3. TECHNICAL COOPERATION OUTPUTS

The PDM consists of five Outputs and several Activities in each Output. Since the Activities for Outputs are rather comprehensive by integrating cross cutting performance of each expert, it is difficult to simplify the relation between the Activities for Outputs and the actual activities conducted by the JICA Expert Team. The table below summarizes the relation among the Output in PDM, the corresponding Activities in PO, and actual activities of the JICA Expert Team.

Output in PDM and its Corresponding Activity in PO

Activity as per PDM		Expected Results(as per PO of R/D)	Corresponding Activity of PO		JICA Expert Team in charge	Syrian C/P in charge
Output 1 : Technical level of laboratory staff concerning environmental sampling and analysis is improved						
1.1	Compilation of the SOP for samplings, analysis, interpretation, evaluation, data filing and reporting.	Standard Operation Procedure(SOP)	1(1)	Preparation of the SOP (BW, CB, HM, AQ)	1)BW=Matue 2)CB=Sato, Sakae 3)HM=Kimura 4)AIR=Hirao	1)14 DFEA=lab chief and staff 2)4 DFEA=DAM, DAMC, HOM, ALP: ditto 3)1 DFEA=DAM: ditto 4)3 DFEA=DAM, HOM, ALP: ditto
1.2	Training in theory for making monitoring plans, samplings, analysis, interpretation, evaluation, data filing and reporting.	*Training materials *Number of training conducted *Number of partricipants	1(2)	Basic (group) training of environmental management for personnel of DFEAs	all members (7 experts in JET)	all CPs in June 2006
			1(3)	Training on data analysis and interpretation, discussion, and instruction at DFEA (BW, CB, HM, AQ)	1)BW=Matue 2)CB=Sato, Sakae 3)HM=Kimura 4)AQ=Hirao	1)14 DFEA=lab chief and staff in each DFEA 2)4 DFEA=DAM, DAMC, HOM, ALP: ditto 3)1 DFEA=DAM: ditto 4)3 DFEA=DAM, HOM, ALP: ditto
			1(4)	Round instruction training and OJT at DFEA, including 1(3) (BW, CB, HM)	1)BW=Matue 2)CB=Sato, Sakae 3)HM=Kimura	1)14 DFEA=lab chief and staff 2)4 DFEA=DAM, DAMC, HOM, ALP: ditto 3)1 DFEA=DAM: ditto
			1(5)	Training on air quality analysis of DFEAs in DAM, ALP, HOM , including 1(3) (AQ)	1)AQ=Hirao	1)3 DFEA=DAM, HOM, ALP: lab chief and staff
1.3	Hands-on trainings in samplings, analysis, interpretation, evaluation, data filing and reporting.	*Training materials *Number of training conducted *Number of partricipants	1(6)	Advice to establish plan of a laboratory of Damascas DFEA and other 13 DFEAs	1)BW=Matue 2)CB=Sato, Sakae 3)HM=Kimura 4)AQ=Hirao	1)14 DFEA=lab chief and staff 2)4 DFEA=DAM, DAMC, HOM, ALP: ditto 3)1 DFEA=DAM: ditto 4)3 DFEA=DAM, HOM, ALP: ditto
			1(7)	Round instruction training and OJT at DFEA, including 1(3) (BW, CB, HM)	1)BW=Matue 2)CB=Sato, Sakae 3)HM=Kimura	1)14 DFEA=lab chief and staff 2)4 DFEA=DAM, DAMC, HOM, ALP: ditto 3)1 DFEA=DAM: ditto
			1(8)	Training on air quality analysis of DFEAs in DAM, ALP, HOM , including 1(3) (AQ)	1)AQ=Hirao	1)3 DFEA=DAM, HOM, ALP: lab chief and staff
			1(9)	Establishment of sample transport system to DFEA in Damascas from others	1)BW=Matue 2)CB=Sato 3)HM=Kimura	1)14 DFEA=lab chief and staff 2)1 DFEA=DAM: ditto 3)1 DFEA=DAM: ditto
1.4	On-site OJT in sampling, analysis, interpretation, evaluation, data filing and reporting.	*Number of training conducted *Number of partricipants	1(10)	Round instruction training and OJT at DFEA, including (BW, CB, HM)	1)BW=Matue 2)CB=Sato, Sakae 3)HM=Kimura	1)14 DFEA=lab chief and staff 2)4 DFEA=DAM, DAMC, HOM, ALP: ditto 3)1 DFEA=DAM: ditto
			1(11)	OJT on the analysis of ambient air of DFEAs in DAM, ALP, HOM, including (AQ)	1)AQ=Hirao	1)3 DFEA=DAM, HOM, ALP: lab chief and staff
			1(12)	Reccomendations for the training system about environmental management	1)CA=Iwai	1)GCEA and 14 DFEA=director and lab chief
Output 2 : Laboratories are properly managed by laboratory staff themselves.						
2.1	Compilation of the laboratory O/M manual for equipment operation and maintenance, spare parts preparation, reagents storage and treatment, liquid and solid laboratory wastes treatment and others.	*O/M manual	2(1)	Preparation of a laboratory O/M manual (BW, CB, HM, AQ)	1)BW=Matue 2)CB=Sato, Sakae 3)HM=Kimura 4)AQ=Hirao	1)14 DFEA=lab chief and staff in each DFEA 2)4 DFEA=DAM, DAMC, HOM, ALP: ditto 3)1 DFEA=DAM: ditto 4)3 DFEA=DAM, HOM, ALP: ditto
2.2	Hands-on trainings at equipment operation and maintenance, reagents storage and treatment, liquid and solid laboratory wastes treatment and others.	*Number of traiings conducted *Number of participants	2(2)	Establishment of laboratory of Dmascas DFEA and other 13 DFEAs and training on the equipment (at DFEAs-BW, CB, HM, AIR)	1)BW=Matue 2)CB=Sato, Sakae 3)HM=Kimura 4)AIR=Hirao	1)14 DFEA=lab chief and staff in each DFEA 2)4 DFEA=DAM, DAMC, HOM, ALP: ditto 3)1 DFEA=DAM: ditto 4)3 DFEA=DAM, HOM, ALP: ditto
2.3	Provide necessary assistance and guidance to prepare Directorates' budget plan for regular monitoring.	n/a	2(3)	Support of budgetary planning of regular periodical environmental monitoring of DFEAs	1)BW=Matue 2)CB=Sato, Sakae 3)HM=Kimura 4)v=Hirao	1)14 DFEA=lab chief and staff in each DFEA 2)4 DFEA=DAM, DAMC, HOM, ALP: ditto 3)1 DFEA=DAM: ditto 4)3 DFEA=DAM, HOM, ALP: ditto

Output 3 : Environmental analysis data is accumulated and properly managed.						
3.1	Design the monitoring record formats for laboratories and for the GCEA in the MOLAE.	*Monitoring report format for Directorates *Monitoring report for GCEA	3(1)	Situation of data management (DM) in MOLAE (DFEA)	1)CA=Iwai and DM=Takahashi	1)GCEA=project director and project manager
			3(2)	Prepration of format for environmental monitoring record	1)DM=Takahashi	1)GCEA and 14 DFEA=director, lab chief and staff
3.2	Compile monitoring records in each Directorate.	*Environmental monitoring records	3(3)	Record of environmental monitoring in DFEAs	1)DM=Takahashi	1)14 DFEA=director, lab chief and staff
3.3	Send the monitoring records from Directorates to the GCEA in the MOLAE.	n/a	3(4)	Set-up data concentrating system in MOLAE regarding environmental monitoring	1)DM=Takahashi	1)GCEA=project manager and director of information
3.4	Publish environmental annual report in each Directorates	(additional activity of PDMe)	3(5)	Suport for the preparation and publication of annual environmental annual reports by each DFEA	1)CA=Iwai and DM=Takahashi	1)Annual report preparation=14 DFEA, director and lab chief 2)Publication of the annual report=GCEA and 14 DFEAs
Output 4 : Laboratory staff is able to formulate an environmental monitoring plan specifying parameters required.						
4.1	Conduct preliminary pollution source inventory	*Report of surveys conducted	4(1)	Preparatory survey for pollution source in each governorate	1)CA=Iwai	1)GCEA and 14 DFEA=director, lab chief, and staff
4.2	Specify monitoring sites and their parameters.	*Number of monitoring sites *Number of monitoring parameters	4(2)	Training on practical skill and environmental monitoring plan (BW, CB, HM, AQ)	1)BW=Matue 2)CB=Sato, Sakae 3)HM=Kimura 4)AQ=Hirao	1)14 DFEA=lab chief and staff in each DFEA 2)4 DFEA=DAM, DAMC, HOM, ALP: ditto 3)1 DFEA=DAM: ditto 4)3 DFEA=DAM, HOM, ALP: ditto
			4(3)	Support for preparation of "environmental monitoring plan" (BW, CB, HM, AQ)	ditto	ditto
4.3	Formulate the environmental monitoring plan specifying parameters and monitoring sites in respective laboratory.	*Environmental monitoring plan for each Directorate	4(4)	Training on practical skill and environmental monitoring plan (BW, CB, HM, AQ)	ditto	ditto
			4(5)	Support for preparation of "environmental monitoring plan" (BW, CB, HM, AIR)	ditto	ditto
4.4	Provide necessary assistance and guidance to introduce the environmental monitoring guideline into a standard for all laboratories.	n/a	4(6)	Guidance of enforcement of "environmental monitoring guidelines"	1)CA=Iwai	1)GCEA and 14 DFEA=director and lab chief
			4(7)	Comprehensive evaluation of environmental monitoring in DFEAs	1)BW=Matue 2)CB=Sato, Sakae 3)HM=Kimura 4)AQ=Hirao	1)14 DFEA=lab chief and staff 2)4 DFEA=DAM, DAMC, HOM, ALP: ditto 3)1 DFEA=DAM: ditto 4)3 DFEA=DAM, HOM, ALP: ditto
Output 5 : The results and data acquired by the Project is open to and shared with the public of the target Directorates, focusing on industrial sector. Staff of target Directorates is able to formulate its action plan for public awareness activities and environmental education.						
5.1	To conduct preliminary survey on activities regarding to environmental education and public awareness in each governorate	*Report of preliminary surveys conducted	5(1)	Public awareness (PA) survey in governorate	1)PA=Aoki	1)GCEA and 7 DFEAs=staff in charge
5.2	To formulate textbooks, manuals, and pamphlets for environmental education.	*Textbook, manuals and pemphlets made by the Project	5(2)	Prepration of materials for activities for environmental education (E&E) in Arabic	1)PA=Aoki	1)GCEA and 14 DFEAs=staff in charge
5.3	To implement seminars and workshops targeted for educational institutions and NGOs and so forth.	*Report of seminars and workshops implemented	5(3)	Conduction of seminars and workshops for environmental education (E&E)	1)PA=Aoki	1)GCEA and 14 DFEAs=staff in charge 2)4 priority DFEAs (DAM, HOM, ALP, and LTK)=ditto
5.4	To enhance the cooperation among organizations and/or institutions regarding to environmental education in each governorate (ex. to implement periodical meeting)	*Report of Meetings	5(4)	Grasp of the current situation of environmental education (E&E) and public awarenss (PA) in	1)PA=Aoki	1)GCEA
			5(5)	Organizing periodical network meetings among organizations and/or institutions regarding to environmental education (E&E)	1)PA=Aoki	1)GCEA
5.5	To formulate an action plan on public awareness activities for industrial sector in target Directorates	*Report of Action Plan	5(6)	Preparation of action plan for public awareness to pollution sources by using monitoring data	1)CA=Iwai and PA=Aoki	4 priority DFEAs=staff in charge

note 1): JET:JICA Expert Team, CA:Chief Advisor, BW:Basic Water Quality, CB:Chemical & Biological Analysis, HM:Heavy Metal Analysis, AQ:Air Quality Analysis, DM:Data Management, PA:Public Awareness

2): GCEA: General Commission for Environmental Affairs, DAM:Damascus, DAMC:Damascus Countryside, ALP:Aleppo, HOM:Homs, LTK:Lattakia

The JICA Expert Team consists of the members covering seven technical aspects, namely 1) Regional Environmental Management, 2) Basic Water Quality, 3) Chemical and Biological Analysis, 4) Heavy Metal Analysis, 5) Air Quality Analysis, 6) Data Management, and 7) Environmental Education and Public Awareness. The technical cooperation outputs are described hereunder by each

technical aspect.

3.1 Basic Water Quality

3.1.1 Training Activities

(1) Training Courses and Contents

There are 14 parameters for the Basic Water Quality Analysis (BW). The general information about the parameters is shown in the table below.

General Information about Basic Water Quality Parameters

No.	Parameter	Unit	Analysis Method	Analysis Instrument	Remarks
1	pH	pH unit	pH meter	sensION1 pH meter	
2	Water Temperature		Thermometer	sensION1 pH meter	
3	Color	Unit	Colorimeter	DR/890 Colorimeter	0-500 units
4	Total Dissolved Solids (TDS)	mg/l	TDS meter (electrode)	sensION5, portable type	0-2,000 mg/l 2,000-50,000 mg/l
5	Dissolved Oxygen (DO)	mg/l	DO meter (Membrane electrode)	sensION6, portable type	
6	Suspended Solids (SS)	mg/l	Colorimeter	DR/890 Colorimeter	0-750 mg/l 750-15,000 mg/l
7	COD (dichromate)	mg/l	Potassium dichromate ($K_2Cr_2O_7$)	DRB 200 Dry	0-150 mg/l 0-1,500 mg/l
8	BOD_5	mg/l	Pressure sensor method	OxiTop IS 12	0-4,000 mg/l
9	Nitrate (NO_3^--N)	mg/l	Cadmium reduction method	DR/890 Colorimeter	0-5.0 mg/l 0-30.0 mg/l
10	Phosphate ion (PO_4^{3-})	mg/l	Amino acid method Ascorbic acid method	DR/890 Colorimeter	0-2.50 mg/l 0-30.00 mg/l
11	Chloride ion (Cl^-)	mg/l	Silver nitrate method	Digital titrator	10-10,000 mg/l
12	Ammonia Nitrogen (NH_3-N)	mg/l	Salicylate method	DR/890 Colorimeter	0-2.50 mg/l 0-50 mg/l
13	Electric Conductivity (EC)	µS/cm	EC meter (electrode)	sensION5, portable type	
14	Turbidity	NTU	Turbidity meter	2100P pocket turbid meter	0-10,000

For technology transfer of the basic water quality monitoring skills (monitoring plan preparation, sampling, analysis, quality assurance and quality control (QA/QC), laboratory operation and maintenance, interpretation of the results and reporting etc.) and knowledge to the counterpart (C/P) personnel, the following nine training courses were prepared and executed in the Project from June 2005 to July 2007.

List of Training Activities of Basic Water Quality Analysis (June 2005 – July 2007)

Course	Objectives and Contents	Period	Venue	Target C/P
1. Basic Lecture Training of Basic Water Quality	- 7 lectures for understanding fundamental items of basic water quality (general concept on basic water quality analysis, sampling design, field measurement, analytical theory, use of equipment, and laboratory operation etc.) - 4-days training course/each round	- 1st round (5 Jun. – 8 Jun., 2005) - 2nd round (12 Jun. 12 – 15 Jun., 2005)	Administration Center of MOLAE, Damascus	- C/Ps of GCEA and DFEAs in charge for lab analysis and data management - 29 C/Ps in the 1st round - 35 C/Ps in the 2nd round

Course	Objectives and Contents	Period	Venue	Target C/P
2. Supplementary Training	- Same as above training - Only for supplemental lecture to C/Ps who missed a part of lectures mentioned above - 1-day supplementary training course	21 Jun., 2005	GCEA, Damascus	5 C/Ps from 2 DFEAs
3. Field Training	- Confirmation of equipment and actual practice training on sampling, field measurement, lab analysis, calibration, usage of SOP, O/M of lab - 3-days training course/each DFEA	23 Jun. – 17 Jul., 2005	14 DFEAs	64 C/Ps from GCEA and DFEAs in charge for lab analysis and data management
4. Follow-up Training	- Review of the field training - Presentation of actual practice and monitoring results for sharing - 2-days training course/each round	- 1st round (31 Jul.- 1 Aug., 2005) - 2nd round (2 Aug. -3 Aug., 2005)	GCEA, Damascus	- C/Ps of GCEA and DFEAs in charge for lab analysis and data management - 24 C/Ps in the 1st round - 39 C/Ps in the 2nd round
5. Follow-up Field Training	- Check and evaluation of analysis data - Trouble shooting on monitoring practice - 1-day training course/each DFEA	- 13 Aug. - 1 Sep., 2005	14 DFEAs	64 C/Ps from GCEA and DFEAs in charge for lab analysis
6. Basic Lecture Training and OJT Training for Basic Water Quality and Monitoring Plan	- 3 lectures for measuring principles of major parameters (BOD, COD, NO_3-N, NH_3-N, PO_4 and Cl^{-}), major problems and countermeasures, preparation of annual budget and monitoring plan in each DFEA - OJT training on sampling, field measurement, laboratory analysis, interferences countermeasures, QA/QC, calibration, usage of SOP, interpretation of the results and O/M of laboratory. - 3-days training course/each DFEA	12 Dec., 2005 - 23 Feb., 2006	14 DFEAs	69 C/Ps from DFEAs in charge for lab analysis and data management
7. Lecture Training and OJT Training for Basic Water Quality and Monitoring Plan	- 2 lectures for laboratory O/M manual & records, use of low range reagents and standard solutions, common problems and solutions with equipment etc. - OJT on sampling, field measurement, laboratory analysis (especially for using low range reagents and standard solutions), QA/QC, calibration, SOP modification, interpretation of the results and O/M of laboratory. - 2 or 3-days training course/each DFEA	4 Jun. – 2 Aug., 2006	14 DFEAs	81 C/Ps from DFEAs and 5 C/Ps from GCEA in charge for lab analysis and data management
8. Lecture Training and OJT Training for Basic Water Quality and Monitoring Plan	- 1 lecture on problems and measures of industrial wastewater sampling methods, interpretation of analysis results, sample transport system to DAM DFEA from each DFEA, monitoring plan and reporting - OJT training on composite sampling, laboratory analysis, QA/QC, interpretation of the results, O/M of laboratory and reporting. - 2-days training course/each DFEA	7 Nov. – 21 Dec. 2006	14 DFEAs	78 C/Ps from 14 DFEAs and 2 C/Ps from GCEA in charge for laboratory analysis and data management
9. Lecture Training and OJT Training for Basic Water Quality and Monitoring Plan	- 1 lecture on sampling for chemical and biological analysis, heavy metals analysis, lab. waste liquid transport system to DAM DFEA from each DFEA, QA/QC and additional equipment purchase - OJT training (test) on QA/QC, interpretation of the results, lab. O/M and trainer training. - 1 or 2-days training course/each DFEA	3 Jun. – 22 Jul., 2007	14 DFEAs	64 C/Ps from DFEAs in charge for lab analysis and data management

(2) Quality Assurance and Quality Control (QA/QC) Activities

In order to ensure accuracy and reliability of the Basic Water Quality Analysis, the following QA/QC activities were conducted since June 2005 at 14 DFEAs.

1) Repeat analysis (3 times for all samples in 2005, 2 or 3 times for 10% of annual

samples after 2006),

2) Close check with other laboratories,
3) Use of standard solution, and
4) Participation of the Atomic Energy Commission's (AEC) Quality Control (QC) program. (Damascus, Damascus Countryside, Homs, Lattakia and Sweida DFEAs)

In order to evaluate the QC level of C/Ps for basic water quality analysis, the JICA Expert Team carried out a QC test for four major parameters by using standard solutions. The results of the QC test in each DFEA are shown in the table below, which shows that some DFEA still need to improve their QC in future. The QC level for the Basic Water Quality could be primary compared with other complicated analysis, and currently it depends on skills of C/Ps related to lab analysis, calibration, and operation and maintenance of equipment. So, it is recommended to continue the activities mentioned above for the time being. The long term vision related to QA/QC is described in Chapter 3.8 Advisory Activities because it has close link with public authorization of the laboratory.

(3) Results of Measurements

In 2006 and 2007, 1,026 and 1,009 samples were collected and analyzed in 14 DFEAs respectively. The results of wastewater quality measurement on major pollution sources in each Governorate are summarized in the following table based on the results of Basic Water Quality monitoring in 2006.

Result of the QC Test for Basic Water Quality Analysis in 14 DFEAs (June-July 2007)

Parameters and Concentration		COD		NO_3-N		NH_3-N		PO_4^{3-}		Date	Total Number	The Number of Acceptable	Acceptance Rate (%)
		500 (mg/l)	Error (%)	10.0 (mg/l)	Error (%)	10 (mg/l)	Error (%)	5.0 (mg/l)	Error (%)				
1	Damascus	525	5%	11.5	15%	7	-30%	5.0	0%	1-Jul.	12	6	50%
		522	4%	12.0	20%	8	-20%	5.0	0%				
		620	24%	11.8	18%	9	-10%	5.1	2%				
2	Damascus Countryside	520	4%	8.6	-14%	9	-10%	4.7	-6%	11-Jul	12	10	83%
		514	3%	11.0	10%	9	-10%	4.9	-2%				
		514	3%	7.9	-21%	10	0%	5.3	6%				
3	Aleppo	516	3%	8.8	-12%	7	-30%	5.0	0%	20-Jun	11	7	64%
		525	5%	9.6	-4%	7	-28%	5.0	0%				
		535	7%	13.1	31%			5.3	6%				
4	Homs	535	7%	9.5	-5%	8	-20%	5.1	2%	5-Jul	12	9	75%
		525	5%	9.9	-1%	8	-20%	5.1	2%				
		532	6%	9.3	-7%	8	-20%	5.1	2%				
5	Hama	536	7%	8.6	-14%	10	0%	4.8	-4%	28-Jun	12	9	75%
		525	5%	8.8	-12%	10	0%	4.9	-2%				
		538	8%	13.8	38%	10	0%	5.3	6%				
6	Lattakia	522	4%	11.7	17%	9	-10%	5.2	4%	26-Jun	12	9	75%
		508	2%	12.0	20%	10	0%	5.2	4%				
		510	2%	13.2	32%	9	-10%	5.3	6%				
7	Deir ez Zor	585	17%	9.9	-1%	8	-20%	4.8	-4%	17-Jun	12	4	33%
		576	15%	10.4	4%	6	-40%	5.6	12%				
		577	15%	10.1	1%	5	-50%	3.8	-24%				
8	Idleb	531	6%	10.5	5%	9	-10%	5.0	0%	21-Jun	11	10	91%
		524	5%	10.7	7%	9	-10%	5.0	0%				
		526	5%			8	-20%	5.2	4%				
9	Hasakeh	506	1%	9.5	-5%	9	-10%	5.2	4%	18-Jun	10	9	90%
		511	2%	9.4	-6%	9	-10%	4.9	-2%				
						8	-20%	5.3	6%				
10	Rakka	581	16%	10.5	5%	14	40%	5.3	6%	19-Jun	12	4	33%
		554	11%	8.8	-12%	14	40%	5.3	6%				
		575	15%	8.3	-17%	14	40%						
11	Sweida	505	1%	12.2	22%	11	10%	5.1	2%	14-Jun	8	6	75%
		531	6%	11.1	11%	11	10%	5.1	2%				
12	Dara'a	394	-21%	9.4	-6%	9	-10%	5.1	2%	13-Jun	12	9	75%
		388	-22%	10.9	9%	9	-10%	5.5	10%				
		408	-18%	10.5	5%	9	-10%	5.6	12%				
13	Tartous	498	0%	9.4	-6%	12	20%	5.1	2%	25-Jun	12	10	83%
		495	-1%	10.6	6%	10	0%	5.1	2%				
		498	0%	10.2	2%	12	20%	5.2	4%				
14	Quneitra	523	5%	9.3	-7%	11	10%	5.2	4%	3-Jul	12	11	92%
		518	4%	9.7	-3%	12	20%	5.2	4%				
		519	4%	9.4	-6%	11	10%	5.4	8%				
										Ground Total	**160**	**113**	**71%**

Acceptable Margin of error< ±10%

The Results of Basic Water Quality Monitoring on Major Pollution Sources in Syria (Jan. to Dec. 2006)

DFEA	Major Pollution Sources	Discharged Into	Major Wastewater Quality Parameters (Unit: mg/l except pH)																												Notes
			pH				TDS				SS				COD				BOD				NO_3-N				PO4				NH_3-N				
			Value			Standard	Value			Standard	Value			Standard	Value			Standard	Value			Standard	Value			Standard	Value			Standard	Value			Standard	
			Min.	Max.	Av.		Min.	Max.	Av.		Min.	Max.	Av.		Min.	Max.	Av.		Min.	Max.	Av.		Min.	Max.	Av.		Min.	Max.	Av.		Min.	Max.	Av.		
DAM	Galab Factory for Soda	Sewage pipes													1,230	2,183	1,899	1,600									1	58	36	20					
	Al Khomasiah Company	River	5.0	13.0	10.4	6-9	42	12,520	2,900	1,200	32	871	487	30	11	1,650	522	150	44	53	49	40													
	Al Ehda Ashariah Zone	River					233	2,721	2,108	1,200	63	74	69	30																	31	34	33	5	
DAM C	The Syrian and Finland for Diary Products	Land	5.5	5.5	5.5	6.5-9.5	5,207	5,207	5,207	800	12,933	12,933	12,933	30	72,250	72,250	72,250	30	35,000	35,000	35,000	20	710	710	710	30	140	140	140	1	150	150	150	5	
	Al Nagah Soap & Be Be Fat	Sewage pipes	12.0	12.0	11.9	6.5-9.5	8,226	20,867	14,547	2,000	70	7,850	3,960	500	16,853	22,625	19,739	1,600	200	4,000	2,100	800	26	1,414	720	50									
	Al Wazeer Factory for Soap	River	13.0	13.0	13.0	6-9	111,500	111,500	111,500	1,200	255	255	255	30	10,673	10,673	10,673	150	1,000	1,000	1,000	40	192	192	192	50	59	59	59	15	10	10	10	5	
ALP	Makki Co for Dying	Land	9.0	10.0	9.4	6.5-9.5					303	319	311	30	13,070	13,620	13,345	30	3,607	3,738	3,673	20													
	Katash for Leather Dying	River	13.0	13.0	13.0	6-9	16,958	16,958	16,958	1,200	1,753	1,753	1,753	30	7,293	7,293	7,293	150	5,320	5,320	5,320	40	1,933	1,933	1,933	50	51	51	51	15	135	135	135	5	
	Ka'akeh for Dairy Products	Sewage pipes	4.8	4.8	4.8	6.5-9.5	2,460	2,460	2,460	2,000	745	745	745	500	6,705	6,705	6,705	1,600	4,172	4,172	4,172	800					45	45	45	20					
HOM	Slaughtering House	River													2,880	23,450	13,165	150	2,500	11,200	6,850	40													
	Fertilizer Factory	Lake	2.1	2.1	2.1		7,150	7,150	7,150																		85	85	85						No Standard
	Homs Oil Refinery (65.000m^3/day)	River																													13	13	13	5	
HAM	Salora for Diary Products	Sewage pipes					2,338	2,338	2,338	2,000					11,980	14,020	13,000	1,600	4,000	4,000	4,000	800									160	160	160	100	
	Al Fadel for Oil	Sewage pipes	10.4	10.4	10.4	6.5-9.5	2,935	2,935	2,935	2,000	2,100	2,100	2,100	500	17,440	17,440	17,440	1,600	4,600	4,600	4,600	800					695	695	695	20					
	Shezar for Soda	Sewage pipes	5.0	5.0	5.0	6.5-9.5									37,500	37,500	37,500	1,600	2,000	2,000	2,000	800													
LTK	Ugarit for Food Products	River									53	141	96	30	1,063	2,592	1,772	150	483	1,833	1,172	40													
	Joud For Soda Juice	River									25	346	98	30	540	1,652	1,004	150	360	1,173	635	40													
	Latakia Roadstead waste water	Sea													221	1,063	523	200	67	242	153	60					5	112	38	10	9	40	27	10	
DZR	Paper Factory	River									121	413	300	30	195	1,158	435	150	80	240	113	40													
	Sugar Factory	River									1,163	3,250	1,942	30	4,369	8,073	6,221	150	3,200	7,800	5,500	40	6	587	208	50	13	278	102	15	20	40	30	5	
IDL	Al Kamal for Pressing Olive	Sewage pipes	4.5	6.5	5.4	6.5-9.5					900	17,800	9,350	500	77,300	81,500	79,400	1,600	>40000	>35000		800	130	130	130	50	10	480	245	20					
	Gassan for Pressing Olive	Sewage pipes									10,500	60,300	35,400	500	18,300	190,000	104,150	1,600	64,000	64,000	64,000	800					108	1,030	569	20					
	Alesha for Diary Products	Sewage pipes	4.7	4.7	4.7	6.5-9.5					3,730	3,730	3,730	500	24,540	24,540	24,540	1,600					61	61	61	50	639	639	639	20					
HSK	Sianlko Factory For Soda Juice	Sewage pipes													3,575	3,575	3,575	1,600																	
RAK	Sugar Factory	River													4,300	6,500	5,135	1,600	2,050	3,000	2,583	800													
	Al Tawfik for Pressing Olive	Sewage pipes	4.8	4.8	4.8	6.5-9.5					20,100	20,400	20,250	500	39,200	39,500	39,350	1,600	25,000	25,800	25,400	800									487	500	494	100	
	Al Nae'm Factory for Ice Cream	Sewage pipes													2,125	2,125	2,125	1,600	975	975	975	800					44	44	44	20					
SWD	Abo Hasan for Pressing Olive	Sewage pipes	5.0	5.0	5.0	6.5-9.5	5,670	6,425	5,922	2,000	16,000	42,700	30,233	500	110,100	110,100	110,100	1,600	2,850	40,000	21,425	800	15	2,900	988	50	840	1,070	953	20					
	Hamzeh for Pressing Olive	Sewage pipes	5.2	5.2	5.2	6.5-9.5	5,090	5,610	5,350	2,000	38,600	52,500	45,550	500	55,800	139,000	97,400	1,600	300	3,700	2,000	800	50	300	175	50	680	780	730	20					
	Al Rayan Factory for Alcohol	Land	3.0	4.0	4.0	6.5-9.5	2,470	2,850	2,638	800	580	7,750	3,002	30	41,525	46,100	43,813	30									372	435	395	1	10	17	12	5	
DAR	Al Bassam Factory for Canning	Land									3,700	3,700	3,700	30	93,250	93,250	93,250	30									13	13	13	1					
	Al Basheer Factory for Food Products (Biscuit)	Land	4.5	4.5	4.5	6.5-9.5	1,104	1,104	1,104	800	680	680	680	30	12,380	12,380	12,380	30					259	259	259	30	315	315	315	1	100	100	100	5	
	Gelleen Factory for Dairy Products	Sewage pipes	4.0	4.0	4.0	6.5-9.5					1,633	1,633	1,633	500	13,400	13,400	13,400	1,600																	
TAR	Oil Storing Tanks	River					21,601	21,601	21,601	1,200	217	217	217	30	72,400	72,400	72,400	150					183	183	183	50	177	177	177	15	283	283	283	5	
QUN	Al Ferdos Factory for Starch	Sewage pipes	3.3	3.7	3.5	6.5-9.5	510	519	513	2,000	4,200	4,300	4,253	500	11,025	11,100	11,060	1,600	3,000	3,000	3,067	800					145	147	146	20					
	Bemco Factory for Fertilizers	Land	4.7	5.0	4.8	6.5-9.5	807	810	809	800	472	480	476	30	1,100	1,119	1,109	30	565	600	582	20	48	50	49	30	85	90	88	1	195	200	198	5	

3.1.2 Products of Activities

(1) Materials of Lecture Trainings

From June 2005 to July 2007, 5 times lecture trainings (total 14 lectures) had been conducted at Damascus and 14 DFEAs. The training materials developed by the JICA Expert Team are attached in Annex 2.3.

(2) SOPs and O/M Manuals

A Standard Operation Procedure (SOP) is a set of written instructions that document a routine or repetitive activity followed by a laboratory. The development and use of SOPs ensures analysis quality through consistent implementation of analysis procedure within each DFEA laboratory, even if there would be temporary or permanent personnel changes. The JICA Expert Team prepared the draft SOPs for basic water environmental monitoring (sampling, field measurement, recording, laboratory analysis, equipment O/M etc.). The concepts considered in SOPs preparation are i) Concise (using figure and photos) and not overly complicated in style, ii) Step-by-step and easy-to-read format, iii) Document not being wordy, redundant, or overly lengthy, and iv) English and Arabic. The list of prepared SOPs and their use state are shown in the table below. The SOP for sending sample to the Damascus DFEA is prepared in the training of the Chemical and Biological Analysis. The details of SOPs are attached in Annex 1.

List of Prepared SOPs for Basic Water Quality and Their Use State

No.	Name of SOPs	Use State	Remarks
1	SOP for pH and Water Temperature Measurement	O	
2	SOP for Color (Apparent) Measurement	O	
3	SOP for Electrical Conductivity (EC) and Total Dissolved Solids (TDS) Measurement	O	
4	SOP for Dissolved Oxygen (DO) Measurement	O	Modified
5	SOP for Suspended Solid (SS) Measurement	O	
6	SOP for Chemical Oxygen Demand (COD) Measurement (High Range 0-1,500 mg/l)	O	
7	SOP for Chemical Oxygen Demand (COD) Measurement (Low Range 0-150 mg/l)	O	
8	SOP for Biological Oxygen Demand (BOD) Measurement	O	
9	SOP for Nitrate (NO_3-N) Measurement (High Range 0-30 mg/l)	O	
10	SOP for Nitrate (NO_3-N) Measurement (Mid Range 0-5.0 mg/l)	O	
11	SOP for Phosphorous (PO_4) Measurement (High Range 0-30 mg/l)	O	
12	SOP for Phosphorous (PO_4) Measurement (Low Range 0-2.50 mg/l)	O	
13	SOP for Chloride (Cl^-) Measurement	O	
14	SOP for Ammonia (NH_3-N) Measurement (High Range 0-50 mg/l)	O	
15	SOP for Ammonia (NH_3-N) Measurement (Low Range 0-2.50 mg/l)	O	
16	SOP for Turbidity Measurement	O	
17	SOP for Sampling	O	
18	SOP for Sampling Checklist	O	
19	SOP for Field Measurement and Observation Record	O	
20	SOP for Water Quality Results Record	O	
21	SOP for Preservation and Storage of Samples	O	
22	SOP for Water Stills	O	Revised by some DFEAs
23	SOP for Interference Treatment	O	
24	SOP for Reagent Correction	O	
25	SOP for sending sample to Damascus DFEA	×	No DFEA sending samples to Damascus DFEA for analysis of all chemical and biological parameters.

