ministry of Environment and Sustainable Development, greeted the participants and wished to confirm that progress has been made since the last JCC meeting. Also, Ms. MOCANU expressed the wish that smooth implementation of the project will be achieved by the end.

2. Presentation of the Third Progress Report (P/R3)

Mr. Akeo FUKAYAMA submitted and explained the Third Progress Report (P/R3) to the representatives from MESD and NEPA. Both the Japanese and the Romanian sides confirmed and appreciated the efforts and the achievements made by the JICA experts and the Romanian counterparts during the project period so far.

3. Approval of the Third Progress Report (PR3)

The P/R3 was approved by all participants.

4. Discussions on the end of the project

Mr. FUKAYAMA proposed that it is adequate to set the end of this project at the end of October or the beginning of November, and added that the closing of the project may be delayed in some case.

Ms. MOCANU questioned on the earlier ending of the project compared with the plan at the beginning, which was set at the end of November.

Mr. FUKAYAMA explained by expressing the worry about the effects of the general elections planned in November.

Ms. MOCANU declared and assured that the Romanian side can maintain the present project organization structure by the end of November, and expressed her wish to the continuation of the project by then.

Mr. FUKAYAMA further explained that the expert team has to discuss with the JICA headquarter on the closing period of the project, and that the conclusion will be informed to the Romanian side through the JICA Romania office.

5. Seminars at LEPA

Mr. MIYAGAWA expressed the hope of technical seminars at LEPA, because he thought that it is very difficult for the staffs of LEPA who are far from Bucharest to attend the seminar in Bucharest.

Mr. FUKAYAMA further expressed the need to take into consideration such seminars for the experts at LEPA, and at the same time he confirmed that the first priority is to support the staffs of NRL and Monitoring Directorate.

6. The next JCC meeting and the draft final report

Ms. MOCANU questioned on when the next JCC meeting will be held and on the submission of the draft final report of the project.

Mr. FUKAYAMA explained that the last JCC meeting will be held near the end of the project, and that the draft final report will be submitted before the JCC meeting for comments.

Japanese side hopes to have the closing up seminar and the 5th JCC meeting together, during the last week of the project.

7. Conclusions

As the results of the discussions at the meeting, both sides reached the following conclusions.

- The ending period of the project will be informed to the Romanian side through the JICA Romania office as soon as possible after the discussions of the expert team with JICA headquarter.
- The last JCC meeting will be held near the end of the project, and a draft of the final report will be submitted to the Romanian side around three weeks before the JCC meeting in order for the Romanian side to have enough time to make comments.
- The expert team will consider about possibility of seminar holding at LEPA.

ANNEX: LIST OF ATTENDEES

ROMANIAN SIDE

Ministry of Environment and Sustainable Development

Ms. Dorina MOCANU	Director of Atmosphere Protection Directorate
Ms. Ecaterina SZABO	Councilor, Atmosphere Protection Directorate

National Environmental Protection Agency

Ms. Corina LUPU	General Director, Monitoring, Coordination and Synthesis
Ms. Corina RUGINA	Director, Monitoring Department
Ms. Iuliana NEACSU	Chief, Air Laboratory of NRL
Ms. Corina CRISTEA	Air Laboratory of NRL

JAPANESE SIDE

JICA expert team

Mr. Akeo FUKAYAMA	Chief Adviser
Mr. Toshiharu OCHI	Expert in charge of Monitoring Equipment

JICA/JOCV Romania Office

Mr. Fumio MIYAGAWA	Resident Representative
Ms. Mihaela SIGHINAS	Program Coordinator

MINUTES OF MEETING
ON
THE FIFTH JOINT COORDINATING COMMITTEE
OF
THE PROJECT FOR STRENGTHENING THE AIR QUALITY MONITORING CAPABILITY OF THE NATIONAL REFERENCE LABORATORY OF THE NATIONAL ENVIRONMENTAL PROTECTION AGENCY IN ROMANIA

MINISTRY OF ENVIRONMENT AND SUSTAINABLE DEVELOPMENT
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

Bucharest, 18th November 2008

Ms. Dorina MOCANU
Director
Atmosphere Protection Directorate
Ministry of Environment and Sustainable Development

Ms. Corina LUPU
General Director,
Monitoring, Coordination and Synthesis General Department
National Protection Environmental Agency