Note: ○=Being used well; ×=Having not been used till Dec. 2007

(3) O/M Manuals

To ensure proper laboratory operation and maintenance (O/M), a laboratory O/M manual was prepared considering the actual situation and the level of C/Ps' skills of DFEAs. The list of prepared O/M manuals and their use state are shown in the table below. The details of O/M manuals are attached in Annex 2.1.

List of Prepared O/M Manuals for Basic Water Quality and Their Use State

No.	Name of Manuals	Use State	Remarks
1	Operation and Maintenance (O/M) Manual for Laboratory (Basic Water Quality Analysis)	O	
2	O/M Record for Equipment (Basic Water Quality Analysis)	O	
3	O/M Record for Reagents (Basic Water Quality Analysis)	O	
4	O/M Record for Laboratory Management Staff (Basic Water Quality Analysis)	O	
5	O/M Record for Suppliers Contact List (Basic Water Quality Analysis)	O	
6	O/M Record for Sending Waste Liquid to DAM (Basic Water Quality Analysis)		Due to the lab wastewater treatment facility in Damascus DFEA having not been put into operation yet till Dec. 2007.

Note: ○=Being used well; =Being used to a certain extent; ×=Having not been used till Dec. 2007

3.2 Chemical and Biological Water Quality

3.2.1 Training Activities of Chemical and Biological Water Quality for the Damascus DFEA (CB-1)

(1) Training Course and Contents

1) Target parameter

For the training of the Chemical and Biological Water Quality Analysis for the Damascus DFEA (CB-1), the following 18 parameters were selected. The table below summarizes the target parameters trained in the Damascus DFEA. The determination methods of parameters for CB-1 applied in the training are basically based on the United States Environmental Protection Agency （USEPA） method or the Standard Method for the Examination of Water and Wastewater in USA.

Target Parameters Trained for CB-1

	Parameter Measured	Method Applied	Major Equipment Used
1	- Oil and Grease	Solvent extraction/ Infrared absorptiometry	Oil content meter
2	- PO_4^{3-} - NH_3-N - Surfactants - Chromium, Total - Chromium, Hexavalent - Sulfide (S_2^-) - NO2-	Spectral photometric	UV/VIS spectrophotometer
3	- NO_3^- - Cl^- - F^- - CN^- - pH - EC	Ion selective electrode (ISE)	Water quality analyzer (Ion meter)
4	- SS - Settleable solid	Filtrate weight	Vacuum filtration unit, etc.
5	- COD_{Cr}	Open reflux method (Potassium dichromate)	Liebig condenser, Heater, etc.
6	- Total coliform	Membrane filter technique (MF)	Filtration unit, Autoclave, Incubator, Colony counter, etc.

2) Contents of the training

The training for measurement of the parameters of the Chemical and Biological Analysis (CB-1) had started after delivery of the equipment to the Damascus DFEA from May in 2006. The training had been implemented for the C/Ps in charge for the Chemical and Biological Analysis in the Damascus DFEA combined with the practical training of water analysis and the lecture trainings. The contents of practical training and lecture training are summarized below.

Contents of Practical Training for CB-1 (May 2006 – December 2007)

No.	Parameter Measured	Equipment Used	Period	Major Contents
1	Oil and Grease	Oil content meter	May – September, 2006	- Preparation of span liquid using standard substance, - Zero calibration and span calibration, - Ratio of volume of solvent and sample injected into the equipment, - Setting of span value, - Internal and external solvent extraction, - Practical measurement of oil and grease using sample collected, - Reclaim of used solvent
2	- PO_4^{3-} - NH_3-N - Surfactants - Chromium, Total - Chromium, Hexavalent	UV/VIS spectrophotometer		- Preparation of standard solutions, - Reagent blank adjustment, - Accuracy check using standard solutions, - Practical measurement of PO_4^{3-}, NH_3^-, surfactants, and chromium using sample collected, - Cross checking of the results generated from DR 5000 and DR 890 (Colorimeter)
3	- NO_3^- - Cl^- - F^- - CN^- - pH - EC	-Ion selective electrode -EC electrode -pH electrode		- Preparation of electrodes, - Preparation of standard solutions, - Preparation of ionic strength adjuster (ISA), - Preparation of two kind concentration standard solutions, whose concentrations vary by tenfold, by serial dilution, - Electrode slope check, - Practical measurement of NO_3^-, Cl^-, F^-, CN^-, pH, and EC using sample collected

No.	Parameter Measured	Equipment Used	Period	Major Contents
4	Oil and Grease	Oil content meter	December, 2006 – February, 2007	- Preparation of span liquid using standard substance, - Zero calibration and span calibration, - Ratio of volume of solvent and sample injected into the equipment, - Setting of span value, - External solvent extraction using separately funnel, - Pre-treatment of samples using filter and centrifuge, - Practical measurement of oil and grease using sample collected at factories, - Reclaim of used solvent
5	- PO_4^{3-} - NH_3-N - Surfactants - Chromium, Total - Chromium, Hexavalent - Sulfide (S_2^-)	UV/VIS spectrophotometer		- Preparation of standard solutions, - Reagent blank adjustment, - Accuracy check using standard solution method and standard additions method, - Container for sample and sample preservation - Practical measurement of PO_4^{3-}, NH_3^-, surfactants, chromium and sulfide using sample collected, - Cross checking of the results generated from DR 5000 and DR 890 (Colorimeter)
6	- NO_3^- - Cl^- - F^- - CN^- - pH - EC	Ion selective electrode (ISE)		- Preparation of electrodes, - Preparation of standard solutions, - Preparation of ionic strength adjuster (ISA), - Preparation of two kind concentration standard solutions, whose concentrations vary by tenfold, by serial dilution, - Electrode slope check, - Practical measurement of NO_3^-, Cl^-, F^-, CN^-, pH, and EC using sample collected, - Accuracy check using standard solution method and standard additions method, - Cross checking of the results of determination of chloride generated from ISE and titration method
7	- SS - Settleable solid	Filter holder Glass-fiber filter Suction flask Vacuum pump Drying oven, etc		- Preparation of glass-fiber filter disk, - Practical measurement of total suspended solids, non-settleable solids and settleable solids.
8	COD_{Cr}	Liebig reflux condenser, Heater, Buret, Magnetic stirrer, Analytical balance, etc.	May – August, 2007	- Check and confirmation of tools, apparatus, instrument and reagents/chemicals - Preparation of reagents and chemicals ・ Standard potassium dichromate solution, ・ Sulfuric acid solution, ・ Standard ferrous ammonium sulfate (FAS) titrant, ・ Ferroin indicator solution - Setting up of the reflux apparatus - Trial run of Liebich condenser and related tools/apparatus - Preparation of standard solution (KHP) - Titration of standard solution - Titration of FAS against $K_2Cr_2O_7$ - Calculation of COD_{Cr} concentration - Measurement of COD_{Cr} using the recording format - Measurement of COD_{Cr} using actual sample collected at a textile dyeing company - Comparison with the open reflux method and the reactor digestion method
9	Total coliform group	Filtration unit, Autoclave, Incubator, Colony counter, etc.		- Confirmation of the reagents - Confirmation of the apparatus and the tools - Test operation of the autoclave and filtration unit - Preparation of the culture media - Preparation of buffered water - Sterilization using autoclave, dry oven, alcoholic lamp, ethanol - Assembling and operation of filtration unit - Counting of number of colonies - Calculation and reporting of number of colonies
10	- PO_4^{3-} - NO_3-N - Chromium, Total - Chromium, Hexavalent	UV/VIS spectrophotometer		- Preparation of standard solutions - Accuracy check of data (QC) ・ Reagent blank, ・ Standard adjust, ・ Standard addition method - Crosschecking with the results of the colorimeter (DR890)

No.	Parameter Measured	Equipment Used	Period	Major Contents
11	- PO_4^{3-} - NH_3-N - Surfactants - Chromium, Total - Chromium, Hexavalent - Sulfide (S_2^-) - NO_2^-	UV/VIS spectrophotometer	November– December, 2007	- Preparation of standard solutions - Making of calibration curve - Accuracy check of data (QC) ・ Reagent blank, ・ Standard adjust, - Standard addition method
12	- Cl^- - F^- - CN^- - pH	Ion selective electrode (ISE)		- Preparation of electrodes, - Preparation of standard solutions, - Preparation of ionic strength adjuster (ISA), - Preparation of two kind concentration standard solutions, whose concentrations vary by tenfold, by serial dilution, - Electrode slope check, - Practical measurement

Contents of Lecture Training for CB-1 (May 2006 – December 2007)

No	Subject	Directorate	Period	Content
1	Measuring Oil and Grease in Water	Damascus	July 2006	✓ Oil and Grease in Water ✓ Principle of Determination of Oil and Grease in Water ✓ What is Infrared Light? ✓ Regulation in Japan ✓ Use of Oil Content Meter (Partition Infrared Method)
2	Analysis Using UV/VIS Spectrophotometer	ditto		✓ General Information on UV/VIS Spectrophotometer ✓ Beer-Lambert Law ✓ Application of Spectrophotometer ✓ Operation of DR5000
3	Water Quality Standard in Japan	ditto		✓ Environmental Quality Standards for Water Pollution ✓ Effluent Standards ✓ Structure of Regulation and Control System of Water Pollution in Japan
4	Measuring Water Quality Parameter Using Ion Selective Electrode	ditto	August 2006	✓ Review of Concept of pH ✓ Concept of Electrode Potential ✓ Ion Selective Electrode ✓ Nernst Equation ✓ Membrane of Electrode ✓ Properties of Ion Selective Electrode ✓ Interferences
5	Sulfide	ditto	January 2007	✓ What is Sulfide? ✓ Categories of Sulfide ✓ Total Sulfide ✓ Occurrence and significance of Sulfide ✓ Determination method ✓ Chemical structure of Methylene blue ✓ Sampling and storage ✓ Preparation of Sulfide standard
6	Analysis Using Ion Selective Electrode	ditto		✓ Activity of Ion ✓ Concept of pH ✓ Electrode potential ✓ Nernst equation ✓ Ion Selective Electrode (ISE) ✓ Ion Selective Membrane ✓ Potential difference across membrane ✓ Calibration curve of Ion Selective Electrode ✓ Calibration and Ion strength
7	Solids in Water	ditto		✓ Solids in water ✓ Size of variety of particles in water ✓ What is total solids in water? ✓ Categories of solids in water ✓ Measurement of total suspended solids ✓ Procedure measurement ✓ Procedure of determination of SS ✓ Measurement of SS and dissolved solids ✓ Measurement of Settleable solids and Nonsettleable solids ✓ Type and feature of glass-fiber filter ✓ Sample handling and preservation
8	Oil and Grease in water	ditto		✓ What is oil and Grease in water? ✓ What is petroleum? ✓ What items are to be monitored? ✓ How will oil detected in the water? ✓ What is TH? ✓ How to measure TH? ✓ Determination of oil in water

No	Subject	Directorate	Period	Content
				✓ 9HORIBA oil content analyzer ✓ Measurement principle of oil content analyzer ✓ Extraction solvent ✓ Measurement sequence ✓ Regulation and control system of water pollution in Japan ✓ Regulation of oil and grease in water
9	Sampling Guide	Damascus Aleppo Damascus Countryside	July 2007	✓ Reliability pyramid of monitoring data ✓ Importance of sampling ✓ How to secure the reliability of sampling ✓ Sampling factor ✓ Sampling guide - Container, Preservation method, Sample volume, Holding time ✓ Amendment of existing Environmental Monitoring Plan
		HOM	August 2007	
10	Measurement of COD_{Cr} by Open Reflux Method	DAM	June 2007	✓ Review of concept of COD ✓ History of Concept of COD ✓ Oxidation by Dichromate ✓ Titration with FAS ✓ Concept of Open Reflux Method ✓ Equipment Required for Open Reflux Method ✓ Chemicals Required for Open Reflux Method ✓ Chemical Preparation ✓ Setting Up Reflux ✓ Basic Concept of Open Reflux Method ✓ Procedure of Measurement by Open Reflux Method ✓ Derivation of Calculation Formula ✓ Precautions of Measuring Procedure ✓ Sample Handling ✓ Procedure for Measurement of Low Concentration COD
11	Total Coliform	DAM	July, August 2007	✓ What is Total Coliform? ✓ Why test for coliform bacteria? ✓ Where they are found? ✓ How to measure/test coliforms? ✓ Selection of Analytical Method ✓ Comparison of Method ✓ Size of Variety of Particles in Water ✓ Membrane Filter Technique ✓ Procedure of Membrane Filter Technique ✓ Outline of the Procedure ✓ Apparatus and Materials ✓ Procedure of Membrane Filter Technique ✓ Colony Counting ✓ Culture Media ✓ Selection of Sample Size ✓ Suggested Volume to be Filtered ✓ Sample Collection, Preservation, and Handling
12	Sample Transfer System	14 DFEA	November – December, 2007	✓ Sampling guide ・ Pre-treatment and preservation method ・ Container for sampling ・ Holding time ・ Minimum sampling volume ✓ Selection of parameters to be monitored ✓ Modification of the environmental monitoring plan

(2) Sample Transportation and Reception System

In order to establish a transportation and reception system between the Damascus DFEA and other 13 DFEAs, a preliminary training was carried out in the end of January 2007 with cooperation of Dr. Ueno, JICA Senior Volunteer (SV), and the Aleppo Chamber of Industry (ACI). The staff in Aleppo DFEA participated and conducted this training with the JICA Expert Team. Contents of the training are shown below.

Contents of Samples for Practical Transportation Training

Training Item	Contents
1) Date and Place	30-31 Jan. 2007, Industrial area in Aleppo
2) Kind of Samples (name of factories)	-Olive Mill (Al Nouf) -Leather tannery factory (Yousef Dleyati) -Textile dyeing factory (Oulapy)
3) Samples taken	5 samples in each factory -Plastic bottle: 1 L, preserved in pH<2 (for AAS), -Plastic bottle: 1 L, preserved in pH<2, -Plastic bottle: 1 L, preserved in pH=12 – 12.5, -Plastic bottle: 1 L, non-treated, and, -Wide mouth glass bottle: 1 – 1.5 L (for oil).
4) Parameters to be analyzed	Refer to a Table in next page

A table below shows the analysis result of the samples taken for preliminary training for sample transportation by the lab in the Damascus DFEA. Through this training, C/Ps in the Aleppo DFEA had learned how to find sampling points, to identify methods for sampling, to conduct sample pretreatment, to transport to the Damascus DFEA.

Analysis Results of Samples taken for Preliminary Transportation Training

Parameter		Olive Mill (Al Nouf))	Leather tannery (Yousef Dleyati)	Textile dyeing (Oulapy)	Determination method	DFEA in charge	Note
pH	-	-	-	-	Electrode	Aleppo	Electrode problem
EC	µS/cm	2,980	19,280	9,000	Electrode	Aleppo	
TDS	mg/L	1,522	11,030	4,870	Electrode	Aleppo	
DO	mg/L	2.36	2.29	5.74	Electrode	Aleppo	
SS	mg/L	342	4,035	468	Gravimetric	Damascus	
BOD/COD	mg/L	3,800(BOD)	10,340(COD)	105(COD)	Manometric/Reactor digestion	Aleppo	
PO_4	mg/L	73	112	8.5	Colorimeter	Aleppo	
	mg/L	27.3	57.2	4.8	Spectrophotometer	Damascus	
NO_3-N	mg/L	0.5	1,910	(Interference)	Colorimeter	Aleppo	
					Spectrophotometer	Damascus	
NH_3-N	mg/L	(Interference)	140	(Interference)	Colorimeter	Aleppo	
		28.8	51.2	2.5	Spectrophotometer	Damascus	
Cl^-	mg/L	2,850	5,525	600	Titration	Aleppo	
		140	5,200	834	ISE	Damascus	
Oil & Grease	mg/L	493	122	20	Partition-Infrared	Damascus	Centrifuged sample
F^-	mg/L				ISE	Damascus	
CN^-	mg/L	0.89	2.7	0.23	ISE	Damascus	
T-Cr	mg/L	0.083	0.40	0.38	Spectrophotometer	Damascus	Accuracy check is needed
Cr (VI)	mg/L	0.095	0.50	0.33	Spectrophotometer	Damascus	
Zn	mg/L	-	1.6	9.2	AAS	Damascus	
Cu	mg/L	-	< 0.5	< 0.5	AAS	Damascus	
Pb	mg/L	-	< 0.2	< 0.2	AAS	Damascus	

Parameter Analyzed for Transportation/ Reception Sample
(for Preliminary Training in Aleppo DFEA)

Parameter Analyzed	Factory			Preservation /Pre-treatment	DFEA in charge		Bottle No.
	Olive Mill (Al Nouf))	Leather tannery (Yousef Dleyati)	Textile dyeing (Oulapy)		Damascus DFEA	Aleppo DFEA	
Temperature	◎	◎	◎	(On site measurement)	□	☑	
pH	◎	◎	◎	(On site measurement)	□	☑ (Electrode)	
EC	◎	◎	◎	(On site measurement)	□	☑ (Electrode)	
TDS	◎	◎	◎	(On site measurement)	□	☑ (Electrode)	
DO	◎	◎	◎	(On site measurement)	□	☑ (Electrode)	
SS	◎	◎	◎	-	☑ (Gravimetric)	□	④
BOD/COD	◎ (BOD)	◎ (COD)	◎ (COD)	pH<2	□	☑ (BOD/COD meter)	
PO_4	◎	◎	◎	pH<2	☑ (Spectrophotometer)	☑ (Colorimeter)	②
NO_3-N	◎	◎	◎	-	☑ (ISE)	☑ (Colorimeter)	④
NH_3-N	◎	◎	◎	pH<2	☑ (Spectrophotometer)	☑ (Colorimeter)	②
Cl^-	◎	◎	◎	No special preservation	☑ (ISE)	☑ (Titration)	④
Oil and Grease	◎	◎	◎	pH<2	☑ (Infrared)	□	⑤
F^-	◎	◎	◎	PL bottle	☑ (ISE)	□	④
CN^-		◎	◎	pH=12 – 12.5 (with NaOH)	☑ (ISE)	□	③
T-Cr, Cr( )		◎	◎	pH<2	☑ (Spectrophotometer)	□	②
Zn		◎	◎	pH<2 (with HNO_3)	☑ (AAS)	□	①
Cu		◎	◎	pH<2 (with HNO_3)	☑ (AAS)	□	①
Pb		◎	◎	pH<2 (with HNO_3)	☑ (AAS)	□	①

3.2.2 Training Course and Contents for Chemical and Biological Water Quality Analysis for Damascus Countryside, Homs, and Aleppo DFEAs (CB-2)

In order to utilize the spectrophotometers and the oil content meters provided by GCEA, additional training were conducted in three selected DFEAs; the Damascus Countryside, Homs and Aleppo DFEAs starting from June 2007. Considering the parameters of Chemical and Biological Water Quality Analysis in the Damascus DFEA (CB-1), 9 parameters were selected for the training of the spectrophotometer. Training items are shown in the table below.

(1) Parameters of Training

Parameters of training for CB-2 are as follows;

Training Parameters for CB-2

Parameter	Method Applied	Equipment Used
Cr^{6+}	Spectral photometric	UV/VIS spectrophotometer (Hach, DR/4000)
T-Cr		
Hardness		
NH_3-N		
NO_3^--N		
NO_2^--N		
PO_4^{3-}		
Sulfide(S^{2-})		
Surfactants		
Oil & Grease	Solvent extraction / Infrared absorptiometry	Oil content meter (Horiba, OCMA-310) (Horiba, OCMA-310)

(2) Contents of the Training

Contents of the training are summarized below.

Contents of Practical Training for CB-2 (June 2007 – December 2007)

No.	Directorate	Period	Contents of the Training
1	Damascus Countryside	June 2007	1) Lecture on spectrophotometer (principle, structure and operation) 2) Lecture on Sampling, preservation, and storage 3) Lecture on method of analysis by spectrophotometer 4) OJT（Sampling, preservation, storage and analysis by spectrophotometer）
2	Homs	June 2007	1) Lecture on spectrophotometer (principle, structure and operation) 2) Lecture on Sampling, preservation, and storage 3) Lecture on method of analysis by spectrophotometer 4) OJT（Sampling, preservation, storage and analysis by spectrophotometer）
3	Damascus Countryside	June 2007	1) OJT（Sampling, preservation, storage and spectrum analysis) 2) Lecture on Oil and Grease 3) Demonstration of handling of a glass ware etc.
4	Aleppo	June 2007	1) Lecture on spectrophotometer (principle, structure and operation) 2) Lecture on Sampling, preservation, and storage 3) Lecture on method of analysis by spectrophotometer 4) OJT（Sampling, preservation, storage and analysis by spectrophotometer） 5) Lecture on standard solution method and standard additions method 6) OJT（standard solution method and standard additions method by Spectrophotometer)
5	Homs	July 2007	1) Lecture on standard solution method and standard additions method 2) OJT（standard solution method and standard additions method by Spectrophotometer) 3) Demonstration of handling of a glass ware etc.
6	Aleppo	July 2007	1) Cleaning method of the still (water distillation unit) 2) Lecture on Oil 3) Lecture on oil content meter (principle, structure and operation) 4) OJT（Sampling, preservation, storage and analysis by Spectrophotometer and Oil content meter)
7	Damascus Countryside	July 2007	1) Cleaning method of the still (water distillation unit) 2) Lecture on Oil 3) Lecture on oil content meter (principle, structure and operation) 4) OJT（Sampling, preservation, storage and analysis by spectrophotometer and Oil content meter)
8	Homs	July 2007	1) Cleaning method of the still (water distillation unit) 2) Lecture on Oil 3) Lecture on oil content meter (principle, structure and operation) 4) OJT（Sampling, preservation, storage and analysis by spectrophotometer and Oil content meter) 5) Lecture on standard materials and standard solutions
9	Aleppo	August 2007	1) Lecture on standard materials and standard solutions 2) Lecture on standard solution method and standard additions method 3) Demonstration of handling of a glass ware etc.
10	Aleppo	November 2007	1) Lecture on measurement theory 2) Review of the previous training 3) Lecture and practical training on reliability and accuracy of analyzed data 4) Lecture on standard solution method and standard addition method with spectrophotometer 5) Lecture on determination principle, sample collection, and quality control 6) Sampling and preservation guide 7) Implementation of water quality monitoring according to the EMP
11	Homs	November, December, 2007	
12	Damascus Countryside	November, December, 2007	

3.2.3 Products of Activities

(1) SOPs

The SOPs for parameters of CB-1 and some analytical instrument had been prepared through activities above mentioned. The SOPs prepared had been reviewed and modified according to the progress of the trainings. Titles of the SOPs prepared for CB-1 and CB-2 are listed below.

SOPs Prepared for CB-1

Title of SOP
– Oil and Grease
– Orthophosphate (PO_4^{3-}) – Chromium, Total (T-Cr) – Chromium, Hexavalent (Cr (6) – Nitrogen, Ammonia (NH_3-N) – Surfactants, Anionic (Detergent)
– Cyanide ion – Nitrate ion – Nitrogen Nitrate (Spectrophotometer) – Nitrite (Spectrophotometer) – Chloride ion – Fluoride ion – Sulfide ion – Suspended solids and Settleable solids – Total coliform – Chemical Oxygen Demand (Open Reflux Method) – Water Purifier (De-Ionizing) – Creation of Calibration Curve using User Program (Spectrophotometer) – SOP for Sampling

For the analysis of the parameters of CB-2, the following SOPs have been prepared.

SOPs Prepared for CB-2

Title of SOP
- SOP for Measurement of Chromium, Hexavalent using DR/4000 - SOP for Measurement of Chromium, Total using DR/4000 - SOP for Measurement of Hardness using DR/4000 - SOP for Measurement of Nitrate, MR using DR/4000 - SOP for Measurement of Nitrate, HR using DR/4000 - SOP for Measurement of Nitrite using DR/4000 - SOP for Measurement of Nitrogen, Ammonia using DR/4000 - SOP for Measurement of Phosphorus using DR/4000 - SOP for Measurement of Sulfide using DR/4000 - SOP for Measurement of Surfactants, Anionic using DR/4000 - SOP for Measurement of Oil & Grease (Common SOP with CB)

The SOPs mentioned above are shown in Annex 1.

(2) Lecture Materials

1) Chemical and Biological Water Quality Analysis for Damascus DFEA (CB-1)

For implementation of the lecture of CB-1, some lecture materials had been prepared by the JICA Expert Team. The titles of lecture are listed in the table below.

Lecture Materials Prepared for CB-1

Title of Lecture Material
❑ Quality System and Elements of Quality Management
❑ Analysis Using Ion Selective Electrode
❑ Oil and Grease in Water
❑ Solids
❑ Measurement of COD_{Cr} by Open Reflux Method
❑ Sampling Guide
❑ Basis of Water Quality Analysis
❑ Analysis Using Ion Selective Electrode-2
❑ Total Coliform
❑ Sulfide
❑ Formulation of Water Quality Monitoring Plan
❑ Analysis Using UV/VIS Spectrophotometer
❑ Water Quality Standards in Japan
❑ Ion Selective Electrode
❑ Summary of Analysis Using UV/VIS Spectrophotometer (DR5000)
❑ Oil and Grease
❑ Sulfide (2)
❑ Solids
❑ Standard Addition Decision Tree

2) Chemical and Biological Water Quality Analysis for the Damascus Countryside, Homes, and Aleppo DFEAs (CB-2)

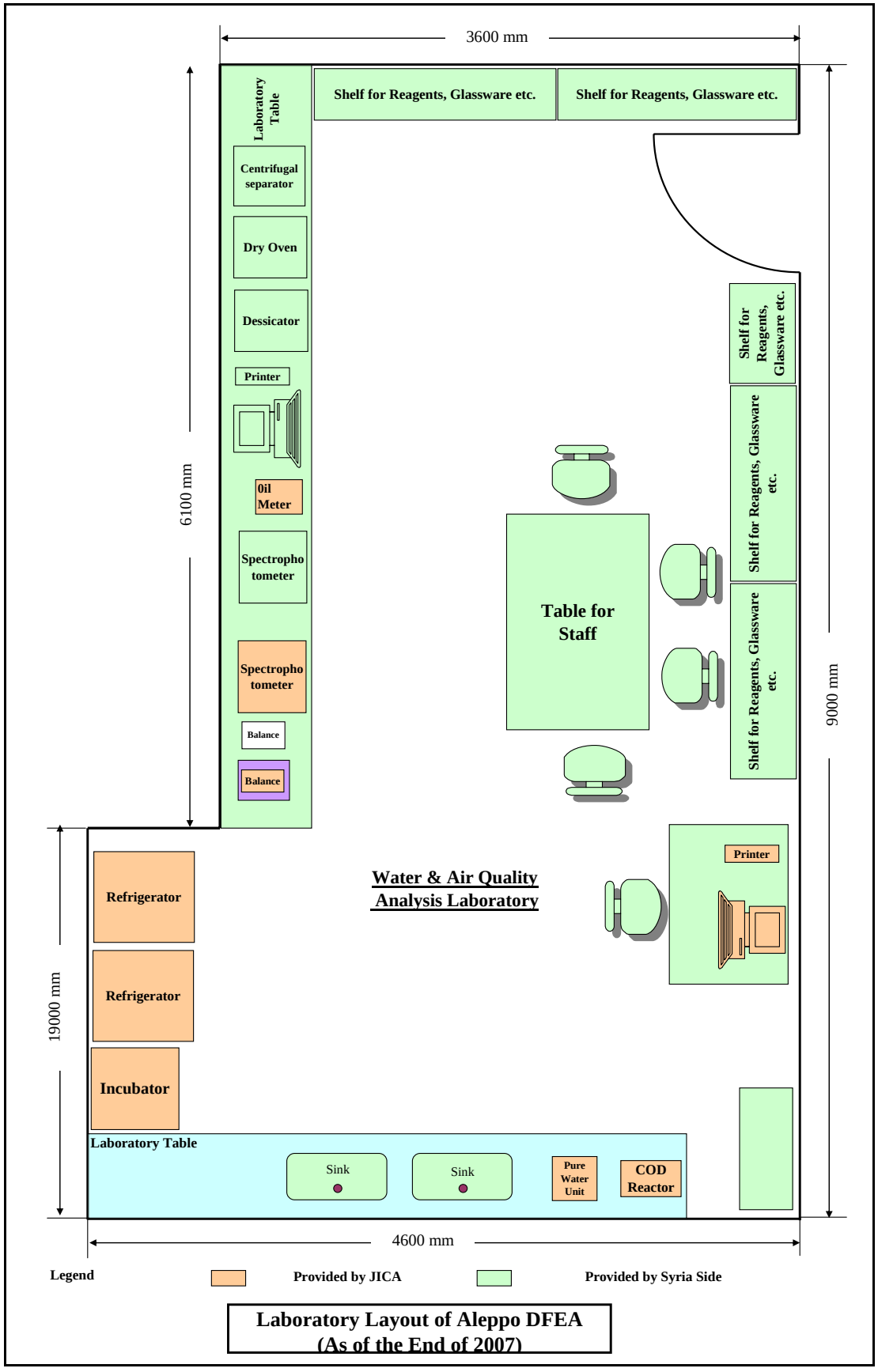
Additional trainings for "CB-2" had been conducted in three DFEAs; the Damascus Countryside, Homs, and Aleppo DFEAs. The titles of materials used in the lectures are listed in table below.

Lecture Materials Prepared for CB-2

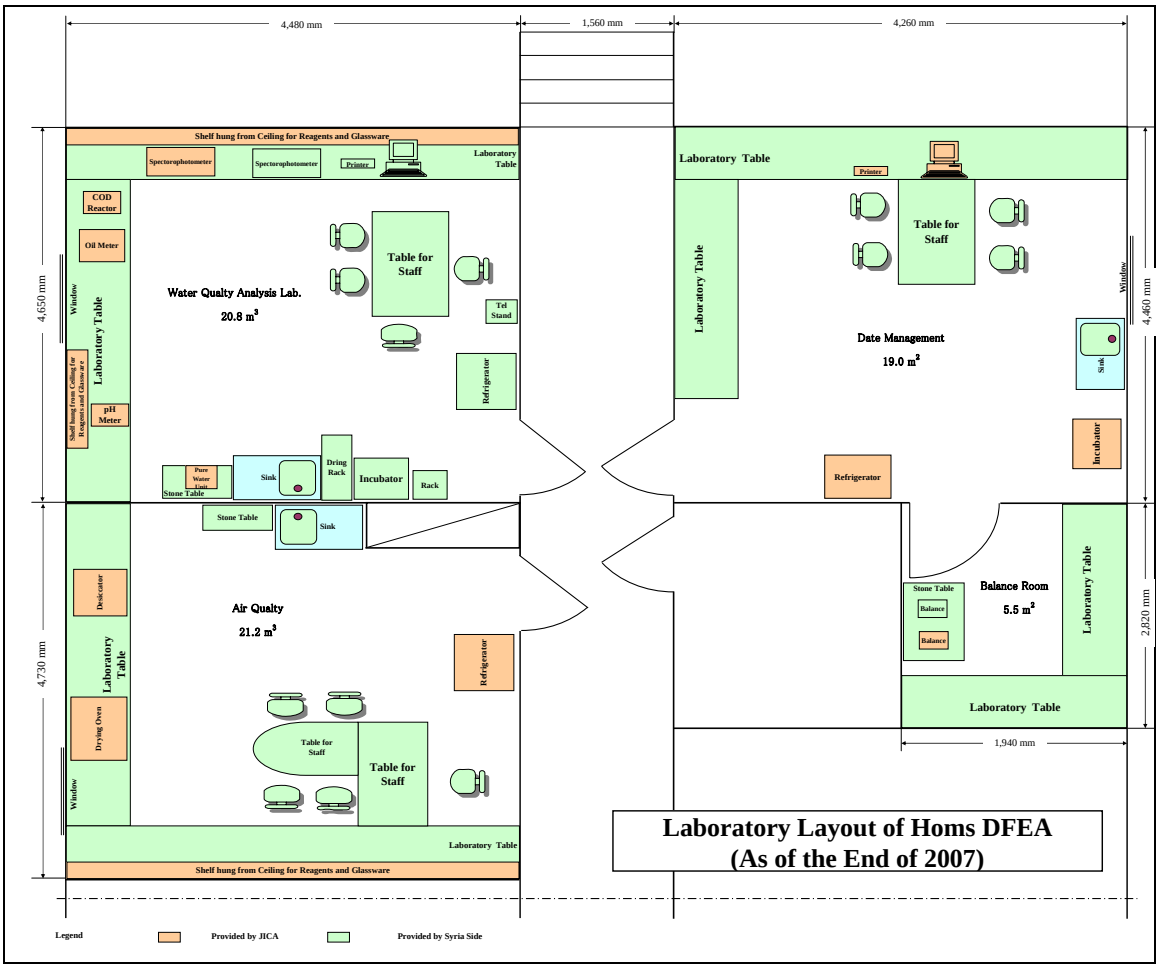
Title of Lecture Material
❑ Sample Collection
❑ Spectrophotometer
❑ Elimination of Interference
❑ Analysis Flow
❑ Standard Solution of Japan
❑ Standard Solution of Oil
❑ Oil Analysis by Gravimetric Method
❑ Correlation Coefficient
❑ Chemical Reactions (Mechanism of Coloring)
❑ Handling of Samples of the Environmental Analysis
❑ Analytical Skills
❑ For Accurate Measurement
❑ Quality Control (Accuracy management)
❑ Statistical Calculations
❑ Analytical Flow

(3) Laboratory Layout Plan

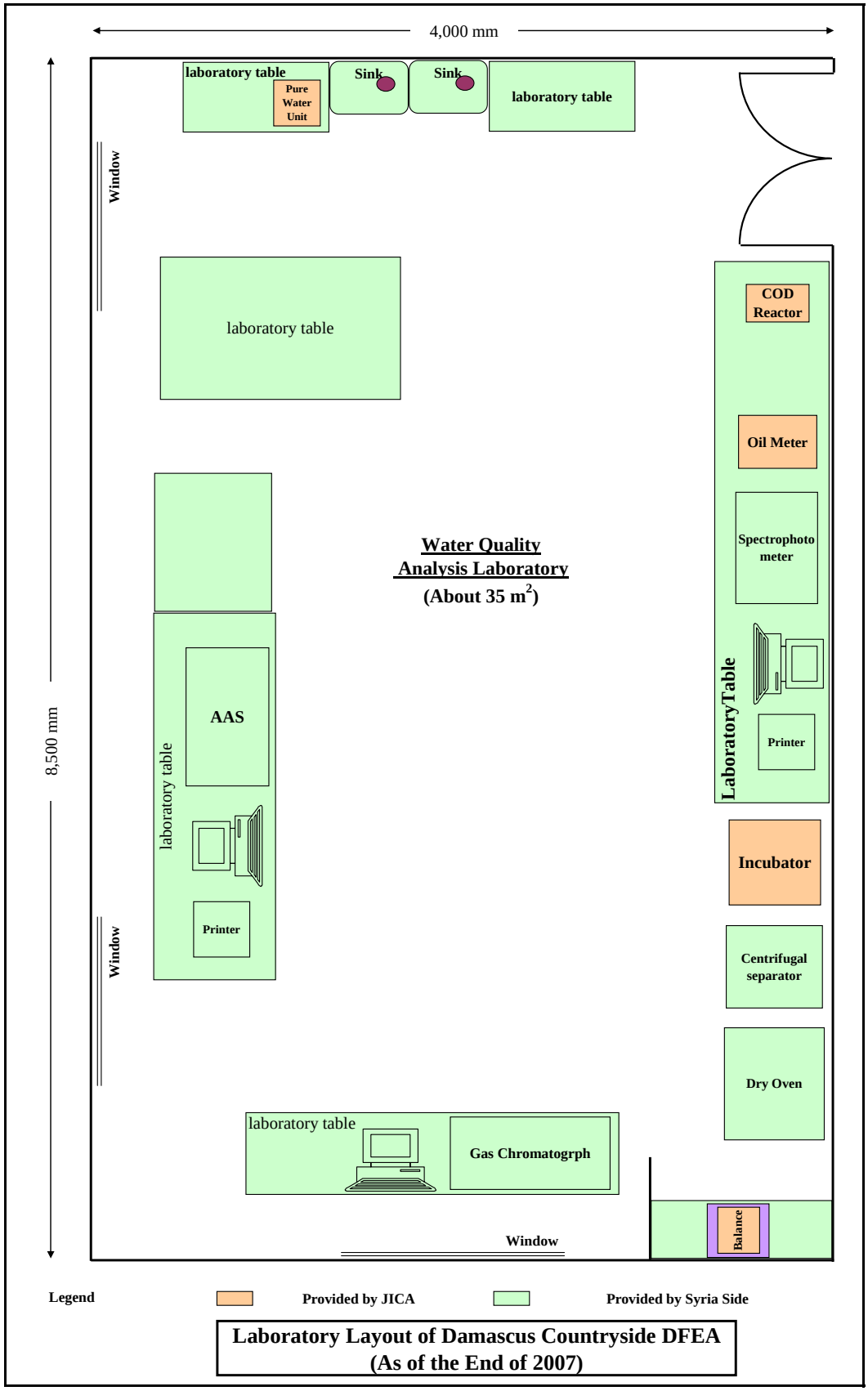
According to the implementation of the additional training, laboratory layout plans of three DFEAs; the Damascus Countryside, Homs, and Aleppo DFEAs, were reconsidered. Current layout plans in three DFEAs are shown below.



Laboratory Layout of Aleppo DFEA (As of the End of 2007)



Laboratory Layout of Homs DFEA
(As of the End of 2007)



Laboratory Layout of Damascus Countryside DFEA (As of the End of 2007)

3.3 Heavy Metal (HM)

3.3.1 Training Activities

The training for the Heavy Metal Analysis (HM) had been conducted in three periods (1st: December 2006 – February 2007, 2nd: May – August 2007, 3rd: November – December 2007). As training activities, theoretical lectures, hands-on and on-the-job training (OJT) had been conducted in order to enable C/Ps to perform measurements of 14 elements (Ag, Al, As, Ba, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Sb, and Zn) by the Atomic Absorption Spectrophotometer (AAS) from sampling until data evaluation and establishing an environmental monitoring plan (EMO). In measurements with AAS, four methods (Flame, Furnace, Hydride Vapor and Cold Vapor) were performed by C/Ps in the Damascus DFEA. In addition, in order to establish metal analysis for samples from other DFEAs, trainings for sampling, preservation, and transportation had been conducted in other 13 DFEAs. The details of activities for metal analysis trainings are as mentioned below. Five C/Ps in charge of metal analysis in the Damascus DFEA here means Ms. Iman Sulayman, Ms. Reem Sadr Eddin (Laboratory Chief), Ms. Sohad Sida, Mr. Samer Khouri and Mr. Talaat Harb. (Add Dr.Muthanna Ghanem when it is mentioned as "6 C/Ps".)

Details of Training Activities for Heavy Metal (HM) Analysis

Period	Training Activity	Details	Date	Venue	Target C/P
1st	Lectures	The outline of metal analyses with AAS The basic ideas of flame method of AAS The basic ideas of furnace method of AAS Sampling in actual fields Pretreatment of samples The basic idea of statistics The basic idea of QA/QC 1% absorption, composition of flames and calibration curves The safety control and handling acid and toxins (1) The safety control and handling acid and toxins (2) Treatment of waste water Data management	12 Dec.,'06 19 Dec.,'06 11 Jan.,'07 8 Jan.,'07 10 Jan.,'07 22 Jan.,'07 24 Jan.,'07 28 Jan.,'07 30 Jan.,'07 1 Feb.,'07 6 Feb.,'07 8 Feb.,'07	Damascus DFEA	6 C/Ps from Damascus DFEA
	Hands-on and On the Job Training for DAM DFEA	1)Preparation of apparatus with acid 2)Preparation of standard solutions and calibration curves 3)Operations of AAS (measurement of calibration curves and quantitation limits, additional recovery tests) 4)Maintenance 5)Sampling and Preservation 6)Pretreatment	10 Dec.,'06 -11 Feb.,'07 13 Dec.,'06 -14 Feb.,'07 14 - 19 Dec.,'06 & 11 Jan. – 14 Feb.,'07 14Dec.,'06 – 7 Feb.,'07 9 Jan.,'07 10–14 Jan., & 4-14 Feb.,'07	Damascus DFEA On Site Damascus DFEA	6 C/Ps from Damascus DFEA And 1C/P from GCEA
	Examination	1) Operating the AAS with either flame or furnace method following SOPs. 2)The criterion of the examination was within 3 mistakes through more than 60 steps 3) All 6 C/Ps from Damascus DFEA had been certified to operate the AAS.	30 Jan. – 7 Feb.,'07	Damascus DFEA	6 C/Ps from Damascus DFEA
2nd	Lectures for DAM DFEA	1)Basic ideas and practical usage of dilution 2)Theoretical and practical explanation of Cold-Vapor Method for Mercury (Hg) 3)Confirmation of safety control 4)Theoretical and practical explanation of Hydride-Vapor Method for Arsenic (As) 5)Calibration curves, sample concentration and dilution Data Management 6)Theoretical and practical explanation of Significant Digits Optical and physical interference and measures to be taken 7)Chemical interference and measures to be taken	4 Jun., '07 5 Jun., '07 6 Jun., '07 8 Jun., '07 16-18 Jul., '07& 30-31 Jul., '07 31 Jul. – 1 Aug., '07 6 Aug., '07 8 Aug., '07	Damascus DFEA	5 C/Ps in Damascus DFEA

Period	Training Activity	Details	Date	Venue	Target C/P
	Lectures for other DFEAs : Refer to the activities for metal analysis in other 13 DFEAs				
	Hands-on and On the Job Training for DAM DFEA	1)Additional Recovery Tests for all (14) elements 2)Data Management 3)Preparation, Pretreatment and Measurement for Cold-Vapor Method for Mercury (Hg) 4)Preparation, Pretreatment and Measurement for Hydride-Vapor Method for Arsenic (As) 5)Registration and measurement of samples from other DFEAs 6)Preparation of check sheet for consumables and spare-parts 7)Pretreatment of Pb for Air Quality Analysis 8))Periodical Maintenance for AAS	3 Jun. – 26 Aug., '07 5 Jun. – 14 Aug., '07 6 – 13 Jun., '07 02 – 11Jul., '07 11 Jul. – 28 Aug., '07& 29 Jul., '07 7 – 9 Aug.,'07 6 - 15Aug., '07 26-27 Aug., '07	Damascus DFEA	5 C/Ps in Damascus DFEA
	On the Job Training for other DFEAs : Refer to the activities for metal analysis in other 13 DFEAs				
	Examination	1)Test for Data Management 2)1st comprehension test for general aspects for metal analysis 3)2nd comprehension test for general aspects for metal Analysis	12-14 Aug., '07 13-14 Aug., '07 28 Aug., '07	Damascus DFEA	5 C/Ps in Damascus DFEA
3rd	Lectures for DAM DFEA	1)Data Evaluation 2)Usage of Standard Additional Method 3)Usage of Matrix Modifiers 4)Training after project	8 Nov.,'07 10 Dec.,'07 10 Dec.,'07 11 Dec.,'07	Damascus DFEA	5 C/Ps in Damascus DFEA
	Lectures for Damascus Countryside DFEA : Refer to the activities for metal analysis in other 13 DFEAs				
	Hands-on and On the Job Training for DAM DFEA	1)Measurements of EMO samples 2)Data Management 3)Organization of data 4)Data Evaluation 5)QA/QC for Cd (: linearity; stability of QL) 6)QA/QC for As (recovery test) 7)QA/QC for Cr by flame method (: linearity; stability of QL) 8)QA/QC for Mn by flame method (: linearity; stability of QL)	4 Nov. – 13 Dec., '07 5 Nov. – 13 Dec., '07 8 Nov. – 13 Dec., '07 8 Nov. – 12 Dec.,'07 11&12 Nov., '07 14 Nov. – 5 Dec.,'07 22 Nov., '07 2 Dec.,'07	Damascus DFEA	5C/Ps in Damascus DFEA
	Examination	Comprehension test for general aspects for metal Analysis	12 Dec.. '07	Damascus DFEA	5C/Ps in Damascus DFEA

(1) Selection of the Criteria for Testing Methods

The Standard Methods for the Examination of Water and Wastewater 20th Edition (StM) were selected as the criteria and reference for metal analysis trainings. The reasons of the selection of StM were as follows.

1) StM was suitable for samples (including wastewater) to be measured.
2) The methods were basically available in Syria considering the supply of apparatus and reagents.
3) StM had been recognized worldwide.
4) StM had been also used in Syria.

(2) Completion of Operations with 19 Methods for 14 Elements

Flame method, Furnace method, Cold Vapor method for Mercury (Hg) and Hydride Vapor method for Arsenic (As) were introduced in the Damascus DFEA and have been operated up to the present time. Both Hg and As were highly toxic substances that required more careful operations than basic methods (Flame and Furnace) through all procedures to the end. Furthermore, these both needed unique particular ways of pretreatments. After all, by finishing the hands-on training of them on 11th July 2007, the Damascus DFEA laboratory had got ready for measurements for all 14 parameters.

(3) QA/QC Activities

For the basic QA/QC for introduction of metal analysis, linearity of Calibration Curves (CC), and stability of Quantitative Limits (QL) were confirmed. At the beginning of December 2007, 19 methods for 14 elements had been introduced in the Damascus DFEA. All 19 methods were confirmed for sufficient linearity (r >=0.995) and stability (CV=<10%).

Results of Linearity of CC and Stability of QL for HM Analysis (Jan.-Aug. 2007)

Item		Method	std-1	std-2 (QL)	std-3	std-4	std-5	std-6	Linearity of CC r>= 0.995	Stability of QL CV (%) =<10
			ppm							
1	Ag	Furnace H D tube	0	0.002	0.004	0.006	0.01		0.9995	5.9
2	Al	Furnace Pyro tube	0	0.005	0.010	0.020	0.030		0.9993	4.0
		Flame N_2O-C_2H_2	0	1.0	2.5	5.0	10		0.9994	2.7
3	As	Hydride Vapor	0	0.005	0.010	0.020	0.040	0.050	0.9988	6.5
		Furnace Pyro tube	0	0.01	0.02	0.03	0.04		0.9973	5.3
4	Ba	Flame N_2O-C_2H_2	0	0.5	1.0	2.0	5.0		0.9998	8.4
5	Cd	Furnace H D tube	0	0.0002	0.0004	0.0006	0.0007		0.9953	2.5
6	Cr	Furnace Pyro tube	0	0.001	0.002	0.004	0.006		0.9998	7.1
		Flame Air-C_2H_2	0	0.5	1.0	2.0	5.0		0.9997	3.3
7	Cu	Flame Air-C_2H_2	0	0.5	1.0	2.0	5.0		0.9995	0.9
8	Fe	Flame Air-C_2H_2	0	0.25	0.50	1.0	2.0	5.0	0.9997	2.2
9	Hg	Cold Vapor	0	0.0005	0.0010	0.0020	0.0050		0.9993	8.7
10	Mn	Furnace Pyro tube	0	0.0005	0.0010	0.0020	0.0030		0.9998	1.2
		Flame Air-C_2H_2	0	0.5	1.0	2.0	5.0		0.9999	1.6
11	Ni	Furnace Pyro tube	0	0.002	0.004	0.006	0.010		0.9982	4.4
12	Pb	Furnace H D tube	0	0.005	0.010	0.020	0.030		0.9987	1.7
		Flame Air-C_2H_2	0	0.20	0.50	1.0	2.0	5.0	0.9994	8.0
13	Sb	Furnace Pyro tube	0	0.005	0.010	0.020	0.030		0.9975	4.6
14	Zn	Flame Air-C_2H_2	0	0.1	0.2	0.5	0.7		0.9979	8.3

Prior to regular analyses, additional recovery tests had been completed for 14 elements alongside OJT with actual samples. In the additional recovery tests, standard solutions were added to deionized water to be set as the same concentration as the second largest calibration (std-4 or 5) of Calibration Curves for each element (see the table above). These samples for recovery test were treated in the same way as actual samples through all procedures. Results of measurements by AAS were compared with the target concentrations. These tests had been done repeatedly until the rate of (actual conc./ target conc. x 100) satisfies the criteria (90-110%).

Each C/P was in charge of Al, Hg, and As because these 3 elements required different 3 pretreatments. As for other elements, only one method of pretreatment was adopted and therefore the elements to be measured were shared by different C/Ps. All the tests except As by Hydride Vapor method had been completed. The details are shown in the table below.

Results of Additional Recovery Tests for HM Analysis up to November 2007

Name	Item and Result	Target / Actual		Started / Finished	No. of Meas.
Ms Iman Sulayman	Al (105 %R)	20.0 21.0	Ppb	18-Jun 26-Jun	2
	As (101 %R)	30.0 30.2	Ppb	4-Jun 18-Jun	2
	Cr (96 %R)	4.00 3.83	Ppb	4-Jun 20-Jun	1
	Ba (101 %R)	2.00 2.02	Ppm	12-Feb 14-Feb	1
	Ag (100 %R)	6.00 6.00	Ppb	20-Sep 26-Sep	3
	Hg (90 %R)	2.00 1.80	Ppb	13-Jul 13-Jul	2
	As(Hyd) (85 %R)	25.0 21.3	Ppb	3-Dec 5-Dec	3
Ms. Reem SarEddin	Al (105 %R)	20.0 20.9	Ppb	18-Jun 26-Jun	2
	As (100 %R)	30.0 30.0	Ppb	4-Jun 18-Jun	2
	Ba (94 %R)	2.00 1.88	Ppm	12-Feb 14-Feb	1
	Mn (92 %R)	2.00 1.83	Ppb	18-Jun 24-Jun	2
	Pb (91 %R)	20.0 18.2	Ppb	10-Jun 14-Jun	1
	Hg (90 %R)	2.00 1.80	Ppb	13-Jul 13-Jul	2
	As(Hyd) (75 %R)	25.0 18.8	Ppb	3-Dec 5-Dec	3
Ms. Sohad Sida	Al (110 %R)	20.0 22.1	Ppb	9-Apr 19-Apr	1
	Fe (100 %R)	1.00 1.00	Ppm	4-Apr 24-Apr	1
	Zn (109 %R)	0.50 0.55	Ppm	12-Feb 14-Feb	1
	Mn (100 %R)	2.00 2.00	Ppb	18-Jun 24-Jun	3
	Sb (102 %R)	20.0 20.4	Ppb	3-Jun 5-Jun	2
	Hg (95 %R)	2.00 1.90	Ppb	22-Jul 22-Jul	3
	As(Hyd) (94 %R)	25.0 23.4	Ppb	3-Dec 4-Dec	3
Mr. Samer Khoury	Al (108 %R)	20.0 21.6	ppb	9-Apr 19-Apr	1
	Cu (104 %R)	2.00 2.08	ppm	4-Apr 7-Apr	1
	Fe (100 %R)	1.00 1.00	ppm	4-Apr 24-Apr	1
	Ni (95 %R)	6.00 5.70	ppb	10-Jun 19-Jun	3
	Pb (106 %R)	20.0 21.1	ppb	10-Jun 19-Jun	1
	Hg (95 %R)	2.00 1.90	ppb	25-Jul 25-Jul	3
	As(Hyd) (106 %R)	25.0 26.6	ppb	3-Dec 4-Dec	3
Mr. Talaat Harb	Al (108 %R)	20.0 21.6	ppb	9-Apr 19-Apr	1
	Cd (100 %R)	0.30 0.30	ppb	18-Jun 26-Jun	3
	Zn (106 %R)	0.50 0.53	ppm	12-Feb 14-Feb	1
	Ni (99 %R)	6.00 5.95	ppb	10-Jun 19-Jun	3
	Sb (100 %R)	20.0 19.9	ppb	3-Jun 5-Jun	2
	Hg (90 %R)	2.00 1.80	ppb	13-Jul 13-Jul	2
	As(Hyd) (96 %R)	25.0 24.0	ppb	3-Dec 4-Dec	3

: necessary to remeasure

Acceptance criteria : 90-110%

% Recovery = found value / true value *100

No. of Meas. means the numbers of repeated measurements

In order to confirm the abilities of C/Ps to get acceptable linearity and stability through measurements from different C/Ps, tests had been executed during 16 -23 of August 2007. Hg was chosen as the target subject because cold vapor method for Hg was one of the most difficult operations.

As a result, 4 C/Ps achieved values of correlation coefficient (r) more than 0.995 with 5 calibrations and 1 C/P obtained r = 0.9997 after rejecting one calibration (acceptance criteria: r >= 0.995, numbers of calibrations =< 3). As for the largest calibrations as the subjects for checking differences among measurements, the CV of them was less than 10% and the deviations between adjacent ones were all within 80 to 120%. In conclusion, the levels of C/Ps were sufficient and the differences were small enough.

Results of the Tests for Linearity and Stability (Hg: mercury by cold vapor method)

Name of C/P	Sohad	Iman	Talaat	Samer	Reem
Hg (ppb)	abs	abs	abs	abs	abs
0	0.0004	0.0005	-0.0004	0.0013	-0.0008
0.5	0.0069	0.0083	0.0102	0.0089	0.0115
1	0.0169	0.0146	0.0191	0.0215	0.0199
2	0.0363	0.0346	0.0388	rejected	0.0424
5	0.0846	0.0971	0.0993	0.1039	0.0989
r =	0.9991	0.9981	0.9999	0.9997	0.9993
Deviation of each 5(ppb) =		115	102	105	95

σ =	avg =	CV =
0.007246	0.09676	7.488167

>= 0.995

80< , <120 (%)

(4) Establishment of Measurements of Samples from other DFEAs

Responding to completion of training activities for metal analysis in all DFEAs (see the next chapter for the details), reception, registration, and measurements of samples from other DFEAs were started as a main part of monitoring activities in the Damascus DFEA on 11 July 2007.

Until the end of November 2007, 46 samples from 9 DFEAs (Damascus, Damascus Countryside, Dara'a, Hama, Homs, Sweida, Quneitra, Idleb, and Tartous) had been received and would be measured for all 14 parameters. Samples were registered in "Analysis Administration Sheet" and treated in the orderly fashion through all operations with Sample ID numbers. Some abstracted contents from the sheets are shown in the table below.

Registered Samples for HM Analysis in "Analysis Administration Sheet"

(up to November 2007)

Administration Number	Representative Name of Samples	Number of Samples	Sample Carry-in	
			Date	Month
0706-01	Recovery Test (Talaat)	2	04	6
0706-02	Recovery Test (Sohad)	2	04	6
0706-03	Recovery Test (Iman)	2	04	6
0706-04	Recovery Test (Reem)	2	04	6
0706-05	Practice for Hg	5	7	6
0706-06	UTAYA	3	13	6
0706-07	Recovery Test (Samer)	2	04	6
0706-08	Recovery Test (Hg)-1	10	13	6
0706-09	Recovery Test (Hg)-2	canceled	-	-
0706-10	DAM Periodical Monitoring	9	20	6
0706-11	Recovery Test (Reem2)	1	18	6
0706-12	Recovery Test (Sohad2)	1	18	6
0706-13	Recovery Test (Iman)	1	18	6
0706-14	Recovery Test (Talaat)	2	18	6
0707-01	Drinking Water from DFEAs	4	8	7
0707-02	Drinking Water from DFEAs2	1	10	7
0707-03	IDL Periodical Monitoring	4	10	7
0707-04	Tap Water from DAMC	1	15	7
0707-05	Recovery Test (Hg)-2	10	18	7
0707-06	Recovery Test (Hg)-3	4	19	7
0707-07	Recovery Test (Hg)-4	4	22	7
0707-08	TAR Periodical Monitoring	4	23	7
0707-09	Recovery Test (Hg)-5	2	25	7
0708-01	Air smpl from ALP	4	6	8
0708-02	Air smpl from HOM	4	6	8
0708-03	Air smpl from HOM	4	7	8
0708-04	Khomaseia	1	15	8
0709-01	DAM Periodical Monitoring	3	17	9
0709-02	SWE Periodical Monitoring	3	18	9
0710-01	DAM Periodical Monitoring	3	4	10
0712-01	SWE Periodical Monitoring	8	3	12
0712-02	DAM Periodical Monitoring	3	1	12
Total	31 registered items	109 samples	-	-

(5) Introduction of Regular Data Management

Data Management must be accurately carried out to maintain the value of analysis results and therefore the training for data management had been conducted through main period of the whole (5 June – 14 August 2007) .

The complete procedure of the data management for metal analysis consisted of: Registration of samples with Administration Number; Preparation of Monthly Report with sample ID; Checking correlation coefficient (r) of Calibration Curves to be satisfied the criterion (>= 0.995); Reduction of calibrations according to need; Check of results beyond the Calibration Curves; Consideration of dilution of samples and repeated measurement; Digital file saving; Printout of results; Attaching "Front Page" and recording with significant digits in mind; Recording data in "Monthly Report" calculating the method blank and duplicate samples.

Within this procedure, there are many rules and many detailed managements are required (i.e. noting the value of "r" in reporting format when a sufficient value is not obtained with 3 or more calibrations; expressing with "<" when the concentration is below the Quantitative Limits; Setting the smallest digit of results as same as the one of the Quantitative Limits; Handling data in accordance with 2 significant digits; etc). Therefore, lectures, hands-on and on-the-job trainings had been conducted continuously until all 5 C/Ps were certified by the examinations for data management on 12 and 14 of August, 2007.

Significant digits could be set as 3 or 4 in consideration of the apparatus and instruments, but they were set as "2" for the introduction of metal analysis in the Damascus DFEA from a standpoint of abilities of analysis technique and results of recovery tests that required only 90-110%R. Significant digits can be modified in accordance with the progress of analyses in future.

(6) Introduction of Data Evaluation

According to accumulation of data for EMO, a basic idea of data evaluation was introduced to the Damascus DFEA. This procedure consisted of: Confirmation of process of data recording; Inspection of data from the view of validity; Evaluation of data comparing with standards for discharged water; Confirmation of previous data; Registering pollution sources; Setting the frequency of monitoring to be conducted. The training for data evaluation took place since 8 November 2007 until the end as OJT using measured data with SOP for data evaluation. This procedure required so high level techniques for data management that 4 out of 5 C/Ps still needed continuous OJT on the items which the JICA Expert Team trained to perform it on his or her own at the beginning of December 2007, because C/Ps received only few round hands on training by the JICA Expert Team.

(7) Comprehension Examination

Since many kinds of activities had been carried out all through training periods, reviews for certain comprehension were necessary and therefore examinations for operations of the AAS,

examinations for practical data management and 3-time comprehension tests for general aspects for metal analysis were taken place.

At the end of the training for Flame and Furnace methods, an examination of operating AAS took place. Each C/P had operated AAS with either flame or furnace method all through the procedure following SOPs. Both methods were composed of more than 60 steps of procedure and the criterion of the examination was within 3 mistakes. All 6 C/Ps (Ms. Iman Sulayman, Ms. Reem Sadr Eddin, Ms. Sohad Sida, Dr. Muthanna Ghanem, Mr. Samer Khouri and Mr. Talaat Harb) from the Damascus DFEA had passed the examination and were certified by the JICA Expert Team to operate AAS.

Tests for data management were conducted by using existing actual raw data of Fe (iron) measurement results. Fe was chosen because its rage of concentration of samples was wider than others. C/Ps were required to tackle to complete the procedure of: choosing adequate data from handouts from the instrument considering the results of dilution or measurement failures; rounding and transforming data with the certain numbers (2) of significant digits; recording the data accurately in a front sheet attached to the handouts; calculating data by averaging and subtracting a value of method blank; and Recording in a reporting format. All 5 C/Ps (Ms. Iman Sulayman, Ms. Reem Sadr Eddin, Ms. Sohad Sida, Mr. Samer Khouri and Mr. Talaat Harb) had confirmed the procedure and been certified as data managers for AAS.

The 1st comprehension test for general aspects for metal analysis was performed to reviewing all relevant aspects of the trainings on 13-14 August 2007. The 2nd test was taken place to reinforce the comprehension to maintain the continuous monitoring activities on 28 August 2007. The 3rd test was held to review all through trainings on 12 December 2007.

(8) Training Activities for Heavy Metal Analysis in other 13 DFEAs

Since the Damascus DFEA would be starting measurements for all (14) parameters for the Heavy Metal analysis with AAS as OJT and be ready to accept samples from other DFEAs, trainings for sampling, preservation and transportation had been conducted in 13 DFEAs. As some of DFEAs owned or would own AAS, lectures for basic idea of metal analysis were given to C/Ps. In addition, confirmation of the conditions and advisory activities for introduction of metal analyses were performed.

Details of the activities are shown in the table below. A to G symbolize activities such as Advisory Activity for Introduction of AAS, Lecture Training (Sampling, Preservation, Transportation, Outline of metal analysis and Monitoring Plan), OJT (Sampling and Preservation, Monitoring Plan, Application form, Preparation of Sampler and Practice of Sampling), Inspection of Sampling Stations, OJT for Utilization of Special Equipment (Hydride Vapor Generator), Advanced Lecture Trainings (SOPs and O/Ms for metal analysis) and Practice for QA/QC (setting calibrations and testing linearity and stability).

After the trainings, All 14 DFEAs had been equipped with sampling devices and been ready

for requesting metal analyses in the Damascus DFEA. Measurements had been started with 4 samples from the Idleb DFEA followed by another 4 samples from the Tartous DFEA since 10 July, 2007.

Training Activities for Heavy Metal Analysis Conducted in all DFEAs

No.	DFEA	Date	Part's	Contents of Training Activities	AAS Status
1	Damascus	Since Dec.2006	5	All Trainings related to metal analysis	Installed, Utilized
2	Damascus Countryside	11 Jul. '07	8	Training A, B, C	Installed
		26 Nov. '07	6	Training F, G	Utilized
3	Aleppo	20 Jun. '07	2	Training A, B, C, D	Provided
4	Homs	5 July. '07	4	Training B, C	
5	Hama	5 July. '07	5	Training A, B, C, D	Installed
6	Lattakia	29-30 Nov.'06	7	Training A, B	Installed
		26 Jun. '07	7	Training A, B, C, E	Utilized
7	Deir ez Zor	17 Jun. '07	3	Training A, B, C, D	To be procured
8	Idleb	21 Jun. '07	4	Training A, B, C, D	
9	Hasakeh	18 Jun. '07	4	Training A, B, C, D	To be procured
10	Rakka	19 Jun. '07	2	Training B, C, D	
11	Sweida	4 Jul. '07	9	Training B, C	
12	Dara'a	4 Jul. '07	5	Training A, B, C	Installed
13	Tartous	25 Jun. '07	4	Training B, C, D	
14	Quneitra	3, 10 Jul. '07	2	Training B, C, D	

Legend for Trainings

A : Advisory Activity for Introduction of AAS (Basic ideas, Necessities and Facilities in the Labs)
B : Lecture Training for Sampling, Preservation and Transportation for metal analysis (Presentation), Outline of metal analysis (main procedure), Monitoring Plan, Pretreatment, Basic idea of Sampling, Preservation and Transportation

C : On-the-Job Training for Sampling and Preservation, Monitoring Plan, Application form, Preparation of Sampler, Practice of Sampling

D : On Site (Inspection of Sampling Stations)
E : On- the-Job Training for Utilization of Special Equipment (Hydride Vapor Generator)
F : Advanced Lecture Trainings (SOPs and O/Ms for metal analysis)
G : Practice for QA/QC (setting calibrations and testing linearity and stability)

(9) Results of Measurements

Responding to acquisition of analyses for all parameters and activities for heavy metal analysis in other 13 DFEAs, monitoring plans had been submitted from 6 DFEAs (Aleppo, Hasakeh, Idleb, Rakka, Sweida and Tartous) to the Damascus DFEA at each DFEA's option until November 2007. Total numbers of stations were 67 and 98 samples would be collected. Measurements of samples from other DFEAs had been performed in the Damascus DFEA and 442 data had been accumulated up to November 2007. The details are shown in the tables below.

The Results of Heavy Metal Analysis (up to November 2007)

Item		Ag	Al	As	Ba	Cd	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn
Quantitation Limit		0.002	0.005	0.005	0.5	0.0001	0.001	0.5	0.25	0.0005	0.0005	0.002	0.005	0.005	0.1
Std-drinking water		-	0.2	0.01	0.7	0.003	0.05	1	1	0.001	0.1	0.02	0.01	0.02	1
Std-discharged water		0.05	1	0.1	1	0.01	0.5	1	0.3	0.005	0.5	0.3	0.2	0.3	1
Unit		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	ug/l	mg/l	mg/l	mg/l	mg/l	mg/l
DAM	Ihda'ashareea	<0.002	0.077	<0.01	<0.5	<0.0001	<0.5	1.7	1.2	0.0007	0.013	0.012	1.4	<0.005	10
	Wella -Jun	<0.002	1.6	<0.01	<0.5	<0.0001	<0.5	1.0	1.6	0.0008	0.013	<0.002	0.50	0.005	0.5
	Wella -Oct	<0.002	0.02	<0.005	<0.5	0.0044	<0.5	<0.5	1.3	<0.0005	<0.5	0.046	0.016		0.1
	Dappaghat -Jun	<0.002	1.8	<0.01	<0.5	<0.0001	>5.0	<0.5	21	0.0009	0.050	<0.002	0.021	0.077	0.6
	Dappaghat -Sep		>0.03	<0.005	<0.5	0.010	<0.5	1.8		<0.0005	<0.5	0.39	0.029		<0.1
	Fa soap -Jun	<0.002	1.8	<0.01	<0.5	<0.0001	<0.5	<0.5	4.6	0.0007	0.019	<0.002	0.038	0.006	0.4
	Fa soap -Oct	0.003	>0.03	<0.005	0.6	0.006	<0.5	<0.5	1.1	>0.005	<0.5	0.22	0.015		0.1
	Alarabi washing car	<0.002	4.4	<0.01	0.6	0.0019	<0.5	<0.5	16	0.0010	0.064	<0.002	0.43	0.055	0.8
	Khomasia	<0.002	1.2	<0.01	<0.5	<0.0001	<0.5	<0.5	<0.25	0.0014	0.0008	<0.002	<0.5	0.005	<0.1
	Bab Sharqi dying -Jun	<0.002	0.79	<0.01	<0.5	<0.0001	<0.5	<0.5	0.48	0.0007	0.028	<0.002	0.008	0.008	0.1
	Bab Sharqi dying -Sep	>0.01	>0.03	<0.005	<0.5	0.010	<0.5	<0.5		<0.0005	<0.5	0.022	<0.005		0.36
	Bab Sharqi dying -Dec			<0.005											
	Gallab	<0.002	0.50	<0.01	<0.5	<0.0001	<0.5	<0.5	0.74	0.0006	0.0018	0.003	0.11	<0.005	0.1
	Zamzam -Jun	<0.002	0.092	<0.01	<0.5	<0.0001	<0.5	<0.5	<0.25	<0.0005	0.0005	<0.002	<0.5	0.005	<0.1
	Zamzam -Dec			<0.005											
	Ehda'asharey		>0.03	<0.005	<0.5	<0.001	<0.5	<0.5	<0.25	<0.0005	<0.0005	>0.1	<0.005		<0.1
	Arab Station	0.008	0.03	<0.005	<0.5	<0.005	<0.5	<0.5	0.36	<0.0005	<0.5	0.14			0.1
	Jalab			<0.005											
DAMC	Tap water	<0.002	0.018	<0.005	3.3	0.0017	<0.5	<0.5	<0.25		0.0010	0.003	<0.005	0.010	0.2
DAR	Tap water	<0.002	0.10	<0.01	<0.5	0.0002	<0.5	<0.5	<0.25	0.0006	<0.0005	<0.002	<0.005	0.0062	0.6
HAM	Tap water	<0.002	0.73	<0.01	<0.5	0.0010	<0.5	<0.5	0.25	0.0005	<0.0005	<0.002	0.024	0.0057	1.2
HOM	Tap water	0.0029	0.087	<0.01	<0.5	0.027	<0.5	<0.5	<0.25	0.0007	<0.0005	<0.002	<0.005	0.0054	0.3
SWE	Tap water	0.065	0.045	<0.01	<0.5	0.0048	<0.5	<0.5	<0.25	<0.0005	0.0039	0.003	0.0054	0.0063	0.1
	Aseer tefah algabal		0.02	<0.005	<0.5	<0.005	0.005	<0.5	0.60	<0.0005	<0.5	0.034	<0.005		0.6
	Aseer eneb algabal	0.007	0.02	<0.005	<0.5	0.0017	<0.5	<0.5	1.1	<0.0005	<0.5	0.2			0.1
	Serf sehee	>0.01	>30	<0.005	<0.5	<0.005	<0.5	<0.5	2.8	<0.0005	<0.5	0.031	<0.005		0.5
	Al Room Dam			<0.005											
	Mzerib Water			<0.005											
	Ira Spring			<0.005											
	Habran Dam			<0.005											
	Al Rayan Factory			<0.005											
	Alcohol Factory			<0.005											
	Ein Mousa			<0.005											
	Al Sweida Hospital			<0.005											
QUN	Tap water	0.26	0.098	<0.01	<0.5	<0.1	<0.5	<0.5	<0.25	0.0008	0.0033	<0.002	<0.005	0.005	<0.1
IDL	Sugar factory	<0.002	3.2	<0.01	<0.5	0.009	<0.5	<0.5	6.4	<0.0005	0.013	0.005	0.16	0.0054	<0.1
	Al'asi before bridge	<0.002	<0.005	<0.01	<0.5	<0.0001	<0.5	<0.5	0.30	0.0007	0.0051	<0.002	0.051	<0.005	0.1
	Al'asi after bridge	<0.002	2.6	<0.01	<0.5	0.0013	<0.5	<0.5	2.9	0.0007	0.0042	<0.002	0.059	0.0056	0.2
	Glass factory	<0.002	0.052	<0.01	<0.5	0.028	<0.5	<0.5	3.9	0.0006	0.024	<0.002	0.17	<0.005	23
TAR	Bdr spring	<0.002	0.014	<0.005	<0.5	<0.0001	<0.5	<0.5	<0.25	0.0001	0.0022	<0.002	<0.005	<0.005	0.3
	Einlzaror spring	<0.002	0.85	<0.005	<0.5	0.0020	<0.5	<0.5	0.46	0.0005	0.0005	<0.002	0.011	<0.005	0.6
	Sorani dam	0.003	0.38	<0.005	<0.5	0.0027	<0.5	<0.5	<0.25	0.0006	0.0024	0.003	0.008	0.007	1.4
	Sorani lake	<0.002	<0.005	<0.005	<0.5	0.0022	<0.5	<0.5	<0.25	0.0004	0.0019	<0.002	<0.005	0.006	0.1

(10) Remaining Issues

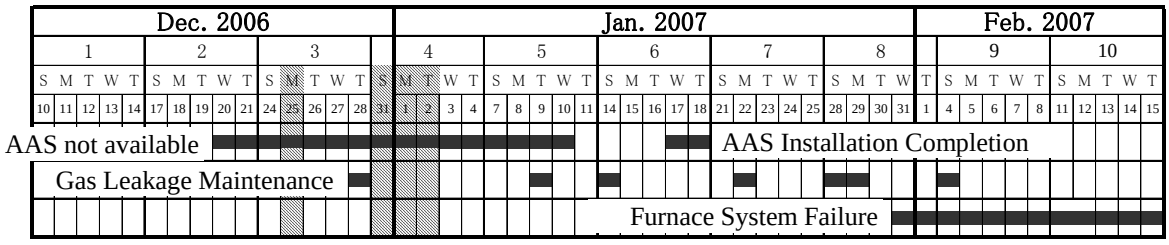
After all trainings, achievement of C/Ps for metal analysis had reached significantly higher level than before, however, they had not completed all planned trainings due to delay of completion of installation of AAS (described below). Remaining issues in the future are as follows.