Mr. Fumio MIYAGAWA
Resident Representative
JICA/JOCV Romania Office

水口正美

Mr. Masami MIZUGUCHI
JICA Senior Adviser
Project Consultation Team

深山暁生

Mr. Akeo FUKAYAMA
Chief Adviser
JICA Expert Team

In accordance with the Minutes of Meeting of the first Joint Coordinating Committee (JCC) for "The Project for Strengthening the Air Quality Monitoring Capability of National Reference Laboratory of National Environmental Protection Agency in Romania" (hereinafter referred to as "the Project") agreed upon by the Ministry of Environment and Sustainable Development (MESD), the National Environmental Protection Agency (NEPA) and Japan International Cooperation Agency (JICA) on May 30, 2007, the Draft Final Report (the DFR) of the project was discussed during the 5th JCC meeting.

The main points discussed and conclusions were:

1. Opening

Ms. Dorina MOCANU, Director of Atmosphere Protection Directorate, within the Ministry of Environment and Sustainable Development, greeted the participants and wished to confirm the contents of the draft final report and the achievements of the project.

2. Presentation and Approval of the DFR

Mr. Akeo FUKAYAMA explained each chapter of the DFR, which was sent on 30th October, to the representatives from MESD and NEPA. Both the Japanese and the Romanian sides approved the contents of the DFR in its general form.

3. Comments to the DFR and its Finalizing

If by any chance there are going to be any other observations and comments to the DFR, the official comments in written form from the Romanian side are to be submitted to the Japanese side by 27th November 2008. The Japanese side will finalize the report taking into consideration the comments from the Romanian side, and the Final Report will be sent to the Romanian side in December 2008.

4. Joint Evaluation

The procedure of the joint evaluation by the Japanese and the Romanian sides was agreed, and the results of the evaluation will be sent from the Japanese side to the Romanian side.

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Ministry of Environment and Sustainable Development

Ms. Dorina MOCANU	Director of Atmosphere Protection Directorate
Ms. Ecaterina SZABO	Councilor, Atmosphere Protection Directorate

National Environmental Protection Agency

Ms. Corina LUPU	General Director, Monitoring, Coordination and Synthesis
Ms. Crina HOTOIU	Director, National Reference Laboratory
Ms. Corina RUGINA	Director, Monitoring Department
Ms. Iuliana NEACSU	Chief, Air Laboratory of NRL
Ms. Corina CRISTEA	Chief, Centre of Air Quality Assessment

JAPANESE SIDE

JICA expert team

Mr. Akeo FUKAYAMA	Chief Adviser
Mr. Toshiharu OCHI	Expert in charge of Monitoring Equipment
Dr. Mitsuru FUJIMURA	Expert in charge of Laboratory Management
Mr. Natsuji SAWAKI	Expert in charge of Laboratory Equipment (AAS)
Ms. Naomi MAEDA	Expert in charge of Laboratory Equipment (GC)
Mr. Fumihiko KUWAHARA	Expert in charge of Monitoring Database
Mr. Atsushi MURAI	Expert in charge of Administration

JICA/JOCV Romania Office

Mr. Fumio MIYAGAWA	Resident Representative
Ms. Mihaela SIGHINAS	Program Coordinator

JICA Headquarters

Mr. Masami MIZUGUCHI	JICA Senior Adviser
Ms. Naoko YAGO	JICA Assistant Director

深山 水口

Appendix 2

List of Annex

List of Annex

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1.1. Portable Dilution Equipment OGD-2000PT

1.2. Ozone Generator OZON3000

1.3. Calibrating Dilution System EDA-2000

1.4. SO_2 and NO_2 Measurements

1.5. Benzene Measurement

1.6. PM10 and PM2.5 Measurements

1.7. Lead Measurement

1.8. Ammonia Measurement

1.9. Hydrogen Sulfide Measurement

Annex 2. Technical Evaluation of Standard Operation Procedures (SOPs)

Annex 3. Operation and Maintenance Manual of NRL

3.1. Quality Manual

3.2. Equipment

3.3. Spare Parts

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3.5. Liquid and Solid Waste

3.6. Safety and Health Control System

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Annex 4. Guideline for Air Quality Monitoring Strategic Plan

Annex 5. Training Materials

5.1. Training Course of Performance Analysis of the CO, NOx and SO_2 Analyzer

5.2. Training Course of Heavy Metal Measurement Technique in the Air

5.3. Training Course of Benzene Measurement in the Air

Annex 6. Monitoring Data

Annex 7. Others