1) OJT for data management should be continued by each C/P.
2) OJT for data evaluation should be conducted by a trainer continuously.
3) Shortage of stationeries for data organization should be improved as soon as possible.
4) Management of the laboratory by the authority should be introduced
5) Practice of O/M in the laboratory should be maintained and manuals should be revised by C/Ps.
6) Recovery test for As by Hydride Vapor Method must be finished by all C/Ps.
7) Hands-on and OJT for Standard Addition Method and Matrix Modifier Method should be conducted with interfered samples which will be found in the following EMO activities.

Delay of completion of installation of AAS

There was a failure in the installation procedure by the supplier. The AAS had been not available for about three weeks (20th December 2006 – 10th January 2007) and gas leakages had been maintained 7 times. The formal installation completion of AAS by the advanced supplier took place on 17-18 January and the gas leakage had been fixed finally on 4 February 2007. Another failure requiring a special adjustment was found out in the furnace system on 31 January and had not been fixed in the period of the training. The training schedule (10 December 2006 – 15 February 2007) was affected and delayed considerably by the problems mentioned above as shown in the following table.

The first Training Period (10 weeks) for Heavy Metal Analysis and Problems



3.3.2 Products of Activities

(1) Situation Report of Heavy Metal Analysis with AAS in Syria up to February 2006

The JICA Expert Team collected information related to the current situation of AAS in the existing laboratories in Damascus, Homs, Tartous and Lattakia Governorates. Most laboratories had been equipped with machineries with sufficient specifications and accessories. Further, suitable gases are used, supplies of gases and reagents were served well and services of agencies for machineries were available as a whole.

In most of laboratories, accessories of AAS had been introduced just as the suppliers recommended. Official testing methods had not been chosen and referred to in advance of the production and installation. In the laboratory of Ministry of Irrigation (MOI), procedures of pretreatment and operation of AAS were transferred from suppliers to operators orally and they had not even been written in documents. Usually, manufacturers' manuals instead of official testing methods were referred for pretreatments. Since manufacturers did not give their priority to pretreatment, but to operation, only addition of acids and filtration in case the sample includes SS would be done without an adequate process such as digestion before analysis with AAS. Often filtration was done before the addition of acids, and then only dissolved substance could be measured in this case.

In many labs mentioned in the following table, the Quantitation Limits (QL, means quantitative smallest value to be measured in each item. It differs from Detection Limit which can be detected but not measured as a certain value), were unknown and then results had been reported without consideration of them. Accordingly, QA/QC could not be conducted and the small values in low concentrations should have been unreliable. Hexavalent chromium was not measured in all visited laboratories. To deal with these matters, officially authorized testing methods had been set as a criterion to be referred for the project. The following official methods make analysis results reliable and valuable, and also help setting required specifications for AAS including equipment. To acquire accurate and precise data, QA/QC had been carried out after the installation of AAS in the Project.

In this Project, hexavalent chromium had been set to be measured by spectrophotometry instead of by AAS for the reason that a very complicated, technical and long pretreatment was necessary before the measurement with AAS considering the laboratory staff without enough experience and working time. This was also the main reason that Hexavalent chromium was not measured in any visited laboratory in the following table.

No.		1	2	3	4	5	6	7	8	9	10
City		Damascus	Damascus	Damascus	Damascus	Damascus	Damascus	Homs	Homs	Tartous	Lattakia
Organization		Sewage Treatment Plant	Ministry of Irrigation	Scientific & Environmental Research Center	Ministry of Agriculture			Water Supply Institute	Al Baath University	Water Authority	Ministry Of Housing & Structuring
Manufacturer of AAS		Shimadzu	UNICAM	Analytik jena	Analytik jena	Analytik jena	Analytik jena	Shimadzu	Shimadzu	Varian	Varian
Machine name		AA-6800 Series	UNICAM 919	AAS vario 6	AAS vario 6	Zeenit 700	NovAA400	AA-6800 Series	AA-6800 Series	SpectrAA 220FS	SpectrAA 220
	Background correction	D2 or SR	D2	D2	D2	Zeeman or D2	D2	D2 or SR	D2 or SR	D2	D2
	Main equipment	Hydride generator Auto sampler(for flame, furnace, hydride generator) UPS	Hydride generator Auto sampler for furnace	Hydride generator Auto sampler (for flame, furnace, hydride generator)	Auto sampler for furnace Generator	Auto sampler (for flame, furnace) No UPS (power cuts cause troubles)	Hydride generator Auto sampler (for flame, furnace, hydride generator)	Hydride generator Auto sampler (for flame, furnace, hydride generator) No UPS (power cuts cause troubles)	Hydride generator, Mercury vaporizer unit, Auto sampler(for flame, furnace, hydride generator) No UPS (power cuts cause troubles)	Hydride generator, Auto sampler for furnace	Hydride generator, Auto sampler for furnace, Generator
	Pretreatment method	Standard Methods or Filtration(when there are SS) and addition of acid(nitric acid)	Filtration(when there are SS) and Addition of acids(nitric or HCl)	Filtration(when there are SS) and Addition of acids(nitric or HCl) or Standard Methods, WHO, SASMO	Filtration(when there are SS) No matrix modifiers or acids	According to manuals of the manufacturer	According to manuals of the manufacturer	Addition of nitric acid (according to manufacture's cookbook)	With information from professors, publications, internet, experience and/or manufacture's cookbook	None (no pretreatment)	Standard Methods
	Measuring method	Standard Methods (main) Manuals of the manufacturer (sub)	Method taught by the supplier of AAS (not written)(main) Manuals of the manufacturer (sub)	Manuals of Analytik jena (main) , Standard Methods, WHO, SASMO (sub)	Trained by the supplier (for 1 week) Mostly learned by self experiments (with chemical background)	Manuals of the manufacturer (trained by supplier)	Manuals of the manufacturer (trained by supplier)	Manuals of the manufacturer (main), Standard Methods (sub) (trained by supplier)	Manuals and cookbook of the manufacturer	Manuals of the manufacturer (trained by supplier)	Manuals of the manufacturer, Standard Methods
	Hg	Hydride generating technique (QL 0.025mg/L)	Hydride generating technique	Hydride generating technique	Not measured	Not measured	Hydride generating technique	Hydride generating technique (QL 0.01mg/L)	Not measured	Cold Vapor technique (QL 0.01mg/L)	Cold Vapor technique (QL 0.005mg/L)
	As, Sb	Hydride generating technique (QL 0.004mg/L)	Hydride generating technique	Hydride generating technique	Not measured	Hydride generating technique	Hydride generating technique	Furnace (QL 0.005mgAs/L)	Hydride generating technique (QL 0.010mgAs/L)	Hydride generating technique (Sb not measured)	Hydride generating technique (QL 0.005mgAs/L) (Sb not measured)
	Cr(VI)	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured
	Other elements	Flame and/or furnace	Flame and/or furnace	Flame and/or furnace	Furnace only	Flame and/or furnace	Flame and/or furnace	Flame and/or furnace	Flame and/or furnace	Flame and/or furnace	Flame and/or furnace
	Kinds of gases	Acetylene, nitrous oxide, Ar, air	Acetylene, nitrous oxide, Ar, air	Acetylene, nitrous oxide, Ar, air	Ar	Acetylene, nitrous oxide, Ar, air	Acetylene, nitrous oxide, Ar, air	Acetylene, Ar, air	Acetylene, nitrous oxide, Ar, H2,air	Acetylene, Ar, air	Acetylene, nitrous oxide, Ar, air
Usable texts		Standard Methods	None	None	Experience	None	None	Translated manuals in Arabic	Notes by the operators	Notebooks	Standard Methods
Agency and service	for AAS	Al-Shahba / good service	UNICAM / good service	Analytik jena / good service	Analytik jena / not very good	Analytik jena / OK	Analytik jena / OK	Al-Shahba / very good service	Al-Shahba / good service	Mimosa / very good service	Mimosa / good service
	for gases	Airproducts / good service	Mawaldi / very good service	Alkaseer / good service	Unknown	Unknown	Unknown	A local agency	A local agency	A local agency	A local agency
	for reagents	Merk / good service	MAAN(Merk) / very good service	Merk / good service	Analytik jena / good service	Analytik jena / OK	Analytik jena / OK	Not necessary yet (used for 3 months)	Al-Shahba / good service	Mimosa / good service	Mimosa / good service

Conditions Report of AASs in Use in Existing Laboratories (as of February 2006)

(2) Standard Analysis Methods and Target Quantitation Limits (TQL) for Metal Analysis

The Standard Methods for the Examination of Water and Wastewater 20th Edition (StM) had been chosen as standard analysis methods for metal analysis of the Project. The reasons were that StM had been officially authorized; it could be the criteria to be referred; it could help operating pretreatments and acquire the required analytical quality; it also was referred at the most visited laboratories in Syria.

Two levels of Target Quantitation Limits (TQL) had been set. As the first objective, Primary TQLs (TQL-1) had been set as minimum values of all kinds of *Maximum Limits of Pollution Parameters for Discharge in the Water Environment* (Syria). As more important values, Essential TQLs (TQL-2) had been set as minimum values of standards of drinking water (Syrian and WHO's) according to the idea that the standard values of environmental water in Syria (in the future) are expected to be set between values for discharge and drinking waters.

Target Quantitation Limits and Related Values

(mg/liter)

Item[a]		The Maximum Limits of Pollution Parameters for Discharge in the Water Environment (Syria)				Primary Target Quantitation Limits (TQL−1)[b]	Syrian Standard for Drinking Water	WHO Guideline Values of Drinking Water		Essential Target Quantitation Limits (TQL−2)[d]
		Agricultural drainage canals	Rivers	On land	Seas					
1	Ag	−	0.05	0.05	0.1	0.05	−	−		0.05
2	Al	3	1	1	3	1	0.2	−		0.2
3	As	0.1	0.1	0.1	0.1	0.1	0.01	0.01	P	0.01
4	Ba	−	1	−	−	1	0.1	0.7		0.7[e]
5	Cd	0.05	0.05	0.01	0.05	0.01	0.005	0.003		0.003
6	Cr	0.5	0.5	0.5	0.5	0.5	0.05	0.05	P	0.05
7	Cu	1	1	1	1.5	1	1	2		1
8	Fe	2	2	1	2	1	0.3	−		0.3
9	Hg	0.005	0.005	0.005	0.005	0.005	0.001	0.001		0.001
10	Mn	0.5	0.5	0.5	1	0.5	0.1	0.4	C	0.1
11	Ni	0.5	0.3	0.3	0.5	0.3	0.2	0.02	P	0.02
12	Pb	0.5	0.2	0.2	0.5	0.2	0.01	0.01		0.01
13	Sb	0.3	0.3	0.3	1	0.3	0.005	0.02		0.02[f]
14	Zn	2	2	1	2	1	3	−		1

a: as all metals set in The Maximum Limits of Pollution Parameters for Discharge in the Water Environment (Syria) in alphabetical order
b: set as minimum values of all kinds of maximum limits of Pollution Parameters
d: set as minimum values of drinking water standards e: WHO had set the value as 0.7 for Ba in 2004
f: WHO had changed the value from 0.005 to 0.02 for Sb in 2004
P: Provisional C: Consumer complaints may occur even lower than the value

(3) Specifications for AAS to be Introduced

1) Reference Parameters

To determine the draft specifications for AAS to be introduced, quantitation limits of official testing methods were referred. Firstly a comparison between detection limits of deferent official testing methods was made. At this point, *EPA Test Methods April 2003 revised edition (EPA)* and *The Standard Methods for the Examination of Water and Wastewater 20th Edition (StM)* were selected for the reason that the both of them were recognized worldwide and detection limits were mentioned in

their selves. Then, Quantitation Limits of Testing Methods were simply calculated by choosing fewer values in each elements from EPA or StM and multiplying them by 10/3 on the basis that detection limits equals 3σ while quantitation limits equals 10σ (σ= Standard deviation of repeatedly measured blank samples). Details are shown in the table below.

Calculated Quantitation Limits of Testing Methods

Methods		Flame method		Furnace method		Flame	Furnace
		EPA	St M	EPA	St M	Quantitation Limits of Testing Methods (ug/L)	
		Detection Limits (ug/L)					
1	Ag	10	10	0.2	0.2	33	0.7
2	Al	100	100	–	3	333	10
3	As	2	–	1	1	7	3
4	Ba	100	30	2	2	100	7
5	Be	5	5	0.2	0.2	17	0.7
6	Cd	5	2	0.1	0.1	7	0.3
7	Cr	50	20	1	2	67	3
8	Cu	20	10	1	1	33	3
9	Fe	30	20	1	1	67	3
10	Hg	–	–	–	–	–	–
11	Mn	10	10	0.2	0.2	33	0.7
12	Ni	40	20	1	1	67	3
13	Pb	100	50	1	1	167	3
14	Sb	200	70	3	3	233	10
15	Zn	5	5	0.05	–	17	0.17

2) Available Specifications

Five machineries [NovAA 400, Zeenit 700 (Analytikjena), AA6300 Series, AA6800 Series (Shimazu), SpectrAA Duo AA240FS/AA240Z (Varian)] were latest models recommended by agencies which could satisfy the required conditions. They also had been selected through consultations and T/C among the JICA Expert Team, the director of GCEA, and the director and C/Ps of the Damascus DFEA, the director and the chief of laboratories of GCEA. See the details of each AAS in the following table.

3) Available Quantitation Limits of the Machineries

Quantitation Limits of each AAS are shown in the following table. They were compared with Additional Target Quantitation Limits (TQL) and Quantitation Limits of Testing Methods calculated. Quantitation Limits of each AAS showed that their values were smaller than both of Essential TQL and Quantitation Limits of Testing Methods. And they satisfied the conditions to be required.

4) Available Suppliers

In order to provide AAS with required specifications, three agencies (Analytik Jena SY, Al-Shahba and MIMOSA) had been chosen as suppliers available in Damascus. The reasons were supplying experiences of AAS in Syria and capability to supply AAS with required specifications. Detailed information of the agencies is shown below.

Details of Agencies for AAS

Manufacturer	Analytik jena	Shimadzu	Varian
Country	Germany	Japan	US
Agency	Analytik jena SY	AL-AHAHBA	MIMOSA
Personnel	Mr. Ahmad Mohamad Mr. Fayes Abed Al Razeq	Mr. Terki Rekab Mr. Hussam Nabhani	Mr. Sami BAZ
Address	Teliani, Alzahraa St., Damascus, Syria	Al Abed St., Al Buhturi Lane No.3, 3rd floor, Damascus, Syria P.O.Box : 30236	Shakib Arslan St., Masri Bldg Abou Roummaneh, Damascus, Syria P.O.Box : 5098
Tel.	+963 11 3314408	+963 11 4441019	+963 11 3333276
Fax	+963 11 3341966	+963 11 4410364	+963 11 3332290
e-mail	ah-na@scs-net.org	teriaki@scs-net.org	mimosa@net.sy
Supply and Service of AAS	Available	available	available
Delivery time	30-45 days	60-90 days	60-90 days
Sales record of the newest models	7 in Damascus, 1 in Dara'a, 1 in Homs Total 9 in Syria	2 in Damascus, 2 in Homs, 2 in Hama, 3 in others Total 9 in Syria	1 in Tartous 1 in Lattakia Total 2 in Syria
Opinion about service from laboratories	Good (SERC) Not very good (Ministry of Agriculture1) OK (Ministry of Agriculture2)	Good (Sewage Treatment Plant) Very good (Water Supply Institute) Good (Al Baath Univ.)	Very good (Water Authority) Good (Ministry of Housing & Construction) Very bad (Lattakia DFEA)

Later, MIMOSA was out of list of the tender because any product from Varian was under economic sanctions of the United States of America (USA).

(4) Other Required Facilities in the Laboratory of Damascus DFEA

For installation of AAS, a fume hood, gas lines from gas cylinders to AAS made of stainless steel and electric power supply enough to utilize furnace method would be necessary and were mentioned in the specification.

(5) Specification Tables for the Tenders

The JICA Expert Team prepared the specification tables for three package for metal analysis (Package 1: AAS and related accessories, Package 2: Apparatus (mainly glassware) and Package 3: Reagents). At this moment, Be (Bellyrium) was in the Specification. Later, it was found out that Be was restricted to import in Syria and Be was set out of target items. See Annex 3.1 for the details.

Available manufacturer		Analytikjena	Analytikjena	Shimadzu	Shimadzu	Varian	Remarks		
Machine name		novAA 400	Zeenit 700	AA6300 Series	AA6800 Series	SpectrAA Duo AA240FS/AA240Z			
Background correction		Deuterium (D2)	D2 / Zeeman	D2 / Self Reverse	D2 / Self Reverse	D2 / Zeeman	D2, Self Reverse, Zeeman sample w/ simple matrices ⟷ complex		
Beam quantity	flame	single / double	single / double	double (optical)	single	double (optical)	double stabilized ⟷ single sensitive		
	furnace	single	single	double (electrical)	double (electrical)	double (optical)	double stabilized ⟷ single sensitive		
Radiator type	flame	water -cooled	water -cooled	air -cooled	air -cooled	air -cooled	water-cooled > air-cooled		
Furnace cooling	water	radiator	radiator	0.6-1.5 (L/min)	0.6 (L/min) or more	1.5-2 (L/min)	required amount, preferable to be smaller		
	argon gas	Max, 2 (L/min)	Max, 2 (L/min)	Max, 3.5 (L/min)	Max, 3.5 (L/min)	Max, 3.8 (L/min)	required amount, preferable to be smaller		
Atomizer exchange		semi-automatic	not necessary	manual	automatic	not necessary	(flame ⟷ furnace) auto > manual		
Position adjustment	flame	automatic	automatic	automatic	automatic	automatic	auto > manual		
	furnace	manual	manual	manual	manual	manual	auto > manual		
Auto sampler for	flame	equipped	equipped	equipped	equipped	equipped			
	furnace	equipped	equipped	equipped	equipped	equipped			
hydride generator		equipped	equipped	optional	optional	equipped			
Auto dilution	furnarator	equipped for furnace	equipped for furnace	equipped for furnace	equipped for furnace	equipped for furnace			
Software		MS Win XP	MS Win XP	MS Win XP	MS Win XP	MS Win XP			
Safety control		several systems related to gas	several systems related to gas	several systems related to gas	several systems related to gas	several cares related to gases, UV light, electricity and magnetic effects			
Weight (kg approx.)		not reported	170kg	110kg	140kg	180kg	preferable to be lighter		
Dimensions	(mm)	900×480×600	1200×480×600	1900×550×460	1300×550×460	1600×600×600	preferable to be smaller		
Power requirement	flame	230VA	230VA	230VA	600VA	225VA	preferable to be smaller		
	furnace	2100VA	2100VA	6000VA	6000VA	3500VA	preferable to be smaller		
Agency		Analytikjena	Analytikjena	AL-SHAHBA	AL-SHAHBA	MIMOSA			
Sales records		4 in DAM, 2 in others	3 in DAM	1 in DAM	8 in Syria	2 in Syria			
After-sale service		available	available	available	available	available			
rough price (US$ approx.) in Jan. 2006		100,000	115,000	75,000	82,000	106,000	Details are not considered definitely		
Quantitation Limits	(μg/L)			common values for both machineries			Essential TQL (TQL - 2)	QL of testing methods Flame	Furnace
	1 Ag	0.1 / Frn	0.1 / Frn	10 / Flm	0.01 / Frn	5.7 / Flm	5	33	1
Flm : Flame	2 Al	1.13 / Frn	0.57 / Frn	190 / Flm	0.03 / Frn	67 / Flm ; 6.7 / Frn	20	333	10
Frn : Furnace	3 As	0.2/Hyd ; 1.3 / Frn	0.2/Hyd ; 1.3 / Frn	0.02 / Hyd	0.2 / Frn	0.28 / Hyd	1	7	3
Hyd : Hydride generation	4 Ba	1.3 / Frn	1.3 / Frn	80 / Flm	0.2 / Frn	23.3 / Flm ; 6.7 / Frn	50	100	7
Cvp : Cold Vapor	5 Be	0.13 / Frn	0.13 / Frn	8 / Flm	0.01 / Frn	1.7 / Flm	200	17	0.7
Wee : With extra equipment	6 Cd	0.023 / Frn	0.017 / Frn	4 / Flm	0.003 / Frn	0.0043 / Frn	10	7	0.3
	7 Cr	0.3 / Frn	0.47 / Frn	20 / Flm	0.02 / Frn	0.017 / Frn	700	67	3
All the values are	8 Cu	063 / Frn	0.5 / Frn	10 / Flm	0.04 / Frn	0.05 / Frn	50	33	3
reported by its	9 Fe	0.3 / Frn	0.5 / Frn	20 / Flm	0.04 / Frn	24.3 / Flm ; 6.7 / Frn	3	67	3
manufacture or supplier.	10 Hg	0.3/Hyd ; 0.03 /Wee	0.3/Hyd ; 0.03 /Wee	0.03 / Cvp		0.143 / Hyd	50	-	-
Some values have been	11 Mn	0.047 / Frn	0.17 / Frn	8 / Flm	0.01 / Frn	0.08 / Frn	1000	33	0.7
culculated from detection	12 Ni	1.0 / Frn	1.5 / Frn	20 / Flm	0.13 / Frn	19.3 / Flm ; 6.7 / Frn	300	67	3
limits as being multiplied	13 Pb	0.27 / Frn	0.27 / Frn	80 / Flm	0.06 / Frn	0.07 / Frn	1	167	3
by 10/3.	14 Sb	1.0/Hyd ; 0.83 / Frn	1.0/Hyd ; 0.83 / Frn	0.04 / Hyd	0.20 / Frn	0.2 / Hyd	100	233	10
	15 Zn	0.02 / Frn	0.01 / Frn	3 / Flm	0.01 / Frn	5.3 / Flm	20	17	0.17

Available Specification of AAS: Measurement Item (Al, As, Ba, Be, Cd, Cr, Ni, Hg, Fe, Sb ,Cu, Mn, Zn, Pb, Ag)

(6) Documents for Lecture Trainings

For lecture trainings for metal analysis, documents shown below were used mainly in the Damascus DFEA and also at other 13 DFEAs since December 2005 until December 2007. The list of documents is as follows. See Annex 3 and 4 for the actual products.

Lecture documents for:

1) Presentation "Metals Analysis Introduction"
2) Theoretical Training for AAS
3) Basic idea of Sampling
4) Basic idea of Pretreatment
5) Handling Toxins
6) Basic idea of Statistics
7) Dilution
8) Significant Digits
9) Comprehension Check Sheet
10) Presentation "Outline of Metal Analysis"

(7) SOPs

For Hands-on and On-the-Job trainings for metal analysis, SOPs listed below were prepared and used in the Damascus DFEA since December 2006 until December 2007. See Annex 1 and 2 for the actual products.

SOPs for:

1) Sampling procedure for Metal Analysis
2) Pretreatment procedures for general metals (except for As and Hg)
3) Preparation of Calibration Curves for metal analysis
4) Procedure of Operating AAS with Flame Method
5) Procedure of Operating AAS with Furnace Method
6) Analysis of Hg
7) Analysis of As
8) Data Management
9) Data Evaluation
10) Standard Addition Method
11) Matrix Modifier

(8) O/M Manuals

For Hands-on and On-the-Job trainings (OJT) for metal analysis, O/M manuals listed below were prepared and used mainly in the Damascus DFEA since December 2006 until December 2007. See Annex 3 for the actual products.

O/M Manuals for:

1) Preparation for Glassware (Flasks, etc.)
2) Preparation for Glassware (Pipettes)
3) Handling Toxins -1 Handling STD
4) Handling Toxins -2 Analysis with AAS
5) Handling Toxins -3 Recognition and Treatment of Waste Water

6) Consumables and Budget Planning
7) Periodical Maintenance of AAS
8) Concentration with Calibration Curves and Dilution

(9) Recording Documents for Heavy Metal Analysis

For Hands-on and OJT for metal analysis, Recording Documents listed below were prepared and used in the Damascus DFEA since December 2006 until December 2007. See Annex 3 for the actual products.

Recording Documents for:

1) QA&QC Results
2) CC Table
3) How to prepare CCs
4) Analysis Administration Sheet
5) Front Page of Results
6) Monthly Report
7) Pollution Data Sheet
8) Daily Report & Machinery Check Sheet
9) Reagent Check Sheet
10) Consumables Inventory
11) Periodical Maintenance Sheet

3.4 Air Quality

3.4.1 Training Activities

(1) Summary of Lecture Training and OJT on Air Quality Analysis

For the technology transfer of atmospheric environmental management, air quality analysis skills (including QA/QC), laboratory O/M, and related knowledge to the C/P personnel, the following training programs were implemented during the period from June 2005 to December 2007.

The C/Ps are staff in charge of air quality analysis in the Damascus, Homs, and Aleppo DFEAs. In addition, the staff in charge for water quality in the Damascus and Homs DFEAs also participated actively in the air quality training.

List of Training Activities of the Project (June 2005 – December 2007)

Overall Goal of Air Quality Analysis	1. The staff in the targeted directorates carries out air monitoring on regular basis according to the monitoring plan formulated by the staff within five years after the completion of the project.
Purpose of the Air Quality Analysis Project	1. Analysis technology level to be targeted is as follows: Damascus, Homs and Aleppo are basic sampling level (manual). 2. The staff in the targeted directorates carries out air monitoring on regular basis according to the monitoring plan formulated by the staff himself.

Training Course	Objectives	Period
1. Basic Lecture Training and OJT	- Lectures on understanding prerequisite fundamental items for the implementation of the atmosphere environmental management and monitoring. - General concept on pollution, laws and regulations, planning, sampling and analysis. - Basic policy on site selection of the Meteorological Monitoring Stations.	June 5 - July 6 2005
2. Lecture Training and OJT on Field Sampling using Simple Samplers	- Lecture on air quality, air pollution, meteorological analysis, and countermeasures. - Lecture on sampling, calibration curves, and data treatment. - Training and OJT on preparation of simple samplers, filter preparation, and calibration curves. - OJT on field sampling using passive (simple) samplers. - Follow-up field training.	Jan. 22 - Feb.21 2006
3. Lecture Training, OJT and Data Analysis	- Practical training on setting-up the condition of the data logger of the meteorological station and exporting the measured parameters from the data logger to the spread sheet software. - Practice on the general sampling record format and preparation of the measurement results table. - Guidance about the common monthly report of meteorological data for each DFEA. - Basic lecture training on the arrangement and analysis of the continuous measurement data. - Instructions about the operational procedure of the air quality Handy Samplers. - Instructions about the operational procedures of the High Volume and Low Volume Air Samplers. - Practical training on the operation of the UV/VIS spectrophotometer. - Basic lecture training on the SOPs of NO_x, SO_2, PM10, TSP, and Pb. - Practical guidance about the Environment Monitoring Plan.	Aug. 13 - Sep. 4 2006
4. Lecture Training, OJT and Data Analysis	- In accordance with the SOPs, implementing the training and gaining the skills of the sampling process, the analyzing methods, and the points of consideration related to the air quality. (NO_x, SO_2, O_3, NH_3, F, TSP, PM10, Dust fall). - Grasping the investigation method of the monitoring project with respect to the objectives. - Guidance about the management of the accuracy of the data measurement and analysis. - Improving the reliability of data analysis. - Guidance about the unique planning of the environmental monitoring project (EMO).	Nov. 16 - Dec. 18 2006 Jan.17 - Feb.6 2007
5. Lecture training, OJT, Monitoring Plan, Data Analysis and Interpretation	- In accordance with the SOPs, the training is carried out with a focus on the skills of the sampling process and analyzing methods related to air quality. (NO_x, SO_2, O_3, NH_3, F, TSP, PM10, Dust fall). - Investigation method of the monitoring with respect to the objectives. - Guidance about the management of the accuracy of the data measurement and analysis. - Improving the reliability of data analysis. - Guidance about the planning of the environmental monitoring.	May 29 - July 23 2007
6. Lecture training, OJT, Comparatively Advanced Data Analysis and Interpretation	- Guidance about making sampling paper filters for the simple samplers. - Preparation of the final seminar. - Analysis of air quality monitoring data and guidance about an assessment procedure. - Assessment of the air quality monitoring data. Explanation about a comparatively advanced analytic technique in the air quality analysis.	Nov. 25 - Dec. 12 2007

(2) Training Program of Air Quality Analysis

The training of air quality analysis was intensively carried out for the C/Ps of Damascus, Homs, and Aleppo DFEAs using the equipment provided by JICA. Major contents of the training course are as follows:

1) Guidance about handling the air quality monitoring and weather observation equipment
2) Points of consideration on the air quality analysis and monitoring
3) Lecture and field training on SOPs
4) Preparation of the monthly and annual reports
5) Analysis and interpretation method of air quality and meteorological data

Contents of Lecture and OJT for Air Quality Analysis (June – July 2005)

Basic Lecture Training Program for Air Quality		Field Training Program for Air Quality	
Lec.	Contents	OJT	Contents
1	1. Lectures on understanding prerequisite fundamental items for the implementation of the atmosphere environmental management and monitoring. 2. General concept of pollution, laws and regulations, planning, sampling and analysis.	1	Selection of Meteorological Monitoring Stations.
2	1. Basic policy on site selection of the Meteorological Monitoring Stations. 2. Discussion about air quality monitoring items and methods in DAM, HOM and ALP DFEAs.		
Damascus	5, 18, 19 June, 2005	Damascus	21, 23 June, 2005
Homs	5, 29 June, 2005	Homs	30 June, 11July, 2005
Aleppo	5 June, 4 July, 2005	Aleppo	5, 6 July, 2005

Contents of Lecture and OJT for Air Quality Analysis (Jan. – Feb. 2006)

Lecture Training Program for Air Quality		Field Training Program for Air Quality	
Lec.	Contents	OJT	Contents
1	General plan of air quality analysis training Basic knowledge of air pollution measuring methods 1) Contents of the lecture. 2) Introduction. 3) Sampling method of gaseous pollutants. 4) Method of measuring suspended particulate matters. 5) Method of measuring the dust fall.	1	Sampling points setting, etc. 1) Investigation of NO_x concentration distribution over wide areas. 2) Setting the sampling points on the map. Prior preparation 1) Establishment of stations installation locations. 2) Examination of installation procedure. 3) Preparation of the sampling record format.
2	Gaseous pollutants measuring method 1) Method of measuring sulfur dioxide and sulfuric acid mist. 2) Method of measuring nitrogen oxides. 3) Method of measuring hydrogen sulphide. 4) Method of measuring Ozone.	2	Preparation of the sampling process 1) Installation of impregnation paper filter 2) Preparation of sampling process and setting-up the simple samplers. Dryness of $NaNO_2$ reagent.
3	Sampling of SPM and points of considerations 1) Explanation of the contents. 2) Basic knowledge. 3) Method of measuring SPM weight. 4) Outline of heavy metal analysis method of SPM.	3	Preparation of analysis 1) Adjustment of reagents. 2) Preparation of tools such as the glassware. Calibration curve 3) Adjustment of NO_2 standard solution concentration. 4) Drawing the calibration curve (each person of C/P) Collection of Simple samplers
4	Passive Sampler Method of Air Pollution Monitoring 1) Outline of the passive sampler for short-term sampling (NO, NO_2, SO_2, O_3). 2) Principle of air quality passive samplers. 3) Investigation method that uses passive samplers. 4) Sampling plan. 5) Concentration map for NO_x, NO_2 and NO. 6) Comparison of Integrated Sampling and Real-Time monitors.	4	Analysis of NO_2 and NO_x Data arrangement and analysis 1) Explanation of calculation procedure of NO_2 and NO_x concentration. 2) Guidance of the method of preparing the concentration map.
DAM	Date: 23 January, 2006, 12 –13 February, 2006	DAM	23 – 26 January, 2006 Participants: 7-10
HOM	Date: 29 January, 2006, 14 –15 February, 2006	HOM	29 January – 1 February, 2006 Participants: 6-9
ALP	Date: 5 February, 2006, 9 February, 2006	ALP	5 – 10 February, 2006 Participants: 3

Contents of Lecture and OJT for Air Quality Analysis (July – Sept. 2006)

Step	Subject	Content
1	Meteorological Stations	1) Installation and Training on the Meteorological Stations. 2) Practical training on setting-up the condition of the data logger of the meteorological station and exporting the measured parameters from the data logger to the spread sheet software.
2	Sampling Record Format	1) Practice on the general sampling record format and preparing the measurement results table.
3	Monthly Report	1) Guidance about the common monthly report of meteorological data for each DFEA. 2) Basic lecture training on the arrangement and analysis of the continuous measurement data.
4	Air Quality Samplers	1) Instructions about the operational procedure of the air quality Handy Samplers. 2) Instructions about the operational procedures of the High Volume and Low Volume Air Samplers.

Step	Subject	Content	
		3) Practical training on the operation of the UV/VIS spectrophotometer.	
5	SOP	1) Basic lecture training on the SOPs of NO_x, SO_2, PM10, TSP, and Pb.	
6	Monitoring Plan	1) Practical guidance on the Environment Monitoring Plan.	
DAM	Date: 6-8, 23, 24, 27 Aug., 2006, 3 Sep., 2006		Participants: 11
HOM	Date: 20 – 22, 28, 29, 31 Aug., 2006, 3 Sep., 2006		Participants: 8
ALP	Date: 13 – 15, 30, 31 Aug., 2006, 4 Sep., 2006		Participants: 3

Contents of Lecture and OJT for Air Quality Analysis (Nov. 2006 – Feb. 2007)

Step	Contents	
1	1) Explanation of the contents of air quality analysis training of this term. 2) Explaining how to treat the Low-Vol sampler, and points of consideration related to the sampling process. 3) Treatment of PM 10 Hi-Vol and TSP Hi-Vol, measurement principle, and sampling process. 4) Measuring the weights of the paper filters used in Low-Vol, PM10 Hi-Vol, and TSP Hi-Vol (before carrying out the sampling). 5) In accordance with the SOPs, preparing the needed instruments and reagents for analyzing NO_x and SO_2.	
2	1) Starting the sampling process by PM10 and TSP Hi-Vol at the DFEA rooftop. 2) Based on the SOP, making the absorption and standard solutions of NO_x and obtaining the calibration curve. 3) Based on the SOP, making the absorption and standard solutions of SO_2 and obtaining the calibration curve. 4) Explaining the air quality environmental standards and the emission standards. 5) Points of consideration related to the sampling of NO_x and SO_2. 6) Explaining the method and the objectives of measuring the dust fall (by dust jars). 7) Preparing the measurement of the dust fall.	
3	1) Ending the sampling process by PM10 Hi-Vol and TSP Hi-Vol. 2) Sampling NO_x and SO_2 at locations (targets) in streets. Analyzing NO_x and SO_2. 3) Setting-up the dust jars for the dust fall sampling at the measurement locations. 4) Measuring the weights of the paper filters used in Low-Vol, PM10 Hi-Vol, and TSP Hi-Vol. 5) Calculating the concentrations of NO_x, SO_2, PM10 and TSP according to the SOPs. 6) Open discussion with the counterpart (questions and answers).	
4	1) Examining the results of the concentration calculation of NO_x, SO_2, PM10 and TSP. 2) Explaining the SOPs O_3 (O_x) and NH_3, and the points of consideration related to the sampling process. 3) Based on the SOP, making the absorption and standard solutions of O_3. 4) Obtaining the calibration curve of O_3. 5) In accordance with the SOP, making the absorption and standard solutions of NH_3.	
5	1) In accordance with the SOP, obtaining the calibration curve of NH_3. 2) Starting the sampling process for O_3 and NH_3. 3) In accordance with the SOP, analyzing and calculating the concentrations of O_3 and NH_3. 4) Points of consideration related to laboratory operation and maintenance.	
6	1) Collecting the dust jars. 2) Preparing the filtration of the dust fall, and measuring the weight of the paper filters. 3) Filtering the dust fall. 4) Drying the insoluble substances, and concentrating the soluble substances.	
7	1) Measuring the weights of the insoluble and soluble substances. 2) Calculating the concentration of the dust fall. 3) Arranging the meteorological data. 4) Basic test for evaluating the trainees' skills.	
8	1) Learning the method of how to input the measurement results into the data recording form, and re-examine the recording format of the environmental monitoring. 2) Data transmission to the GCEA. 3) Guidance about preparing the yearly project of the air quality monitoring.	
9	1) Comparing the measurement results with the environmental standards. 2) Explaining the results of the basic test.	
10	1) Investigating NO_2 and SO_2 concentration for a targeted factory.	
11	1) Based on the SOP, making the absorption and standard solutions of fluorine compound (F) and obtaining the calibration curve. 2) Investigating fluorine compound (F) concentration for a targeted factory.	
12	1) Calculating the concentration of NO_2, SO_2, and F. 2) Open discussion with the counterpart (questions and answers).	
13	1) Follow-up practice training on air-quality monitoring. 2) Review of the air quality annual monitoring plan.	
14	1) Meeting with the C/P to examine the layout of the air quality analysis laboratory.	
DAM	Date: 16, 19, 20, 27-30Nov., 7, 10, 12-14 Dec., 2006, 17, 18, 24, 25 Jan., 2007	Participants: (3)7-10
HOM	Date: 28-31 Jan., 2007, 1, 4-6 Feb., 2007	Participants: 6-8
ALP	Date: 21-23 Nov., 2006, 3-6, 17, 18 Dec., 2006, 21, 22 Jan., 2007	Participants: 3-4

Note: Hi-Vol: High Volume air sampler, Low-Vol: Low Volume air sampler

Contents of Lecture and OJT for Air Quality Analysis (May 2007 – Jul. 2007)

Step	Contents
Step-1	1) Explaining the training contents of the air quality analysis of this term. 2) Confirming the monitoring situation of DFEAs operation. 3) Additional guidance about fundamental topics related to air pollutants SOPs. 4) Checking out the communication between the Low-Vol Samplers and the portable computer. 5) Explanation and discussion about the basic policy of the measurement program.
Step-2	1) Based on the SOP, making the absorption solution of NO_x. 2) Carrying out the sampling process of NO_x (in 8 points). 3) Analyzing NO_x. 4) Calculating NO_x concentration and examining the results.
Step-3	1) Based on the SOP, making the absorption solution of SO_2. 2) Carrying out the sampling process of SO_2 (in 8 points). 3) Analyzing SO_2. 4) Calculating SO_2 concentration and examining the results. 5) Arrangements of the operations that should be done by C/P until the next term: - Measurement of dust fall (field setting). - Environmental monitoring plan prepared by DFEA (draft). - Selection of PM10 and TSP measurement (sampling) points (draft). - Establishment of concentration measurement plan in wide areas and selecting the measurement (sampling) points by using the simple samplers (draft). - Calculating SO_2 concentration and examining the results.
Step-4	1) Measurement of the dust fall (field setting). 2) Measurement of PM10 Hi-Vol, and TSP Hi-Vol. 3) Arrangements of the operations that should be done by C/P until the next term: - Environmental monitoring plan prepared by DFEA (draft). - Selection of PM10 and TSP measurement (sampling) points (draft). - Establishment of concentration measurement plan in wide areas and selecting the measurement (sampling) points by using the simple samplers (draft).
Step-5	1) Confirmation of the environmental monitoring plan prepared by DFEAs. 2) Confirmation of the measuring points of each measurement item. 3) Measurement preparation based on the environmental monitoring project. 4) Measurement of NO_x, SO_2. 5) Measurement of NO_x (NO, NO_2), and SO_2 concentrations in wide areas by using the simple samplers. 6) Measurement of PM10 Low-Vol, PM10 Hi-Vol, and TSP Hi-Vol. 7) Measurement of O_3 (O_x) and F. 8) Collection of metrological data (wind direction, wind velocity, temperature, relative humidity, and solar radiation) and preparing the monthly report. 9) Targets to be executed until the next term: - Measurement of the dust fall fixed quantity (concentration). - Calculating the concentration of each measurement item. - Continue in collecting the metrological data (wind direction, wind velocity, temperature, relative humidity, and solar radiation) and preparing the monthly report.
Step-6	1) Investigating the concentration decline of air pollutants released from sources in main roads (NO_x, PM10 Hi-Vol, and TSP Hi-Vol). 2) Guidance about analyzing air quality investigation data and evaluation procedure. 3) Effective use of air quality equipments and O/M. 4) Guidance about accomplishing the monthly and annual reports. 5) Adjustment about the "Environmental Monitoring Project" of air quality. 6) Explanation of the draft budget plan related to the air quality analysis. 7) Examination and evaluation of the air pollutants.
Step-7	1) Guidance of the draft budget plan related to the air quality analysis. 2) Scenario of the future of air-quality monitoring. 3) Proposal of environmental administration and air-quality monitoring. 4) Basic test for evaluating the training proficiency (skill levels of the trainees). 5) Open discussion with C/P (questions and answers).
DAM	29-31 May, 10-14 June, 8-10 , 19, 23 July, 2007 Participants: 3-6
HOM	3-7, 24-28 June, 11-12, 22 July, 2007 Participants: 4-7
ALP	17-21 June, 1-5, 15-17 July, 2007 Participants: 3-6

Contents of Lecture and OJT for Air Quality Analysis (Nov. 2007 – Dec. 2007)

Step	Contents
Step-1	1) Guidance about making sampling paper filters for the passive (simple) samplers. 2) Preparation of the final seminar.
Step-2	1) Analyzing the air quality monitoring data and guidance about an assessment procedure. 2) Assessment of the air quality monitoring data. Explanation about a comparatively advanced analytic technique in the air quality analysis.

Step	Contents	
Step-3	1) The subject of the present air quality analysis and the corresponding scheme and a future course.	
Step-4	1) Lecture of the basis of air pollution source survey and pollution control. 2) About the action (activity) of the C/P since the start of this project.	
DAM	5, 10-12 Dec., 2007	Participants: 3-4
HOM	29 Nov., 2-4 Dec., 2007	Participants: 5-6
ALP	25-28 Nov., 2007	Participants: 4

(3) Sampling Method for Air Quality Analysis

Since the basis of the Air Quality Sampling Method is important for obtaining accurate data, the JICA Expert Team repeated training again about sampling method by guiding C/Ps of the Damascus, Homs, and Aleppo DFEAs. The outline of the basis of the Air Quality Sampling Method is described below, and details are presented in Annex 1.

1. Points of consideration for the sampling

1.1 General notes of sampling

(1) Selection of the sampling points
(2) Establishment of the sampling height
(3) Measurement interval (sampling frequency) etc.
(4) Grasping the meteorological conditions

1.2 Notes in SPM sampling

(1) Common items
(2) High Volume and Low Volume Air Samplers
(Sampling duration and Sampling points, etc.)

1.3 Purpose and notes of dust fall (by dust jars) measurement

1.4 Notes of gaseous pollutants sampling

(1) Selection of the sampling tube
- Ozone (O_3), Sulfur dioxide (SO_2), Carbon mono oxide (CO), Nitrogen dioxide (NO_2)
- Ammonia (NH_3), Hydrogen fluoride (HF), Chlorine gas (Cl_2)

(2) Selection of the impinger for a gas sampling
(3) Notes about sampling results

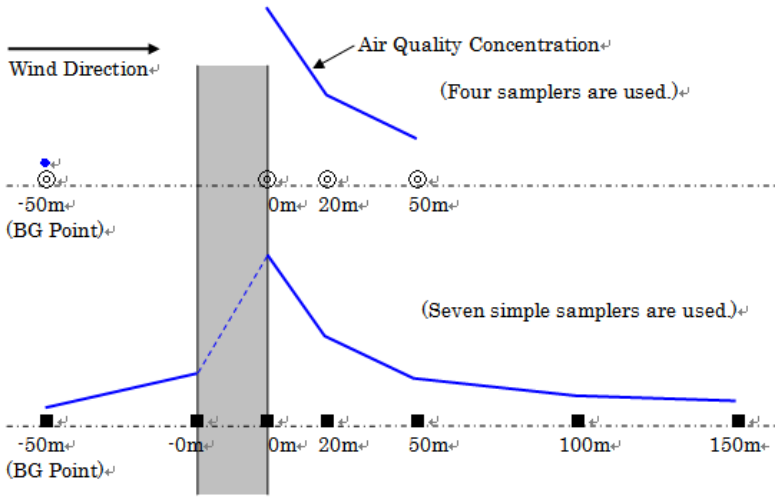
2. Air Quality Environmental Standards and Emission Standards

3. Investigation Method

3.1 The target is a road

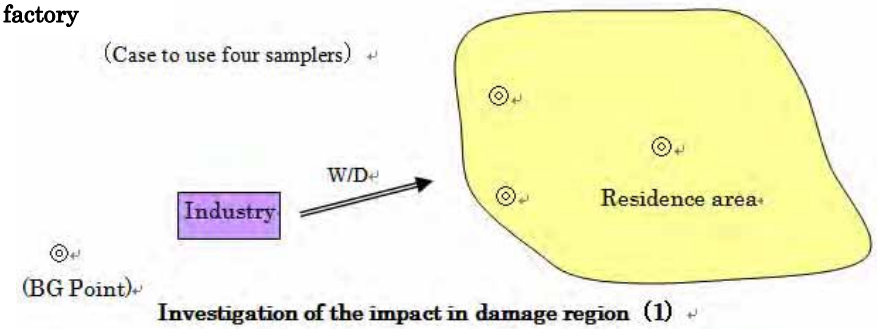
- Using four samplers
- Using many samplers

.

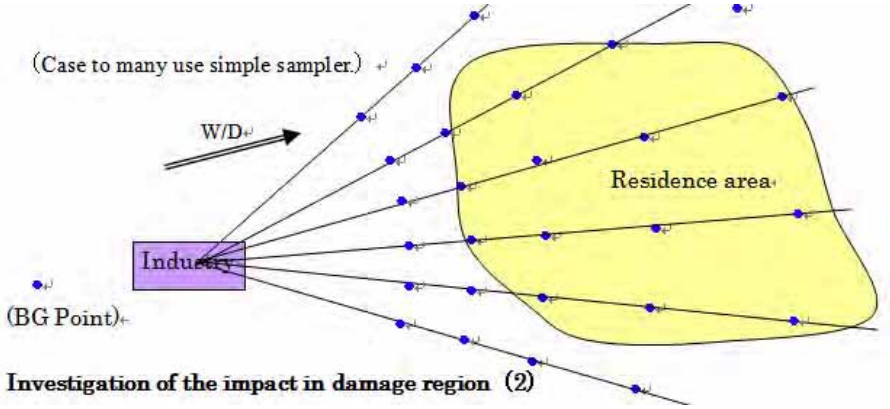


Decrease Investigation of Air Quality Concentration from Roadside (Image)

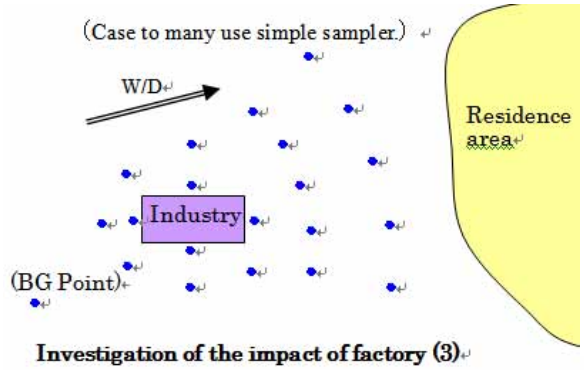
3.2 The target is a factory



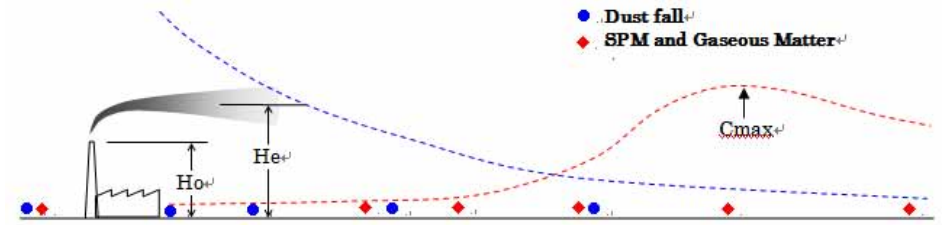
Investigation of the impact in damage region (1)



Investigation of the impact in damage region (2)



Investigation of the impact of factory (3)



Difference between object substance and sampling points

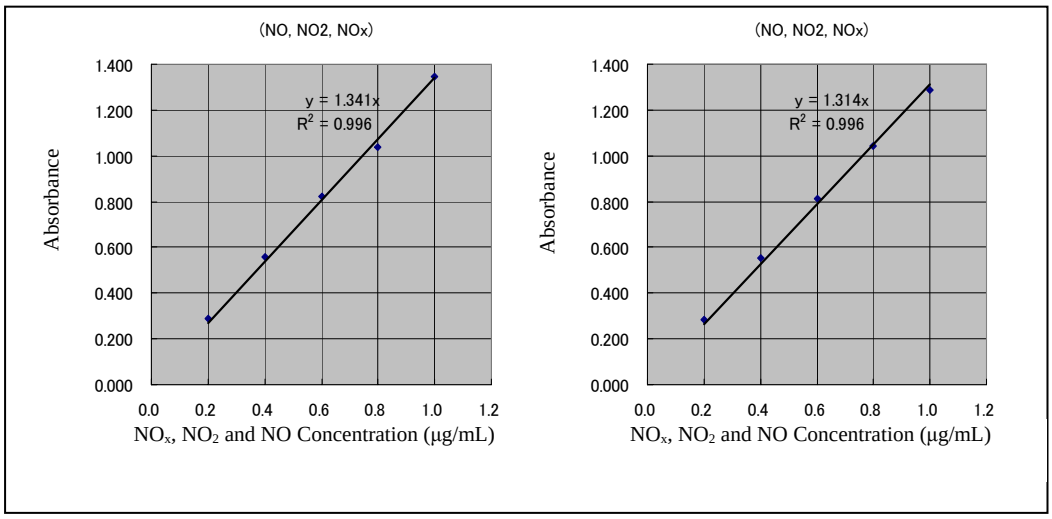
Cmax Point (m) ≒ He (m) × 10

※ Cmax point and Cmax changes greatly depending on the meteorological condition.

(4) QA/QC Activities

The Quality Assurance and Quality Control (QA/QC) of air quality analysis should considered for weighing standard substances, preparing standard solutions, and drawing calibration curves in

accordance with SOPs. Each C/P drew a calibration curve and compared its result each other to check level of QA/QC. The figure below shows an example of calibration curve drawn by C/Ps.



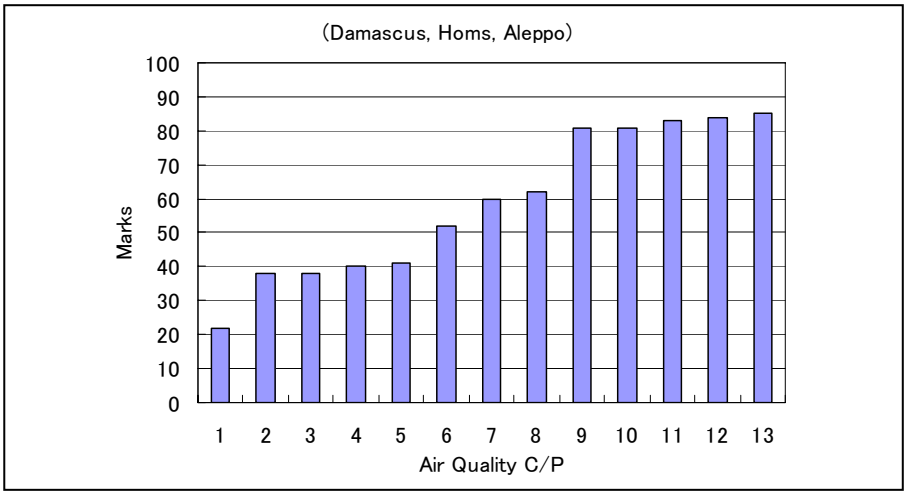
Calibration Curve prepared by C/Ps of Damascus and Aleppo DFEAs

(5) Results of Training Activities

1) Skill Level of C/Ps in charge for Air Quality Analysis

The followings are the current skill and knowledge level of C/Ps trained by the JICA Expert Team such as environmental and emission standard, sampling and analysis method, calibration, calculation of concentration, conversion ppm to mg/l, and so on.

a) Majority of scores fall into two ranges; more than 80 and nearly less than 40.
b) Trainees with high score were active in the training.
c) Assigning part-time or partial role for C/Ps in air quality analysis is not effective.



Skill Level of C/Ps of Air Quality Analysis

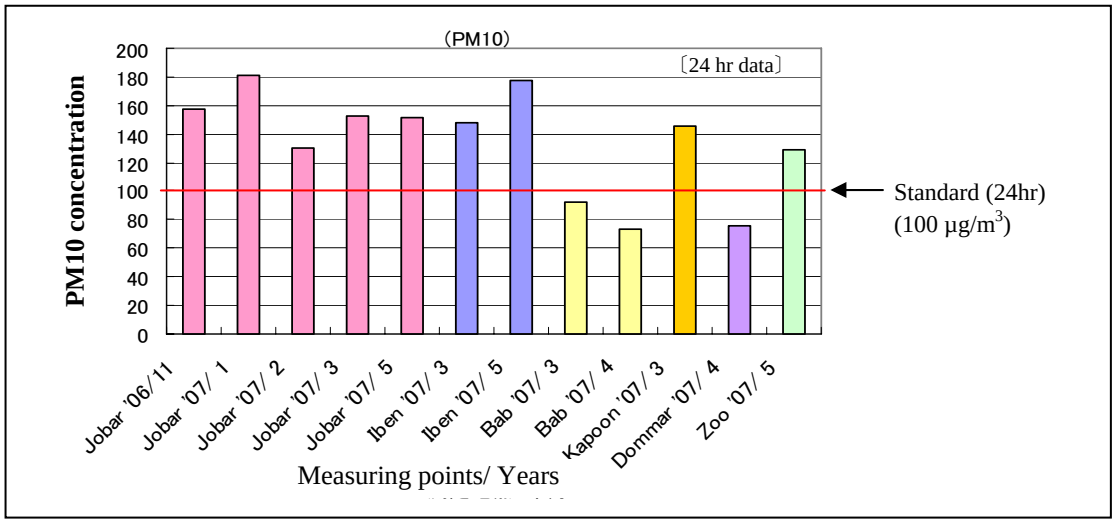
2) Investigation results carried out by C/Ps

The figures below show the investigation results carried out by C/Ps of the Damascus, Homs and Aleppo DFEAs.

a) Damascus DFEA

Suspended Particulate Matter (PM10)

Values of PM10 often exceed the PM10 environmental quality standard of 24-hour value as shown in the figure below. This could be serious and needs more attention, especially for its influence on human health through long-term exposure.

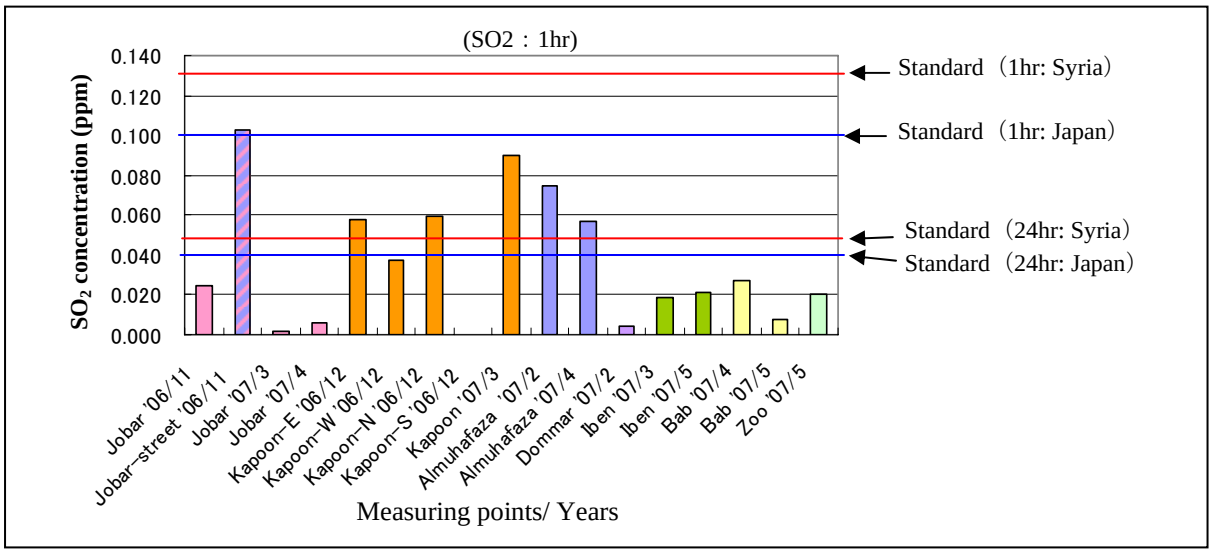


PM10 Result of Damascus DFEA

Sulfur dioxide (SO_2)

Even though a sampling duration is usually one hour, the JICA Expert Team believes that the priority should be given to the comparison with the environmental quality standard value of 24 hours. The reason is that the establishment of 1-hour environmental standard value is the highest value among 24 hours continuous measurement readings. In other words, the comparison with 1-hour environmental standard value is dangerous. Therefore, it is for the environmental safety consideration to compare with the 24-hour environmental standard value since it is lower than that of the 1-hour value.

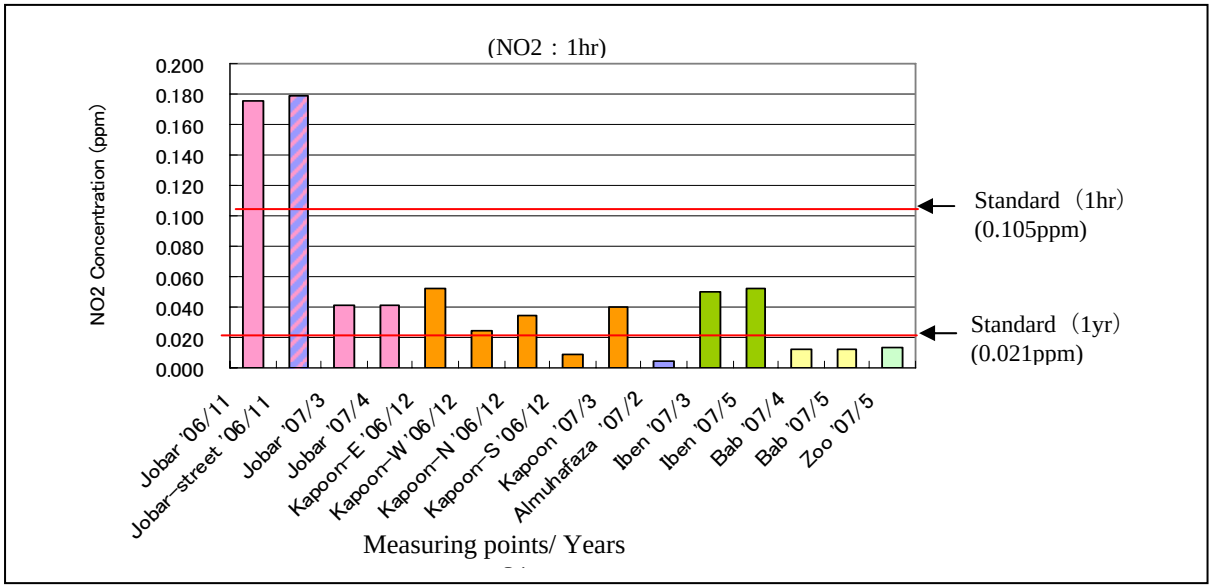
In general, SO_2 environmental standard of one-hour value is set to avoid acute damage to human health, noting that its measurement results are within the acceptable level. However, it should be noted that the monitoring results often exceed SO_2 environmental standard of 24-hour value which indicates chronic damage.



SO_2 Result of Damascus DFEA

Nitrogen dioxide (NO_2)

The monitoring results mostly comply with the NO_2 standard of one-hour value except for the Jobar area. However, many monitoring stations show exceeding results of the NO_2 standard of one-year value. Since NO_2 could affect human health by mid/ long-term exposure, special attention would be required on the actual annual mean value. In this context, it is recommendable to set up a new NO_2 standard of 24-hour value. The environmental quality standard in Japan (value for 24 hours): In the range 0.04 - 0.06 or less.

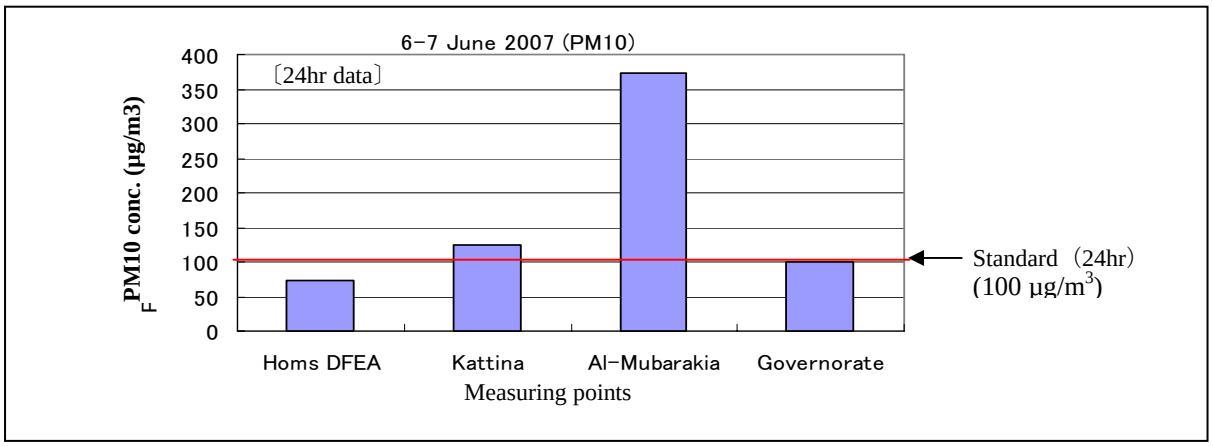


NO_2 Result of Damascus DFEA

b) Homs DFEA

Suspended Particulate Matters (PM10)

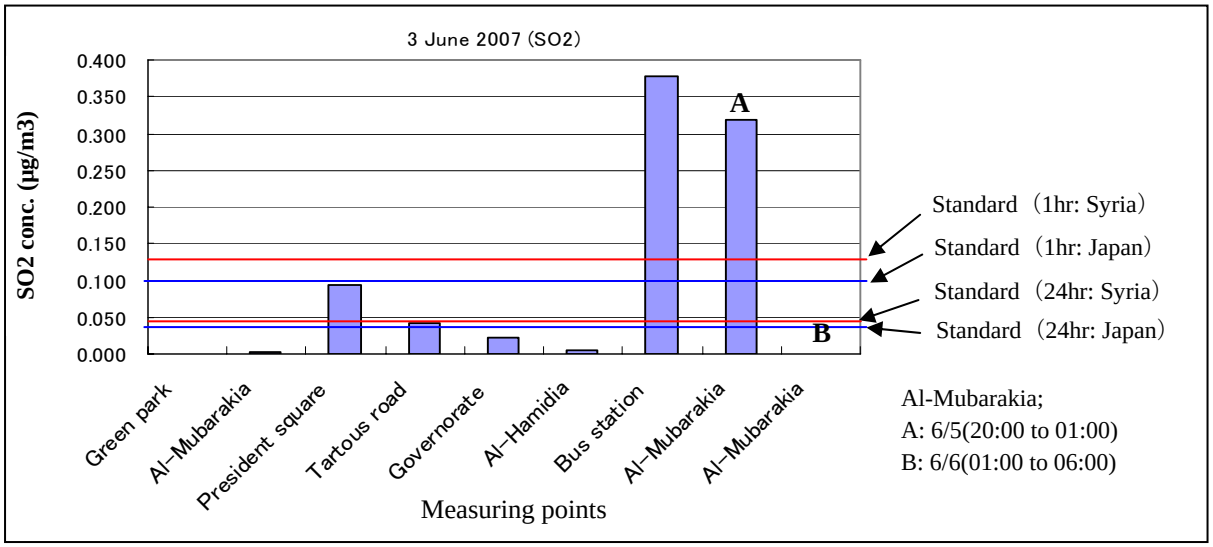
The results of Al-Mubarakia and Kattina villages could be remarkable under the influence of the fertilizer factory located nearby the monitoring stations.



PM10 Result of Homs DFEA

Sulfur dioxide (SO_2)

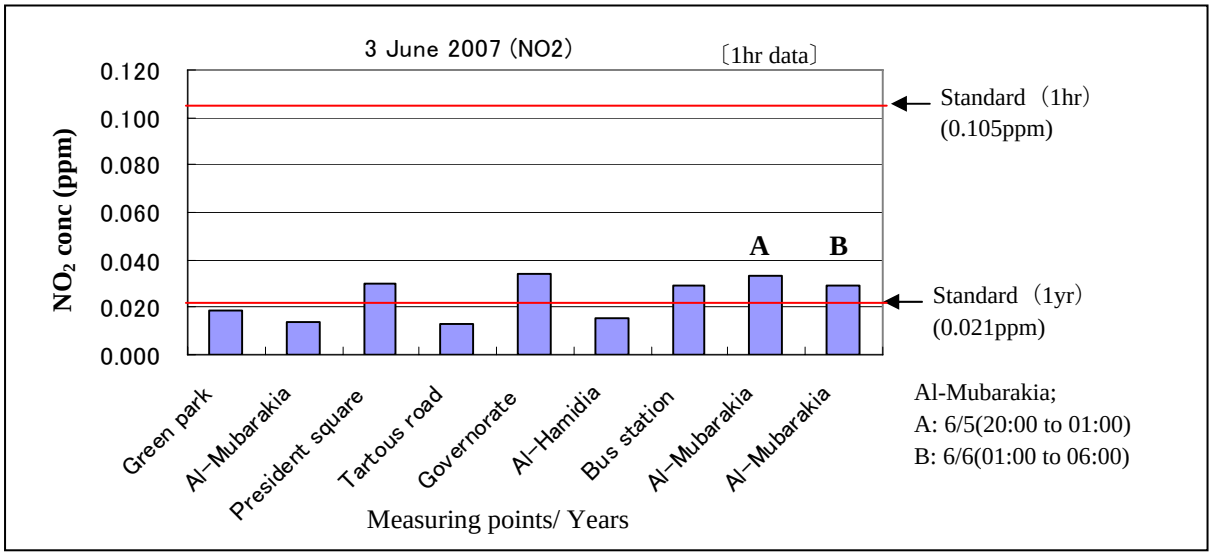
The figure shown below reveals very high concentration of SO_2 and fairly exceeds the SO_2 standard of one-hour value especially in the Bus station and Al-Mubarakia village. This also suggested some influence from the fertilizer factory. In this figure, "B-point" represents a background concentration of PM10 with no influence. Therefore, it must be a great concern on the health damage of citizens living near the factory.



SO_2 Result of Homs DFEA

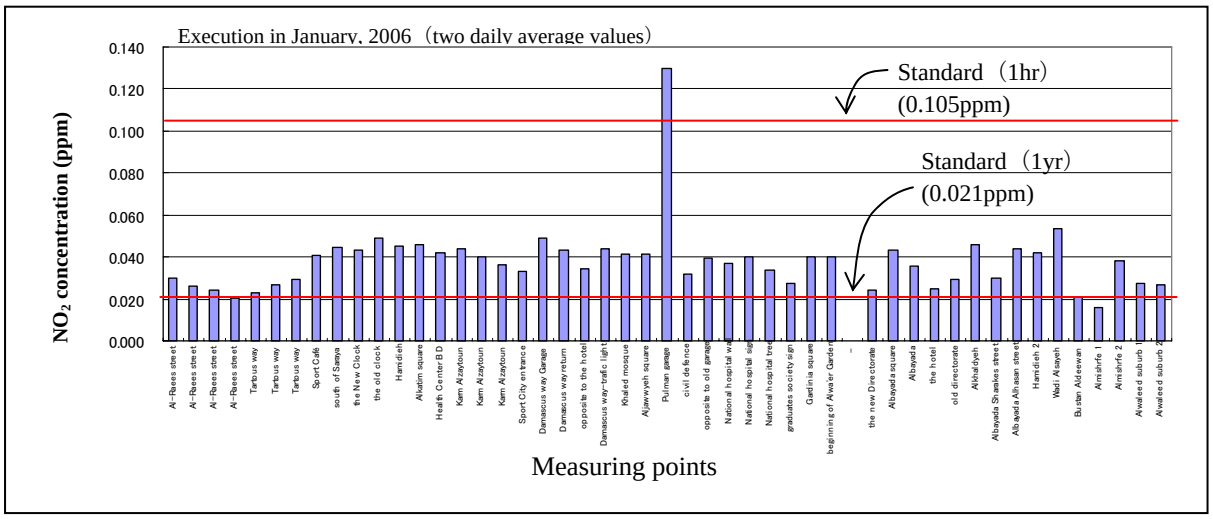
Nitrogen dioxide (NO_2)

It is believed that NO_2 concentration in "bus station" and Al-Mubarakia (A)" is not correct because of the influence of SO_2 during the sampling, and this caused the color intensity of the absorption solution to decrease.



NO_2 Result of Homs DFEA

The figure below shows NO2 measured concentration obtained by the passive samples and at a large number of sampling points.



NO_2 Result of Homs DFEA by Passive Sampler

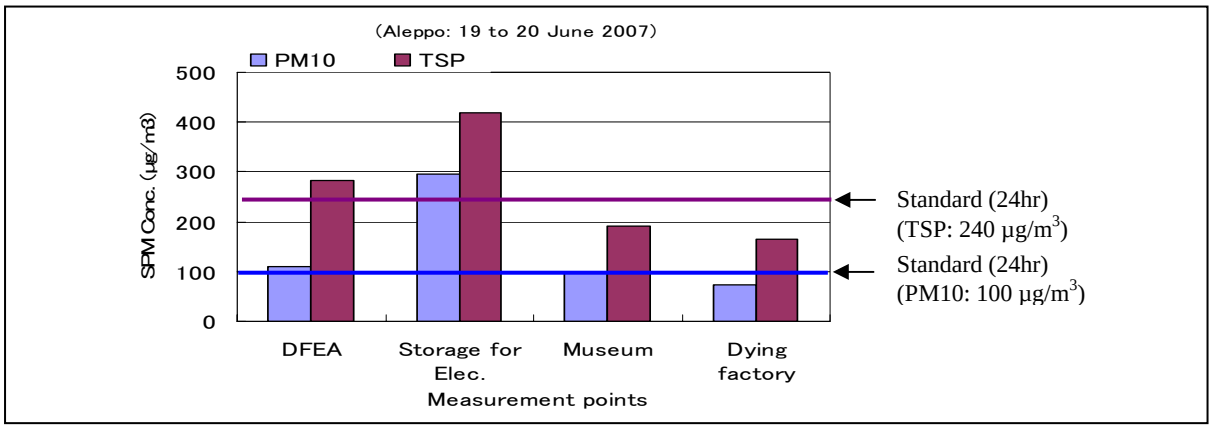
The real pollution situation based on the season, time zone, and the meteorological conditions, etc. becomes clear by continuous data accumulation. Thereafter, it will be possible to contribute to the

examination of appropriate correspondence strategies in the future.

c) Aleppo DFEA

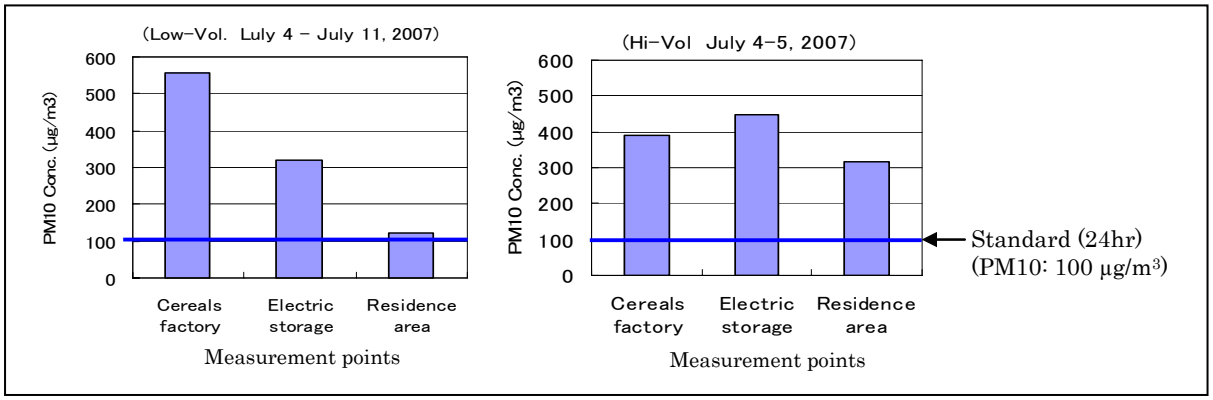
TSP and PM10

Concentrations of both TSP and PM10 exceeded the environmental quality standard. SPM concentration in the area around the cement factory is awfully high. The influence of the cement factory on this area has been under focus.



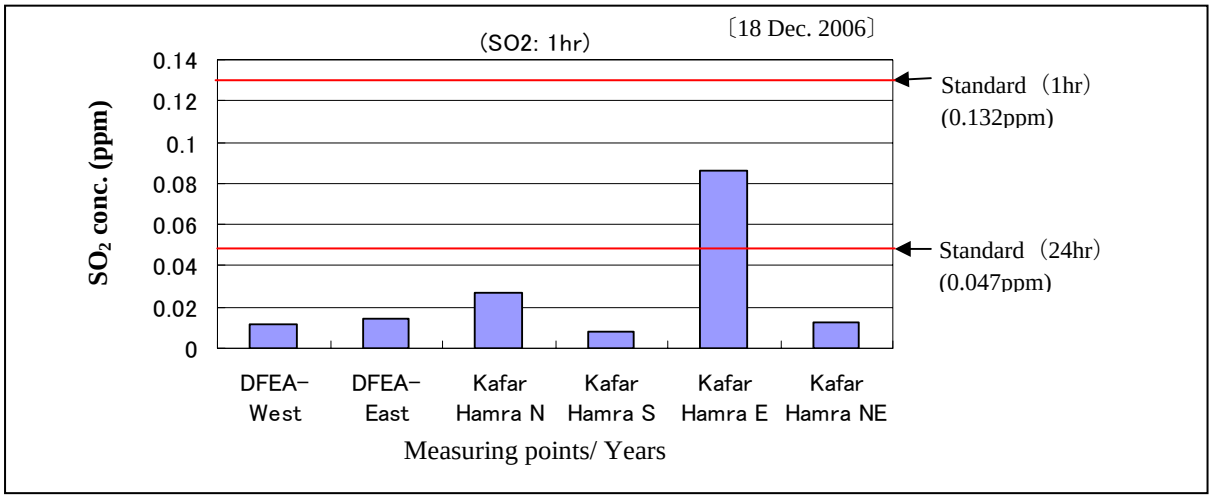
SPM Result of Aleppo DFEA

PM10 concentration in the area around the cement factory is shown in the figure below. This data is for 24 hours sampling with the Hi-Vol samplers, and for 7 days sampling with the Low-Vol samplers. PM10 has reached a very serious concentration level. Therefore, full-scale investigation in a wide area is indispensable.



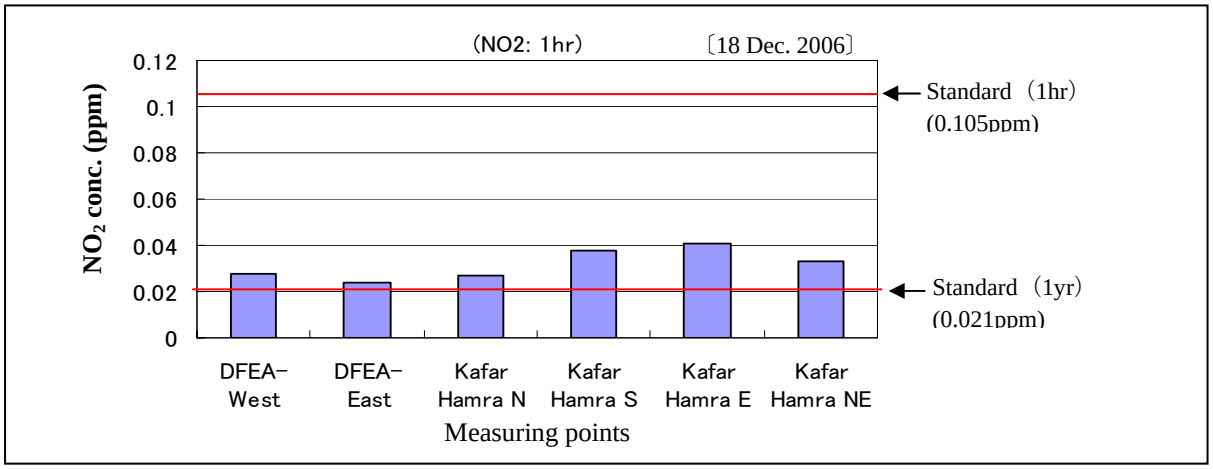
PM10 Result of Aleppo DFEA (around the Cement Factory)

Sulfur dioxide (SO_2)



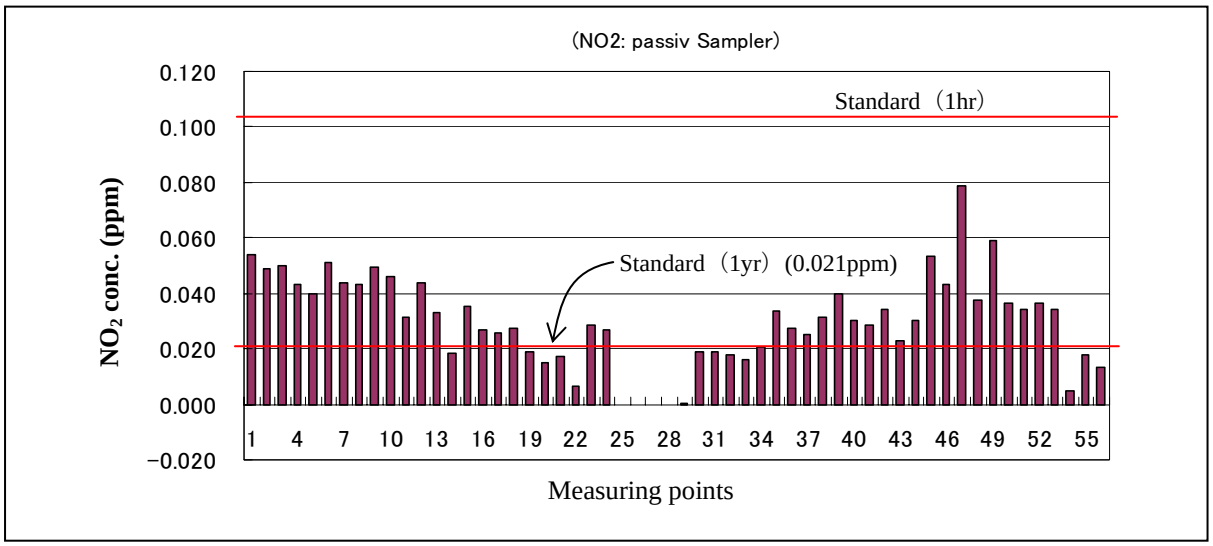
SO_2 Result of Aleppo DFEA

Nitrogen dioxide (NO_2)



NO_2 Result of Aleppo DFEA

The figure below shows NO_2 concentration obtained by the passive samplers at a large number of sampling points.



NO_2 Result of Aleppo DFEA by the Passive Sampler

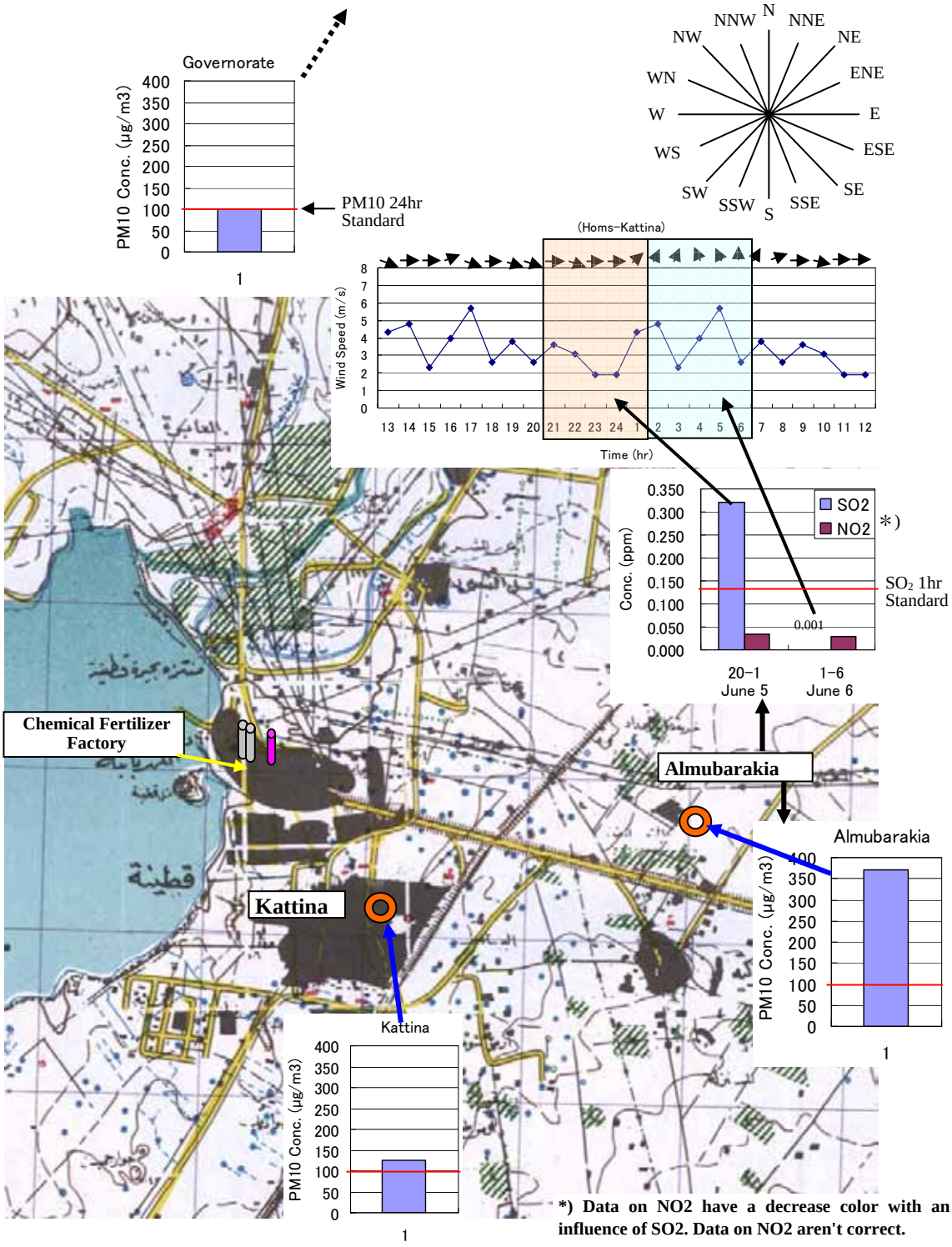
(6) Data Analysis and Interpretation

Since the data analysis and interpretation was the first experience for all C/Ps, the JICA Expert Team trained them jointly showing actual output images and guided how to calculate and arrange the data obtained by C/Ps in the course of training activities. Although almost all C/Ps are able to analyze samples and arrange the data chronologically and horizontally by monitoring station base, it is still difficult to understand dispersion of pollutants, relation between pollution source and monitoring station, consideration with meteorological conditions. These kind of data interpretation is normally required a lot of practices and long term training and experience, so this is the future task for C/Ps in charge for air quality analysis. The following outputs are the results of provisional case study conducted by C/Ps in the Homs and Aleppo DFEAs supported by the JICA Expert Team.

1) Homs DFEA

Distribution of PM10 and SO2 concentrations around the fertilizer factory

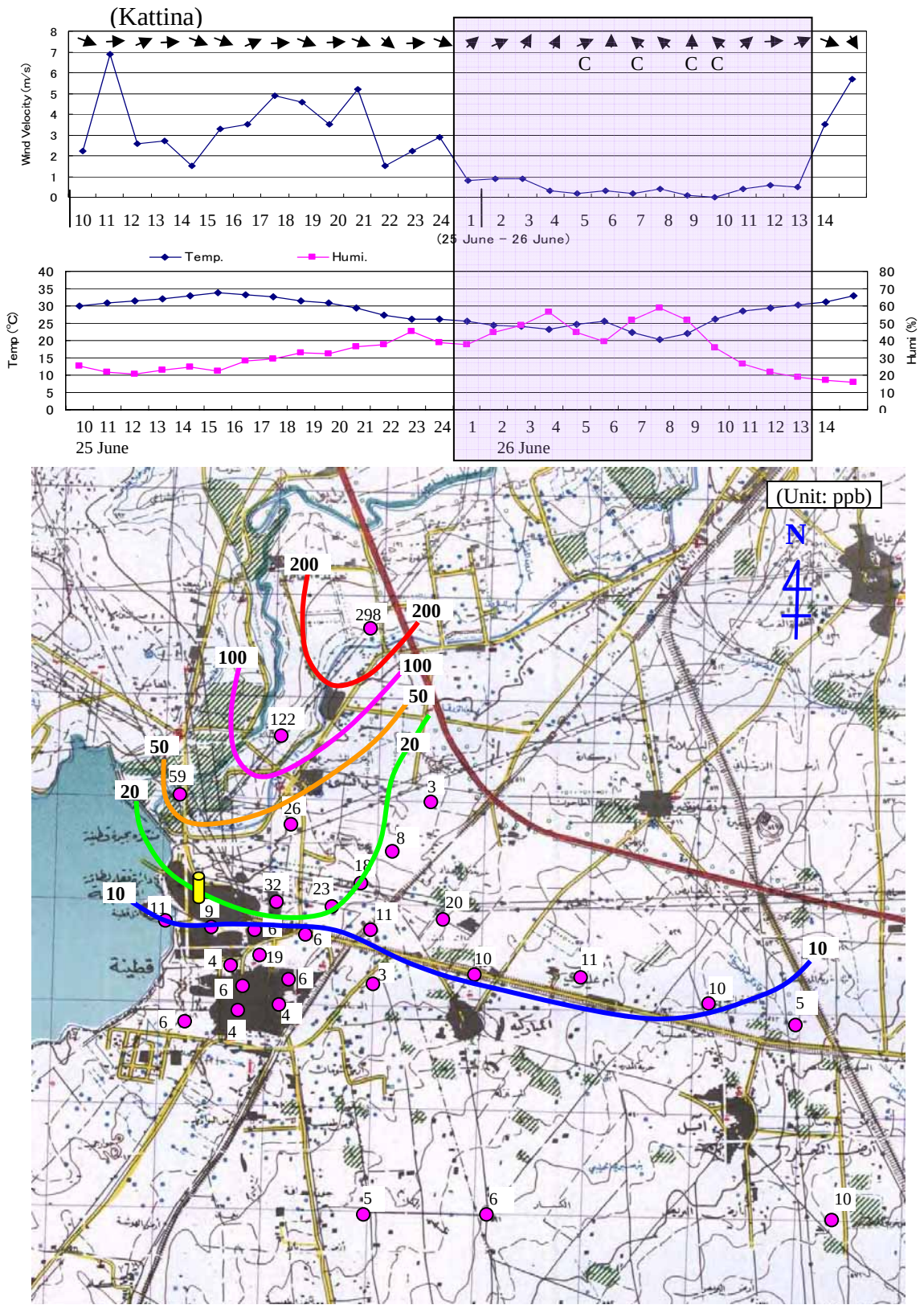
There is a clear relation between SO_2 concentration and the wind direction. At night time, Al-Mubarakia village is affected by the factory because of the west prevailing wind. The PM10 concentration also shows the highest concentration in Al-Mubarakia villages strongly affected by the weather condition.



PM10 and SO_2 Result around the Chemical Fertilizer Factory

NO_2 concentration distribution over a wide area

Considering the weather conditions, some impact on surrounding area could be found by discharged NO2 from the factory when wind velocity is slow.



NO_2 Value Contour Map of Industrial and Residential Area in Homs

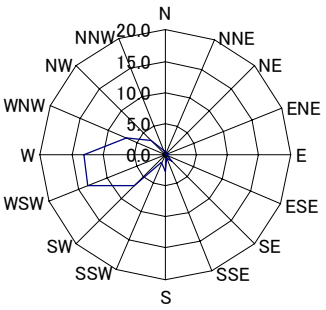
2) Aleppo DFEA

Distribution of Monitoring Values of PM10 around the Cement Factory

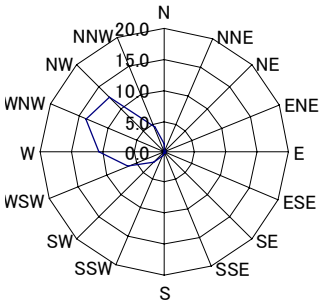
Figure in next page shows the distribution of PM10 concentration around the cement factory along with the weather conditions based on the observation data. The concentration in the Electric Storage area located in leeward is very high with a value exceeds 400 μg/m^3. Even in the residential area, the concentration resulted from 24 hours sampling is high, about 300 μg/m^3.

Aleppo: June 1-18, 2007

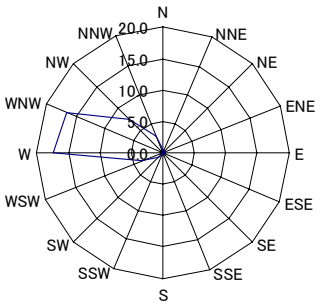
South Side
(Waste water treatment station)



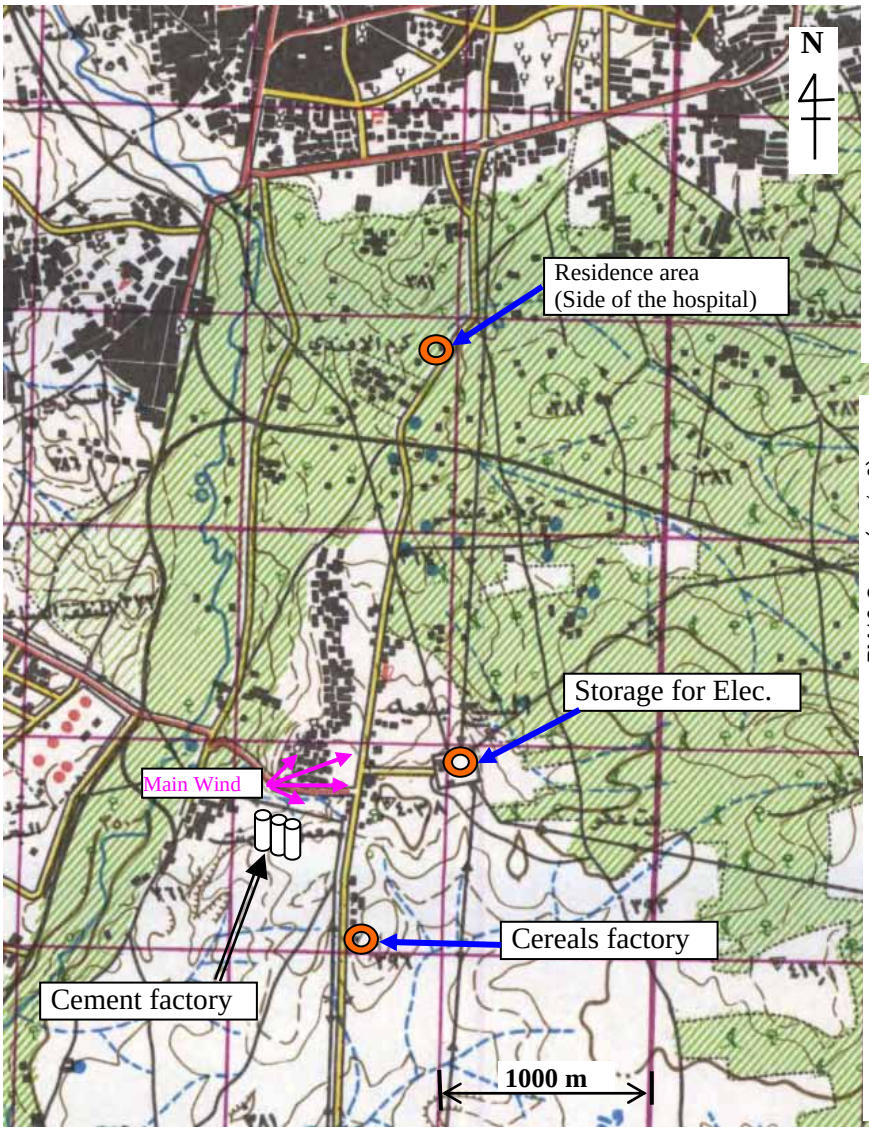
Downtown
(Archeological museum)

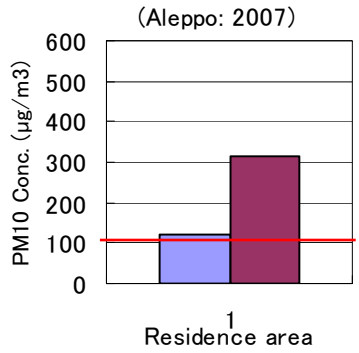


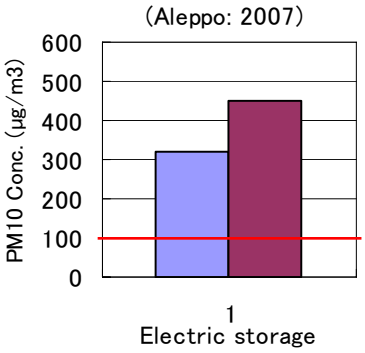
North Side
(Dying factory)

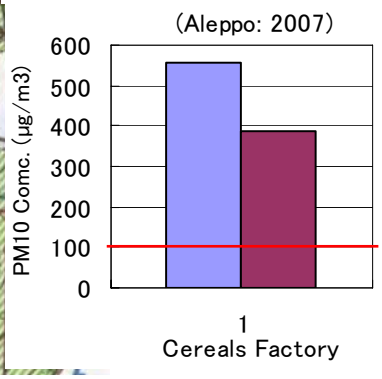


(Neighborhood of the Cement Factory)







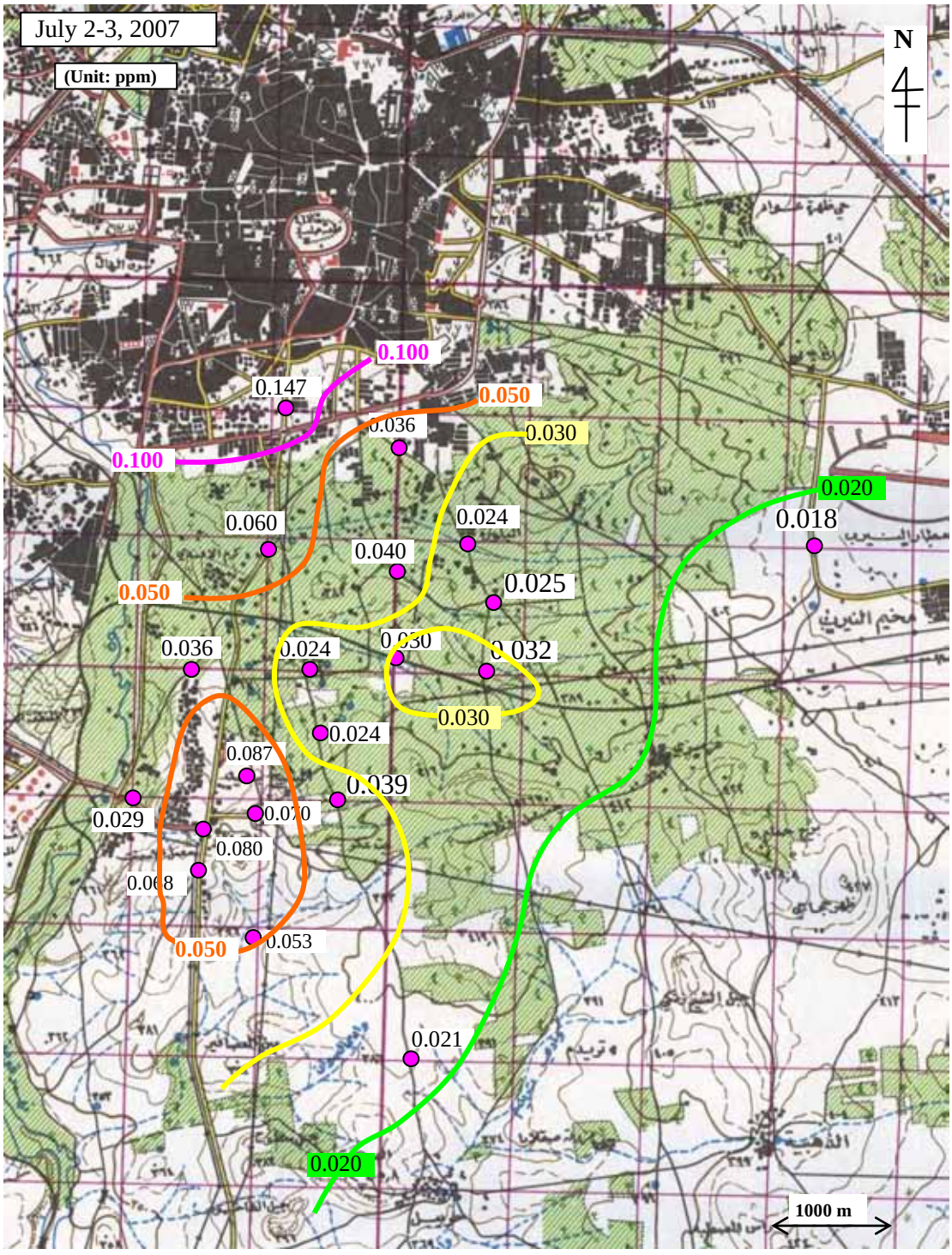


: Low-Vol (July 4 –11, 2007) Hi-Vol (July 4 – 5, 2007) Environmental Standard

PM10 Result around the Cement Factory

NO_2 concentration distribution over a wide area

The Figure below shows the distribution of NO_2 value in the suburban area of Aleppo City. The fuel oil combustion facilities could be considered as the main source of NO_2 emission in addition to the mobile sources.



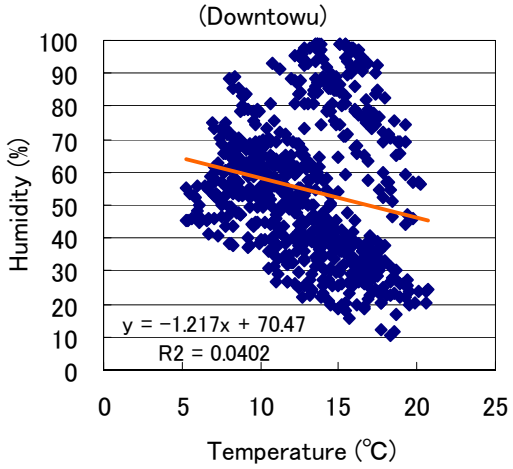
NO_2 Value Contour Map in Suburban Area of Aleppo City

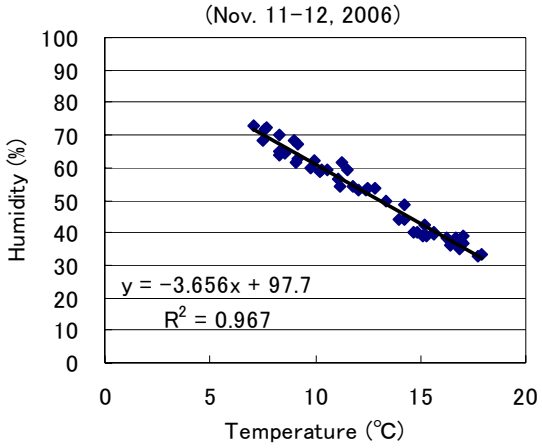
3) Correlation Analysis

i) Temperature - Humidity (data of November 2006)

The relation between temperature and humidity is illustrated in the figures below which indicate measurement of a complete month (24 readings a day for 30 days). The left figure shows slight reverse ration or no relation between atmospheric temperature and humidity. However, after removing data in irregular days such as cloudy and rainy days, it shows clear negative relation between them as the right figure.

Relation between Temperature and Humidity





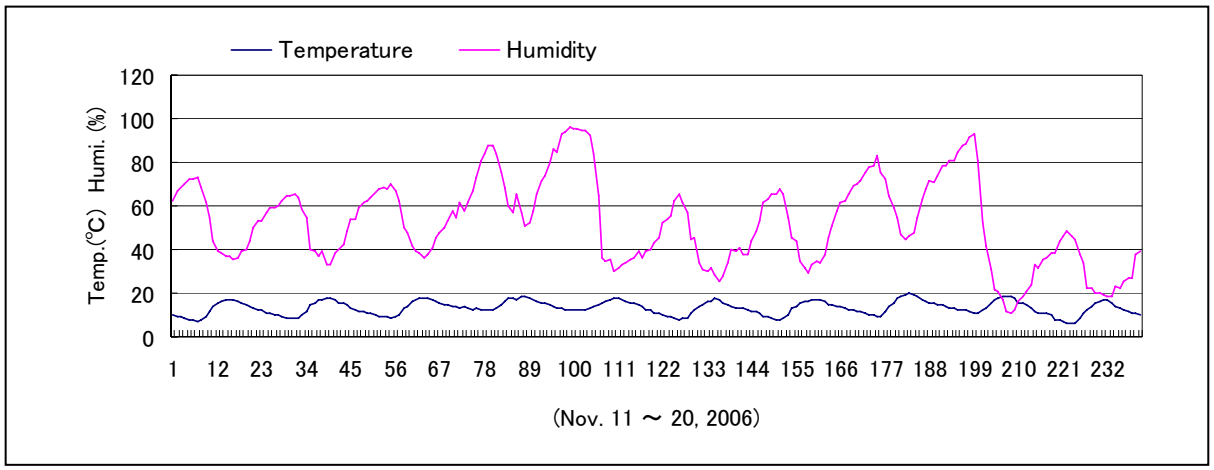
Hourly Relations between Temperature and Humidity in Downtown Area of Aleppo City

(Data: November 2006)

Time	Mathematical relation	R^2	R	Time	Mathematical relation	R^2	R
1	y = 5.990x - 5.17	0.596	0.772	13	Y = -0.0266x + 34.0	0.0000	0.000
2	y = 5.598x + 3.38	0.631	0.794	14	Y = -1.178x + 58.4	0.016	0.126
3	y = 5.460x + 10.6	0.724	0.851	15	Y = -3.572x + 99.0	0.143	0.378
4	y = 5.176x + 17.4	0.735	0.857	16	Y = -3.577x + 99.3	0.148	0.385
5	y = 5.048x + 23.1	0.786	0.887	17	Y = -1.531x + 64.8	0.021	0.145
6	y = 4.844x + 26.9	0.715	0.846	18	Y = 0.406x + 38.2	0.0013	0.036
7	y = 5.040x + 27.5	0.733	0.856	19	Y = 1.988x + 18.1	0.029	0.170
8	y = 5.183x + 22.2	0.859	**0.927**	20	Y = 4.441x - 11.6	0.130	0.361
9	y = 5.368x + 4.98	0.745	0.863	21	Y = 6.176x - 29.7	0.289	0.538
10	y = 4.798x - 6.42	0.508	0.713	22	Y = 6.550x - 28.5	0.374	0.612
11	y = 3.084x + 3.36	0.127	0.356	23	Y = 6.191x - 19.1	0.374	0.612
12	y = 1.766x + 14.5	0.051	0.226	24	Y = 7.703x - 29.6	0.622	0.789
All data: y = -1.217x + 70.47 (R= 0.200)							

R^2: Determination coefficient R: Correlation coefficient

: R > 0.8 : R > 0.7 : Positive : Negative

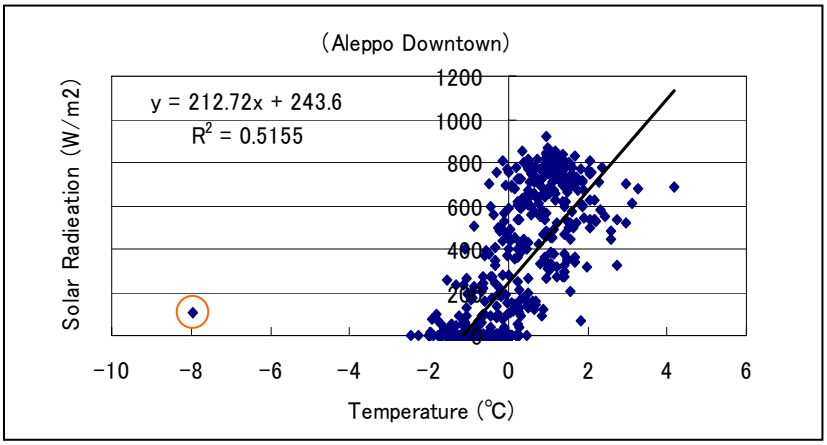


Hourly Change of Temperature and Humidity in Downtown Are of Aleppo City

ii) Temperature – Solar Radiation (data of September 2006)

The relation between temperature difference and solar radiation is shown in figure below. Temperature difference indicates the difference between the temperature readings of two successive hours as in the equation "Temp. Diff = Temp (at hour 2) - Temp (at hour 1)".

Normally, the relation between temperature difference and solar radiation is positive. In the figure, a circle marked shows drastic atmospheric temperature change, which is caused by the passage of a cold front. The drastic atmospheric temperature drop occurred in 25 September 2006 at 13:00. Therefore, staff in charge of air quality monitoring checked the weather conditions of the days such as 24, 25 and 26 September 2006.



Relation between Temperature and Solar Radiation

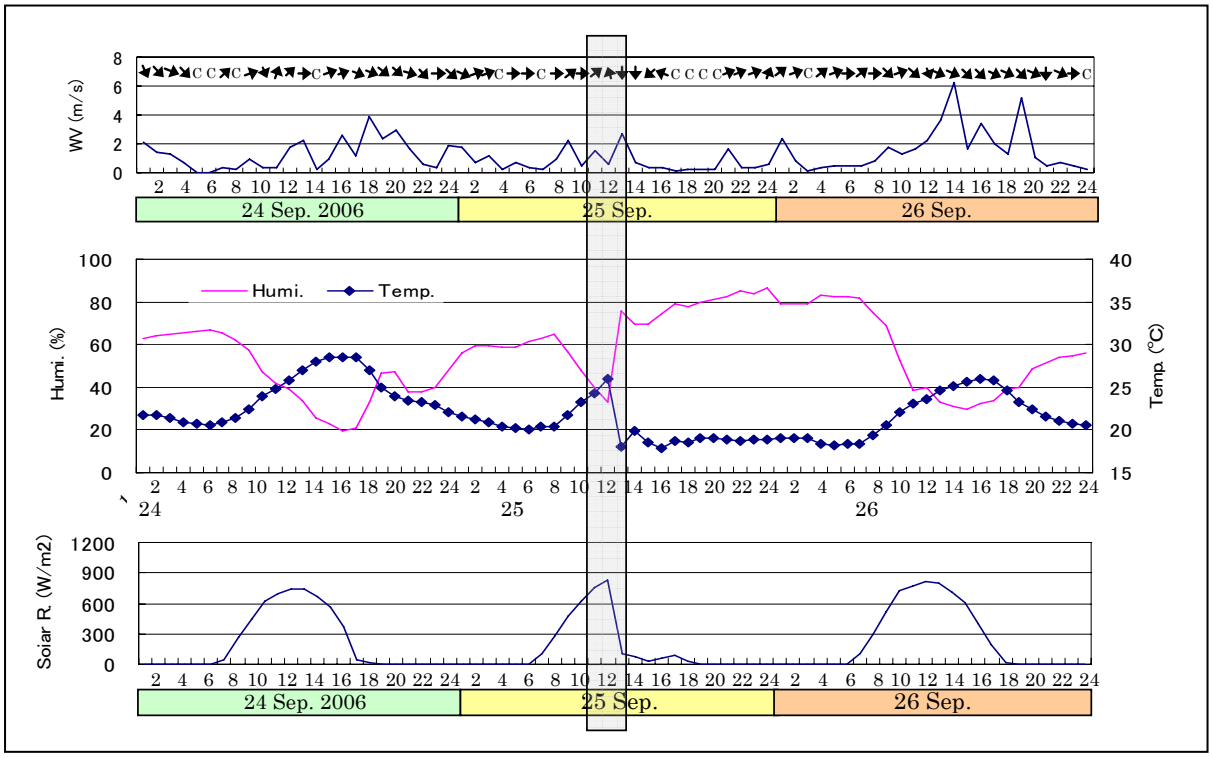
The figure below shows the weather conditions in the downtown area of Aleppo City for the three considered days and it revealed the following points:

- At 13:00 in 25 September, wind direction was from west to south then it changed to the north.

- Atmospheric temperature dropped accompanied with simultaneous humidity increase.

- Solar radiation is changed widely caused based on the weather from clear to cloudy.

- After 13:00, the wind velocity became slow being cloud in a stagnant condition. Under such conditions, there is a tendency that air quality concentration became high in the ground.

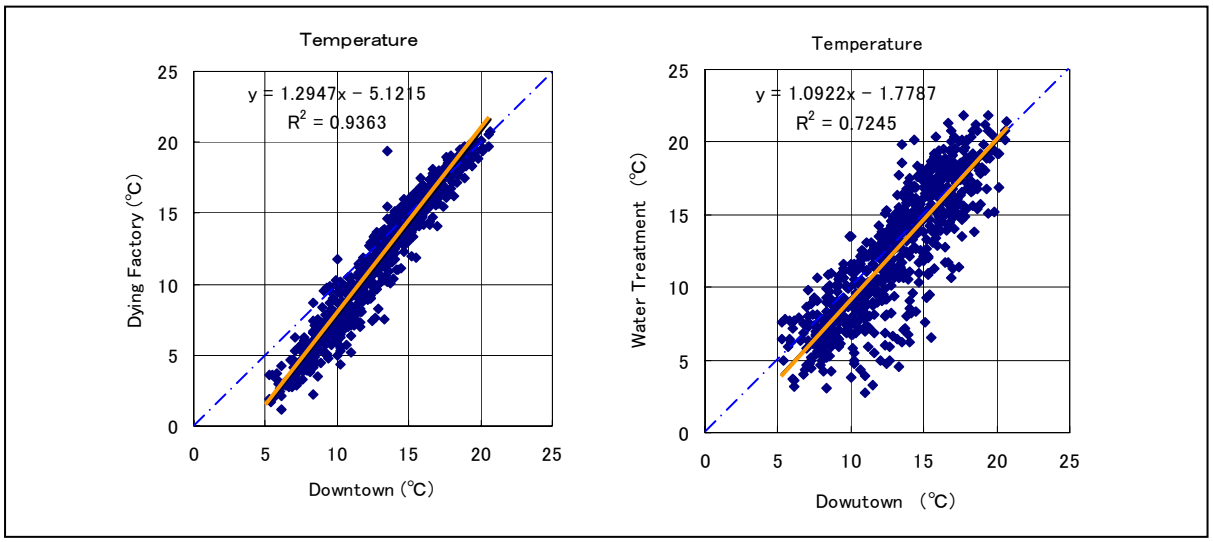


Weather Condition of Aleppo Downtown Station

iii) Correlation between locations

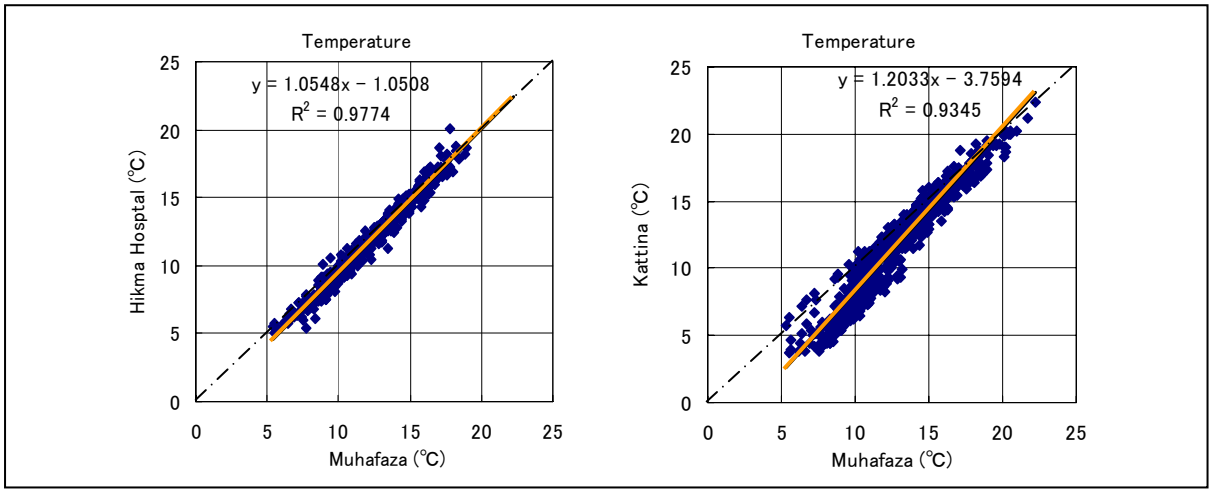
Temperature in Aleppo (Data of November 2006)

Data discrepancy differs from depending on measuring locations. The wastewater treatment station includes huge aeration facility having effect on the air temperature and humidity in accordance with the wind direction.



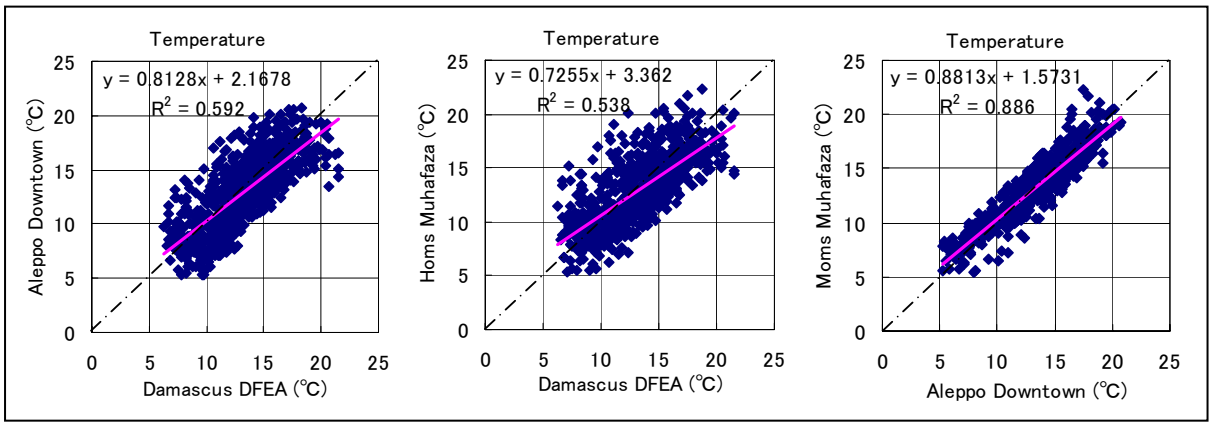
Temperature in Homs (Data of November 2006)

There is a strong interrelation between Muhafaza and Hikma Hospital.



Temperature comparison between Homs and Aleppo (Data of November 2006)

Data of November 2006 shows a strong interrelation between Aleppo Downtown and Homs Muhafaza.



(7) Environmental Impact Assessment (EIA) and Scope of Regional Investigation

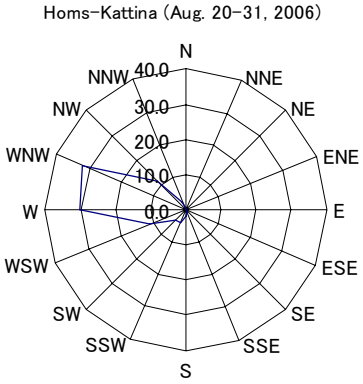
Homs is dominated by west wind, still various wind directions emerge but east wind does not. In the seasonally short term investigation, the area subjected to investigation can be narrowed as can be understood form the Wind Rose. By assuming a factory with a stack of 80 ~ 90 m in height, the estimated effective stack height is 120 m depending on the discharge gases temperature and flux. In this case, the maximum concentration above the ground (Cmax) occurs within a range of 10 km from pollution source for all air stability classes A ~ D, and Cmax value falls generally in the range 0.020 ~ 0.200 ppm depending on the atmospheric stability classes.

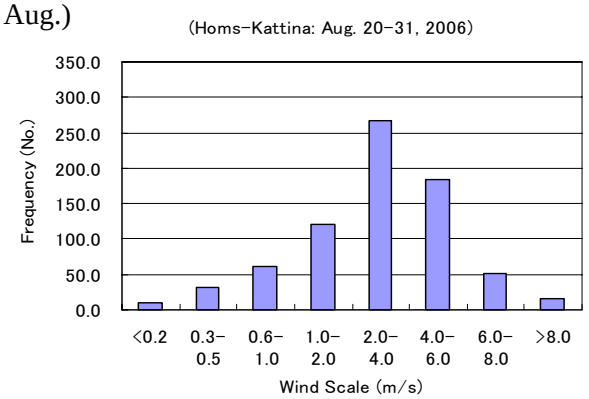
The maximum concentration at 10 km from the source of pollution has the general value of 0.020 ppm for all classes of atmospheric stability. Depending on the weather conditions, a serious impact is possible on the area which extends within 5 km from the smoke source. The height of a factory stack is one of the countermeasure methods for greatly eliminating the environmental impact of that factory on its vicinity.

1) Meteorological analysis and evaluation

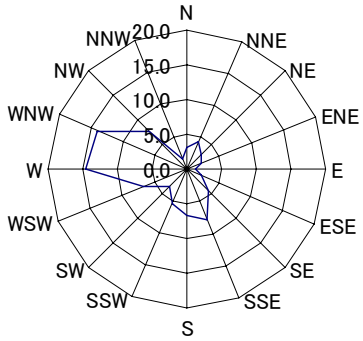
The regional weather condition is very important for predicting air quality concentration. The meteorological data of Kattina village in Homs for the period from August 2006 to June 2007 are evaluated to determine the weather characteristics of Homs region. Next figure shows wind rose and frequency of wind velocity.

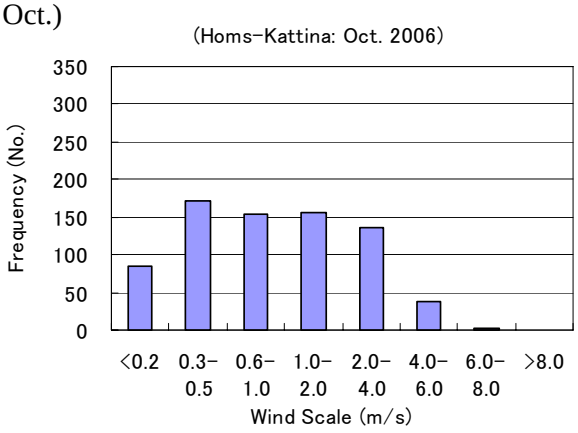
(Summer: Aug.)



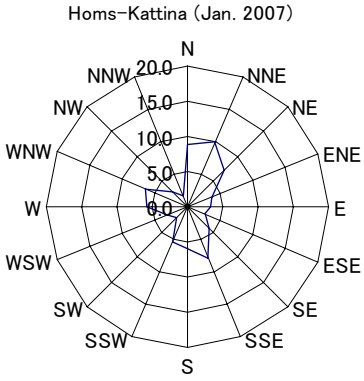


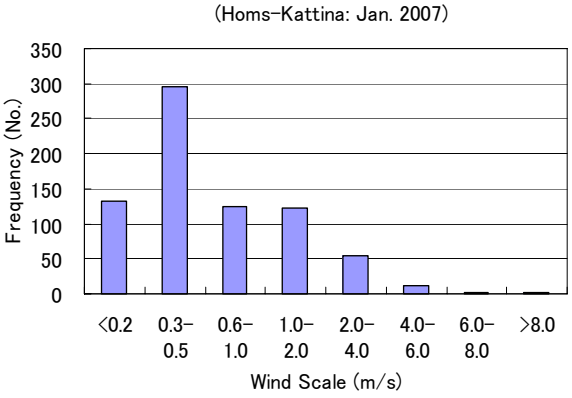
(Autumn: Oct.)



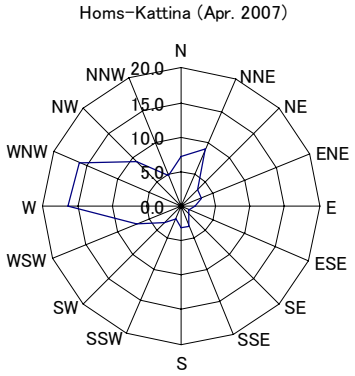


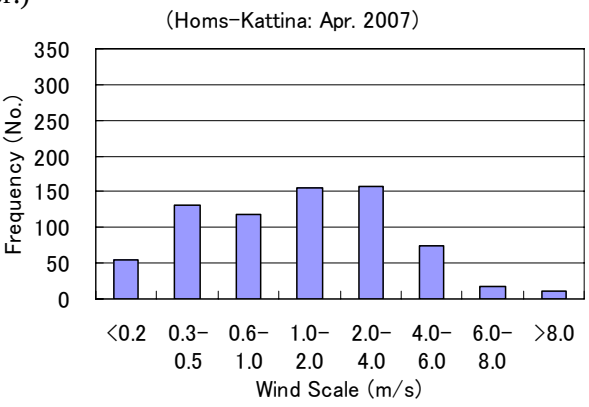
(Winter: Jan.)





(Spring: Apr.)





Wind Rose

Frequency of the wind velocity

2) Atmospheric dispersion model (plume type)

In the prediction of the concentration of the air pollutants that are discharged from the pollution sources, plume equation of air dispersion is generally used.

Point source dispersion formula (when wind is blowing)

$$C = \frac{Q}{2\pi \cdot \sigma_y \cdot \sigma_z \cdot U} \exp\left\{-\frac{y^2}{2\sigma_y^2}\right\} \cdot \left[\exp\left\{-\frac{(He - z)^2}{2\sigma_z^2}\right\} + \exp\left\{-\frac{(He^2 + z)}{2\sigma_z^2}\right\}\right]$$

Where,

C: Concentration at the forecast point (m^3/m^3)

y and z: Distances of the horizontal direction (y) and the vertical direction (z) from the point stationary source (stack) to the forecast point (m). (z is the distance from the ground surface to the pollutant sampling point. It is usually set at 1.5 m; the level of human breathing of air).

Q: Considered pollutant flux in the stationary pollution source ($m^3_{NO_x}/s$).

U: Wind velocity (m/s)

(The direction of leeward is assumed to be the direction x).

(By definition: Leeward is the direction in which the wind is blowing).

(By definition: Windward is the direction from which the wind is coming).

He: Effective stack height (m)

σy: Dispersion width along the horizontal direction (y), (m).

σz: Dispersion width along the vertical direction (z), (m).

Setup Condition of the Atmosphere Dispersion Calculation

NO_x Concentration in the exhaust gases		ppm	2000
Exhaust gas flux (total)		m^3/s	12.56
Considered pollutant flux (Q_{NO_x})		m^3/s	0.02512
Atmospheric stability class (A - G) and the setup of the wind velocity (U)	A	m/s	2.0
	B	m/s	2.0
	C	m/s	3.0
	D	m/s	4.0
	E (Night)	m/s	3.0
	F (Night)	m/s	2.0
	G (Night)	m/s	1.0

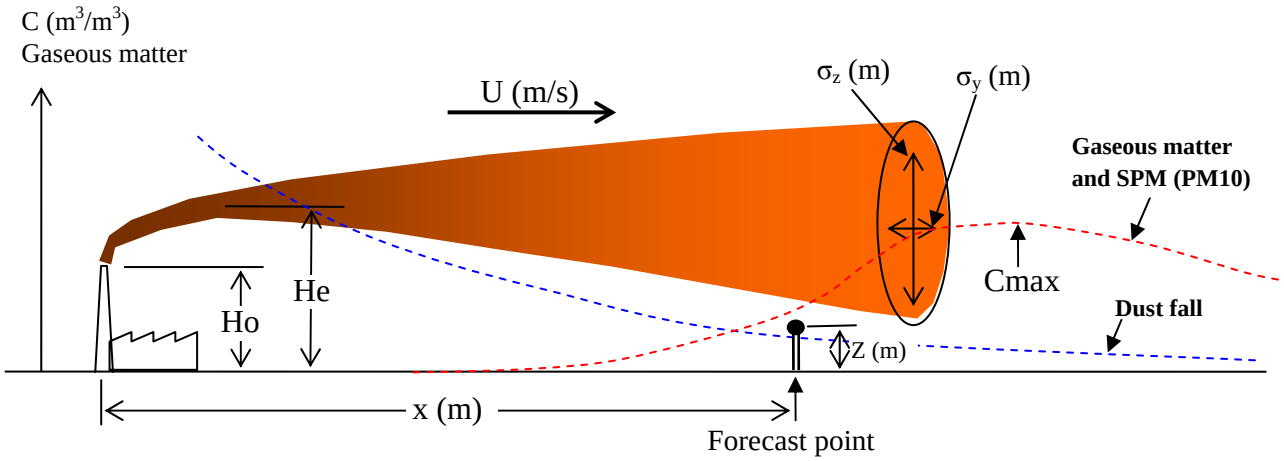


Image of the Atmospheric Dispersion Model

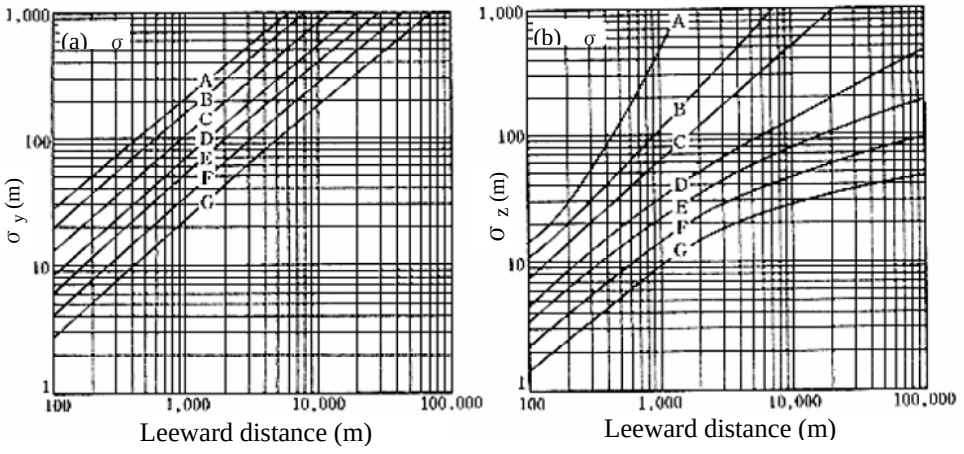
The next table illustrates the classification of Pasquill atmospheric stability classes. Class "A" indicates extremely unstable ambient air, and thus its dispersion is fast. On the other hand, class "G" indicates extremely stable ambient air, and thus its dispersion is very slow.

Pasquill Atmospheric Stability Classes Classification

Wind velocity (m/s)	Solar radiation (kW/m^2)				Net radiation (radiation reflected from the earth into the sky during night time. (kW/m^2)		
	0.60 ~	0.30 ~ 0.60	0.15 ~ 0.30	~ 0.15	-0.020 ~	-0.040 ~ -0.020	~ -0.040
~ 2	A	A - B	B	D	D	G	G
2 ~ 3	A - B	B	C	D	D	E	F
3 ~ 4	B	B - C	C	D	D	D	E
4 ~ 6	C	C - D	D	D	D	D	D
6 ~	C	D	D	D	D	D	D

Note: In addition to the above mentioned classification, there is a classification method that takes into account the cloudiness degree.

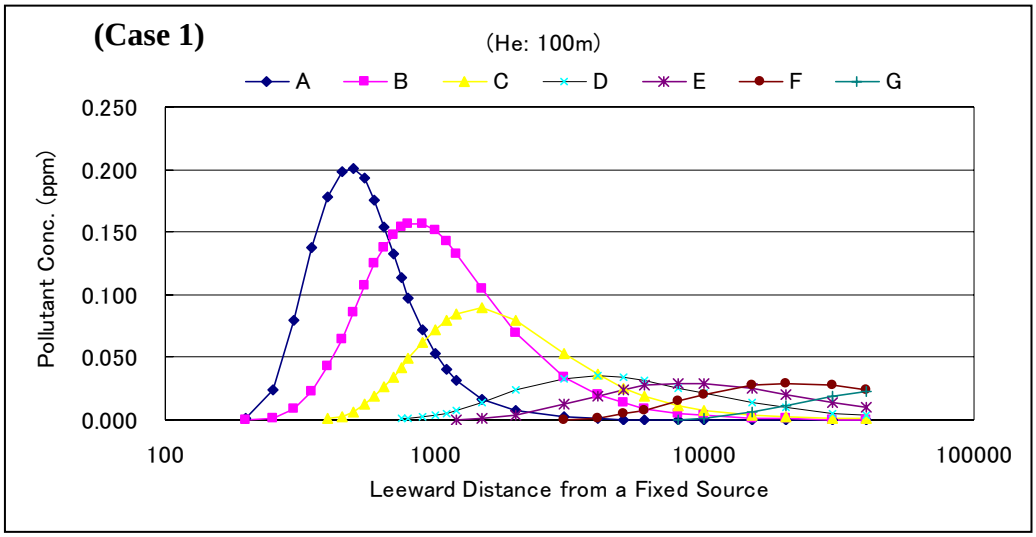
Regarding the classification of the atmospheric stability classes, the relation between the horizontal dispersion width (σy) and the vertical dispersion width (σz) with the distance of the pollution source is shown in the figure below.



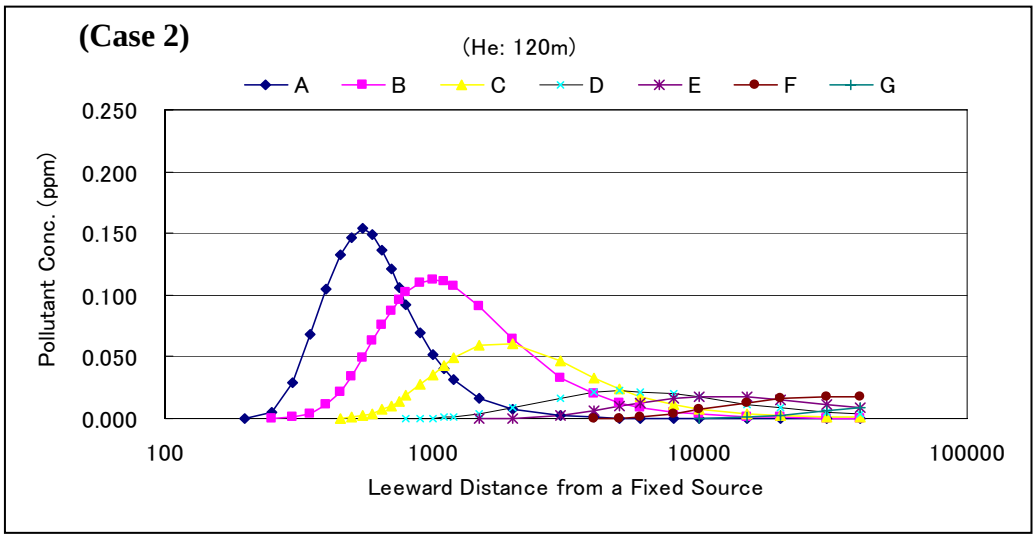
3) Pollutant concentration distribution in the leeward direction

The relation between a pollutant concentration in the main stream of the gaseous pollutants and the distance from the stationary source of pollution is shown in the figures below (each figure is obtained for a certain effective stack height (He) and all atmospheric stability classes). From these figures we can notice the followings:

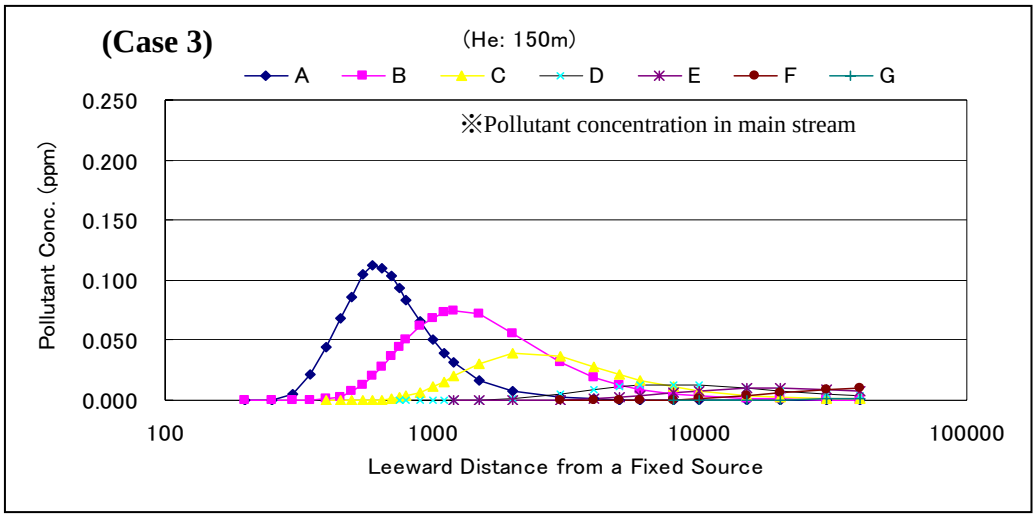
- Cmax concentration differs greatly in accordance with the weather conditions, i.e., atmospheric stability classes.
- High concentration values are generated when air is unstable.
- When the location of Cmax is at short distance form the pollution source, the concentration Cmax becomes high.
- The higher the effective stack height (He), the longer the distance of Cmax from the pollution source and the smaller the value of Cmax.



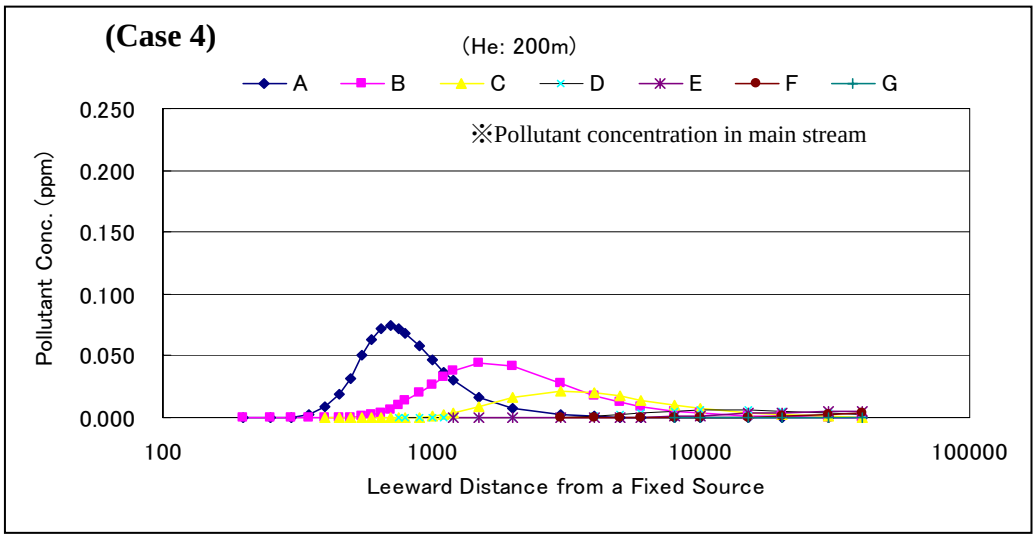
Relation between Concentration and Distance from the Stationary Source along with the Atmospheric Stability Classes (He: 100m)



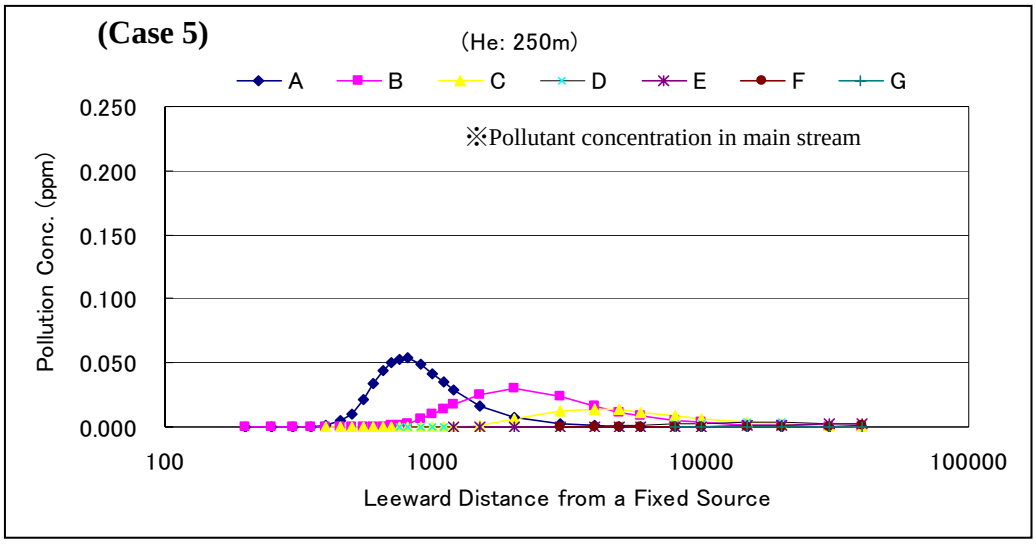
Relation between Concentration and Distance from the Stationary Source along with the Atmospheric Stability Classes (He: 120m)



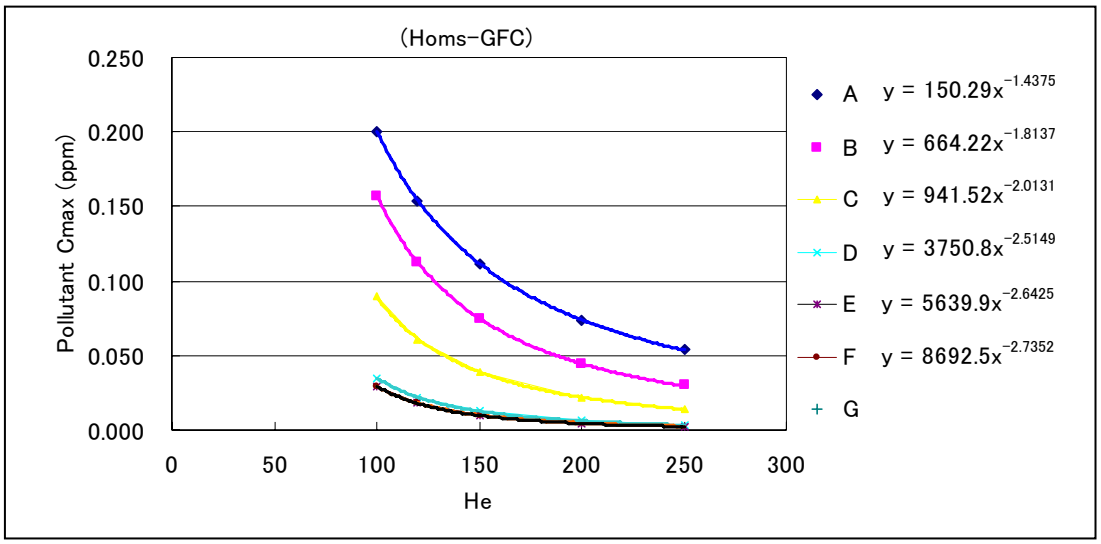
Relation between Concentration and the Distance from Stationary Source along with the Atmospheric Stability Classes (He: 150m)



Relation between Concentration and the Distance from Stationary Source along with the Atmospheric Stability Classes (He: 200m)



Relation between Concentration and Distance from the Stationary Source along with the Atmospheric Stability Classes (He: 250m)



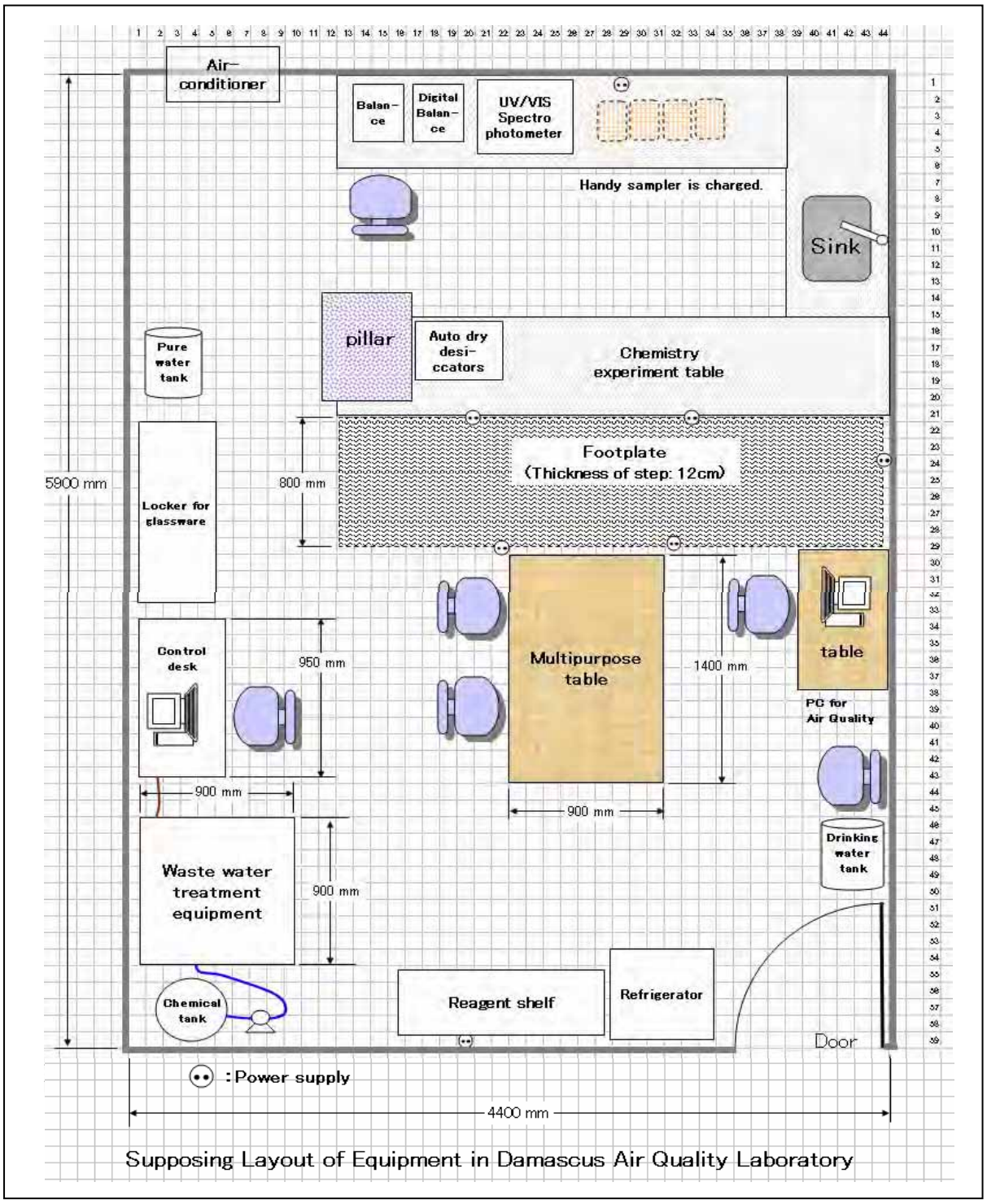
Relation between Cmax and Effective Stack Height (He)

for the Various Atmospheric Stability Classes

In case of pollution source with a high stack, the more unstable the ambient air is, the larger the impact of the concentration above the ground, as was mentioned above. Conversely, in case of pollution source with a short stack, the more stable the ambient air is, the larger the impact of the concentration above the ground. Therefore, it is necessary to consider this point.

(8) Suggestion for Layout Plan of Air Quality Laboratory in Damascus DFEA

In response to the request for Damascus DFEA related to a layout plan of the new air quality laboratory, the JICA Expert Team prepared and suggested the following draft layout plan in February 2007.



Proposed Layout of the Air Quality Analysis Laboratory

3.4.2 Products of Activities

(1) SOP

The SOPs of air quality analysis are completed as listed below, and the actual products are attached to Annex 1.

- (SOP)-01 Sampling and Concentration Calculation Procedure of Nitrogen Oxide (NOX)
- (SOP)-02 Sampling and Concentration Calculation Procedure of Sulfur Dioxide (SO2)
- (SOP)-03 Sampling and Concentration Calculation Procedure of Suspended Particulate Matters (PM10)
- (SOP)-04 Sampling and Concentration Calculation Procedure of Total Suspended Particulate Matters (TSP)
- (SOP)-05 Sampling and Concentration Calculation Procedure of Lead (Pb)
- (SOP)-06 Sampling and Concentration Calculation Procedure of Ozone (O3)
- (SOP)-07 Sampling and Concentration Calculation Procedure of Ammonia (NH3)
- (SOP)-08 Sampling and Concentration Calculation Procedure of Fluorine compounds
- (SOP)-09 Simple air sampler (passive sampler)
- (SOP)-10 Basis of the Air Quality Sampling Method

(2) O/M manual and basis of the chemical analysis

The O/M manuals of air quality analysis are completed as listed below, and the actual products are attached to Annex 2.1.

- (O/M Manual)-1 Basic Operation in Chemical Analysis
- (O/M Manual)-2 Tools and Materials Management
- (O/M Manual)-3-1 Maintenance record tables of glassware and Reagent for Damascus
- (O/M Manual)-3-2 Maintenance record tables of glassware and Reagent for Homs
- (O/M Manual)-3-3 Maintenance record tables of glassware and Reagent for Aleppo

(3) Documents for Lecture Training

The Recording Documents and Lecture Materials prepared by the JICA Expert Team are as follows, and the actual products are attached to Annex 2.2 and 2.3.

1) Recording Document

- Rec. Doc-1 Sampling and Analysis Record for Air Quality Analysis
- Rec. Doc-2 Monthly report of Meteorological observation data
- Rec. Doc-3 Variation of the Atmospheric Temperature and Wind Rose
- Rec. Doc-4 Sampling Record of Passive Sampler for Air Quality Analysis

2) Lecture Material

- Lec. for AQA-1 Monitoring Data and its Key Points
- Lec. for AQA-2 Making sampling paper filters
- Lec. for AQA-3 Proposal of the Determination Method for the Environmental Impact Assessment and the Scope of the Regional Investigation

3.5 Data Management

3.5.1 Training Activities

(1) Summary of Data Management training schedule

The target C/Ps are the staff of GCEA and 14 Defers in charge for data management of the Project. At first, the integrated training including data management was held on 5 to 15 June 2005 in Damascus. Subsequently, three times complete round instruction training to 14 DFEAs for data management of basic water quality was conducted in January, June to July 2006, and January to

February 2007. Furthermore, two times semi-round instruction training to 5 to 6 DFEAs for the Basic Water Quality, the Chemical and Biological Water Quality, and the Air Quality were conducted in July and November to December 2007 supplementarily.

(2) Basic Lecture Training in June 2005

A basic lecture training of environmental management and monitoring was held twice (1st round: 5 to 8 June 2005, 2nd round: 12 to 15 June 2005) with the same contents being targeted on C/Ps in charge of water quality analysis and data management in GCEA and DFEAs at Damascus. As for data management, the basic concept of data management, the recording format of Basic Water Quality, and an example of the environmental report in Japan as a goal were introduced on 8 and 15 June, 2005.

(3) Unified Recording Format

It is important to use a unified and common recording format (excel sheet) in DFEA in order to exchange data between GCEA and DFEA, and issue the monitoring report in both regional and national level. The recording formats of each component were introduced as following timing:

Recording Format and Prepared Timing

Component	Prepared in	Revised	Reference
Basic Water Quality	June 2005	Revised July 2007	As attached Annex 3.5
Chemical & Biological Water Quality 1	July 2007	-	As attached Annex 3.5
Chemical & Biological Water Quality 2	July 2007	-	As attached Annex 3.5
Heavy Metal	July 2007	-	As attached Annex 3.5
Combined Water Quality	July 2007	-	As attached Annex 3.5
Air Quality	July 2007	-	As attached Annex 3.5

As a result of several revisions, the Basic Water Quality, the Chemical and Biological Water Quality, and the Heavy Metal were combined as one excel sheet as a water quality sheet, but the Air Quality is separated in another independent sheet.

(4) Introduction of QA/QC (Basic Statistics)

1) Basic Statistics for QA/QC

The first round training to 14 DFEAs in January 2006 was focused on the data quality, namely Quality Assurance and Quality Control (QA/QC), and ISO/IEC 17025 was briefly introduced. The basic statistics such as standard deviation (σ), coefficient of variation (CV), and Gaussian distribution were explained and the concept of "traceability" was lectured. It seemed that most counterparts thought it was difficult to practice QA/QC in their daily works because QA/QC is new concepts to them. (as attached in Annex 4.5)

2) Detection Limit and Recording Digit

It is essential to understand how to deal with essential digits and decimal places by each parameter, how to input the data in case of under the estimated detection limits (EDL), how to input data in case of diluted sample, how to deal with digit after the decimal point. The JICA Expert Team

conducted lecture and OJT using their data on the computer in June and July 2006 for all DFEAs. Training program and detailed information about the estimated detection limits are as follows.

Training Program of Data Management

Program	Summary of Contents
(1) Data Management –Practical Lesson-	- Unified file naming rule - How to make data holder in computer - How to input data in a correct way - Signature of person in charge of data management - Print out and filling in the end of this year
(2) EDL and Recording Digit for Basic Water Quality Analysis	- Measuring range and the estimated detection limits - Data less than the estimated detection limits - Data exceed measuring range - How to input data taking account of dilution - Digit after the decimal point in final result
(3) OJT for Data Handling of the Record of Basic Water Quality Analysis in PC	- Renaming of existing file - Making data holder by type of sample water - Checking result in recording format taking account of the estimated detection limits and Max limits - Checking essential digits and decimal places of the result - Data evaluation taking account of Syrian standard of discharged water
(4) O/M record of Chemical Reagents	- How to fill up Record of reagent - Importance of expire date management of reagents - How to estimate out of stock date - Importance of toxic compounds management and lab. waste management

EDL and Recording Digit for Basic Water Analysis (for all 14 DFEAs) rev.

							Description in Recording		
No.	Parameter	Instrument	Unit	Measuring Range		EDL Estimated Detection Limit	<EDL	>EDL	Type of Digit (Attention to Period)
1	pH	pH meter	-		0 to 14	-	-	0, 0.1, 0.2, …13.9, 14	#. #
2	درجة الحرارة Water temp.	pH meter	℃		-10.0 to 110.0	-	-	-10.0,-9.9,…, 109.9, 110.0	##. #
3	اللون Color	portable colorimeter	-	not diluted	0 to 500 units	25	<25	25, 26, …., 500	###
				diluted(×20)	500 to 10,000	-	-	500, 520,540,…10,000	###0
4	Total dissolved solids (TDS)	portable EC/TDS meter	mg/l	Low	0 to 2000 mg/L	1	-	1, 2, …., 2000	###
				High(g/L)	2000 to 50,000 mg/L	-	-	2000, 3000,4000,…50,000	#000
5	DO	portable DO meter	mg/l		0 to (10.5)	0.05	<0.05	0.06, 0.07… ,9.50,…	#. ##
6	Total suspended solids (SS)	portable colorimeter	mg/l	not diluted	0 to 750 mg/L	22.1 mg/L	<22	22, 23, ….., 750	###
				diluted(×20)	760 to 15,000 mg/L	-	-	760, 780, …,15,000	###0
7	COD	colorimeter	mg/l	Low	0 to 150 mg/L	4 mg/L COD	<4	4, 5,……..150	##
				High	0 to 1,500 mg/L	30 mg/L COD	<30	30, 31, 32,…..1,500	###
				diluted(×20)	1,500 to 30,000mg/L	-	-	1520, 1540, ….,30,000	####0
8	BOD_5	culture	mg/l	not diluted	1 to 4,000 mg/L	1	<1	1, 2, 3, 4,…….4,000	## or #5 or #00
				diluted(×10)	4,000 to 40,000mg/L	-	-	4,000, 4,010,….40,000	####0
9	NO_3^-	portable colorimeter	mg/l	Low	0 to 5.0 mg/L	0.2 mg/L NO_3^--N	<0.2	0.2, 0.3, …..,5.0	#. #
				High	0 to 30 mg/L	0.8 mg/L NO_3^--N	<0.8	0.8, 0.9, 1.0 …29, 30	##. # / ##
				diluted(×10)	30 to 300 mg/L	-		30, 31, 31 …..,300	###
10	PO_4^{3-}	portable colorimeter	mg/l	Low	0 to 2.50 mg/L	0.05 mg/L PO_4^{3-}	<0.05	0.05, 0.06, …., 2.50	#. ##
				High	0 to 30.0 mg/L	0.14 mg/L PO_4^{3-}	<0.14	0.14, 0.15,…,10.0,…., 30.0	##. ## / ##. #
				diluted(×10)	30.0 to 300 mg/L	-	-	30.0, 31.0, ….,298,299, 300	###
11	Cl^-	Digital Titrator	mg/l		10 to 10.000 mg/L	10 mg/L Cl^-	<10	10, 11, ….., 10,000	###
12	NH_3-N	portable colorimeter	mg/l	Low	0 to 2.50 mg/L	0.08 mg/L NH_3-N	<0.08	0.08, 0.09, ….., 2.50	#. ##
				High	0 to 50 mg/L	1 mg/L NH_3-N	<1	1,2,3, 50	##
				diluted(×10)	50 to 500 mg/L	-	-	50, 60, 70 …., 500	##0
13	الناقلية الكهربائية Electrical Conductivity	portable EC/TDS meter	µS/cm		1 to 199,900 µS/cm	1µS/cm	<1	1, 2, …., 199,900	####
14	العكارة	portable turbidity meter	NTU	Low	0.00 to 9.99	0.01 NTU	-	0.01, 0.02, …,9.99	#. ##
				Midium	10.0 to 99.9	0.1 NTU	-	0.1, 0.2, ….99.9	##. #
				High	100 to1000	1 NTU	-	100, 101, 1000	###
	Turbidity			diluted(×10)	1,000 to10,000	10 NTU	-	1000, 1010, , 10,000	###0

Regarding the Chemical and Biological Water Quality 2, the estimated detection limits (EDL) and recording digit were explained to the Damascus Countryside, Homs, and Aleppo DFEAs in July 2007 as shown below.

EDL and Recording Digit for Chemical & Biological Water Analysis 2
(for Damascus Countryside, Homs and Aleppo) July 2007

No.	Parameter	Instrument	Unit	Measuring Range		EDL Estimated Detection Limit	Description in Recording		
							<EDL	>EDL	Type of Digit (Attention to Period)
1	Cr^{6+}	Spectrophotometer	mg/l	not diluted	0 to 0.70	0.01 mg/L Cr^{6+}	<0.01	0.01, 0.02, …0.68, 0.69, 0.70	#. ##
2	T-Cr	Spectrophotometer	mg/l	not diluted	0 to 0.70	0.01 mg/L Cr	<0.01	0.01, 0.02, …0.68, 0.69, 0.70	#. ##
3	Mg Hardness	Spectrophotometer	mg/l	not diluted	0 to 4.0 mg/L	0.1 mg/L $CaCO_3$	<0.1	0.1, 0.2, 0.3,….3.8, 3.9, 4.0	#. #
				diluted(×20)	2 to 80 mg/L	-	-	2, 3,4,5 6,7, 8 ……78,79, 80	#～##
				diluted(×50)	5 to 200 mg/L	-	-	10,11,12,13,14……198,199,200	##～###
				diluted(×100)	10 to 400 mg/L	-	-	101,102,103,…..397,398,399,400	##～###
4	Ca Hardness	Spectrophotometer	mg/l	not diluted	0 to 4.0 mg/L	0.1 mg/L $CaCO_3$	<0.1	0.1, 0.2, 0.3,….3.8, 3.9, 4.0	#. #
				diluted(×20)	2 to 80 mg/L	-	-	2, 3,4,5 6,7, 8 ……78,79, 80	#～##
				diluted(×50)	5 to 200 mg/L	-	-	10,11,12,13,14……198,199,200	##～###
				diluted(×100)	10 to 400 mg/L	-	-	101,102,103,…..397,398,399,400	##～###
5	Total Hardness	Spectrophotometer	mg/l	not diluted	0 to 4.0 mg/L	0.1 mg/L $CaCO_3$	<0.1	0.1, 0.2, 0.3,….3.8, 3.9, 4.0	#. #
				diluted(×20)	2 to 80 mg/L	-	-	2, 3,4,5 6,7, 8 ……78,79, 80	#～##
				diluted(×50)	5 to 200 mg/L	-	-	10,11,12,13,14……198,199,200	##～###
				diluted(×100)	10 to 400 mg/L	-	-	101,102,103,…..397,398,399,400	##～###
6	NO_3^--N	Spectrophotometer	mg/l	Middle	0 to 5.0 mg/L	0.2 mg/L NO_3^--N	<0.2	0.2, 0.3, ……4.8, 4.9, 5.0	#. #
				High	0 to 30 mg/L	0.8 mg/L NO_3^--N	<0.8	0.8, 0.9, 1.0 ……..29, 30	##. #～##
				diluted(×10)	30 to 300 mg/L	-	-	30, 31, 31 ….280, 290, 300	###
7	NO_2^--N	Spectrophotometer	mg/l	not diluted	0 to 0.30 mg/L	0.02 mg/L NO_2^--N	<0.02	0.02, 0.03,……0.29, 0.30	#. ##
				diluted(×10)	0.3 to 3.0 mg/L	-	-	0.3, 0.4, …2.8, 2.9, 3.0	#. #
8	NH_3-N	Spectrophotometer	mg/l	not diluted	0 to 2.50 mg/L	0.08 mg/L NH_3-N	<0.08	0.08, 0.09, …..,2.49, 2.50	#. ##
				diluted(×10)	2.5 to 25 mg/L	-	-	2.5, 2.6,2.7…24.8, 24.9, 25.0	#. #～##. #
				diluted(×100)	25 to 250 mg/L	-	-	25, 26,27…248, 249,250	##～###
9	PO_4^{3-}	Spectrophotometer	mg/l	not diluted	0 to 2.50 mg/L	0.05 mg/L PO_4^{3-}	<0.05	0.05, 0.06, …, 2.49, 2.50	#. ##
				diluted(×10)	2.5 to 25 mg/L	-	-	2.5, 2.6,2.7…24.8, 24.9, 25.0	#. #～##. #
				diluted(×100)	25 to 250 mg/L	-	-	25, 26,27…248, 249,250	##～###
10	Sulfide (S^{2-})	Spectrophotometer	mg/l	not diluted	0 to 0.80 mg/L	0.01 mg/L PO_4^{3-}	<0.01	0.01, 0.02, …, 0.79, 0.80	#. ##
				diluted(×10)	0.8 to 8.0 mg/L	-	-	0.8, 0.9, …7.7, 7.8, 8.0	#. #
11	Detergents, Anionic (Surfactans)	Spectrophotometer	mg/l	not diluted	0 to 0.275 mg/L	0.03 mg/L LAS	<0.03	0.003,0.004, …,0.274, 0.275	#. ###
12	Oil & Grease	Oil Content Analyzer	mg/l	not diluted	0 to 200 mg/L	0.2 mg/L	<0.2	0.2, 0.3, ….., 200	#. #～###
				diluted(×10)	200 to 2,000 mg/L	-	-	200,201, 202,…1,999, 2,000	###～####

(5) File Naming Rule and Storage in Computer

1) File Naming Rule

Both DFEAs and GCEA should use common file name for quick understanding of information from file name without opening files. File naming rules for the Basic Water Quality were introduced to DFEAs in June to July 2006, and revised in August and November 2007. As for the Chemical and Biological and the Heavy Metal, data is to be input in the same sheet to the Basic Water Quality. The Air quality file naming rule was introduced to the Damascus, Homs, and Aleppo DFEAs in July 2007. The table below shows a file naming way, abbreviations of governorate, type of water, and type of area where air sample was collected.

File Naming Rule

Component	File naming Rule	Introduced Timing	Way of Naming
Basic water quality Analysis	XXX－YYY－ZZZ	June, July 2006	X:Name of Governorate in 3 Character Y:Type of Sample Water (water body) Z :Station Number (Sequential Number) Example: DAM-I-003
Water Quality Analysis (Basic, Chemical & Biological and Heavy Metal)	WWW－XXX－YYY－ZZZ	July, November 2006	W: year X:Name of Governorate in 3 Character Y:Type of Sample Water (water body) Z:Station Number (Sequential Number) Example: 07-DAM-I-003
Air Quality Analysis	A－WWW－XXX－YYY－ZZZ	July 2006	A: Air W: year X:Name of Governorate in 3 Character Y:Type of Area Air Sample collected. Z :Station Number (Sequential Number) Example: A-07-ALP-R-001

Name of Governorate in 3 Characters

Name	Abbreviation (in 3 Characters)
1. Damascus DFEA	DAM
2. Damascus Countryside DFEA	DAC
3. Aleppo DFEA	ALP
4. Homs DFEA	HOM
5. Hama DFEA	HMA
6. Lattakia DFEA	LTK
7. Deir ez Zor DFEA	DEZ
8. Idleb DFEA	IDL
9. Hasakeh DFEA	HSK
10. Rakka DFEA	RAK
11. Sweida DFEA	SWD
12. Dara'a DFEA	DAR
13. Tartous DFEA	TAR
14. Quneitra DFEA	QNT

Water samples were classified according to a type of sampled water, namely industrial wastewater, domestic wastewater (sewage water), rivers including canal, lakes including dam and reservoir, under ground water, seas, and complaints.

Type of Sample Water and Abbreviation (Water Quality)

Abbreviation	Type of Sample Water
I	Industrial waste water
D	Domestic waste water (Sewage water)
R	Rivers (including canal)
L	Lakes (including Dam and reservoir)
G	Under ground water
S	Seas
C	Complains

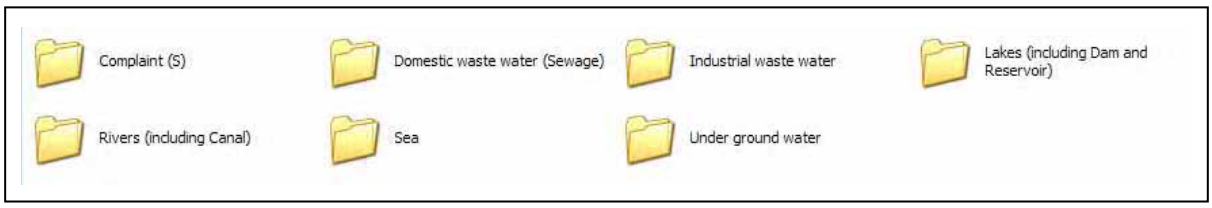
The air samples were classified according to a type of sampling area, namely background area, Industrial area, commercial area, main road (vehicle emission), residential area, and complaints.

Type of Type of Area Air Sample collected and Abbreviation (Air Quality)

Abbreviation	**Type of Area Air Sample collected**
B	Background
I	Industrial
C	Commercial
V	Main Road (Vehicle Emission)
R	Residential
S	Complaints
S: S is coming from Arabic word Shaukaui (complaints)	

2) Storage in PC

From data accumulation viewpoint, it is necessary to store the data in well arranged holder in PC, because the monitoring data arrangement should cover both hard copy base (paper) and electric file base. The accumulation of data needs to be in electric files. Recommended example of the data holder in PC is as follows.



Result of Water Quality Analysis (2007)

Result of Air Quality Analysis (2007)

(6) Annual Report

Although some C/Ps had an experience to arrange spotted analysis data conducted in line with specific project study and implementation, it is the first experience to prepare an annual report of the data obtained by the regular environmental monitoring for all C/Ps. So, the JICA Expert Team has started to explain how to prepare an annual report of the Basic Water Quality Analysis from January 2007. At that time, the Tartous, Hasakeh and Idleb DFEAs had well prepared the annual report of environmental monitoring in advance, so the JICA Expert Team instructed other 11 DFEAs by using these advanced samples. With well understanding, all DFEAs have worked positively to prepare an environmental monitoring report for the first time. As for the Chemical and Biological Water Quality, and Heavy Metal, the JICA Expert Team conducted a lecture in July 2007. The annual report of water quality in 2007 includes elements of the Basic Water Quality, Chemical and Biological Water Quality, and Heavy Metal. For air quality, the JICA Expert Team had a lecture and OJT in July and November to December 2007 at the Damascus, Homs, and Aleppo DFEAs. A content of the annual report of air quality is same as that of water quality.

(7) Networking (Sending the Monitoring data to GCEA)

The data transmission system and networking is being developed by the Information Technology (IT) section in GCEA for establishment of the networking system supported by JICA providing necessary equipment and software shown below in 2005.

Equipment and Software Provided by JICA in 2005

No.	Name	Specification	Quantity
1	UPS System for Server	-	1
2	G.S-HDSL Routter	256 MBPS	12
3	Switches	16 Ports	7
4	Patch Panel	16 Ports	7
5	Cabin	9 Units	3
6	Server cabin	Ready (1m)	1
7	Cables	Ready (1m)	100
8	Cables	Ready (1m)	100
9	Cables	Connect (300m)	10
10	Outlets	-	100
11	Tubes	Capacity 4-6 cables	150
12	Database system	SQL Server 2000	1
13	Antivirus System	Norton Antivirus 2005	1

In the round instruction training to 14 DFEAs in January and February 2006, the JICA Expert Team introduced and explained the networking system briefly emphasizing importance of environmental data network system for the environmental management in Syria.

(8) Web Site Preparation in GCEA

In conjunction with the network (data transmission system), the Information Technology (IT) section in GCEA has been developing their home page on the web. Recently, the top page (http://www.gcea.gov.sy/) became available in both Arabic and English in July 2007 to show information of the JICA Capacity Development Project (http://www.gcea.gov.sy/English/JICa_e.htm) within the Environment Project as shown in the next page.

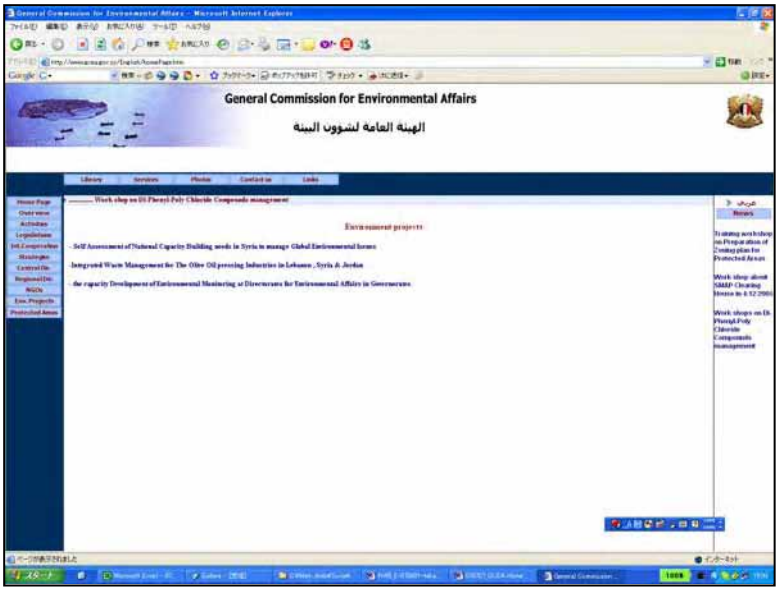
(9) Operation and Maintenance (O/M) of Computer

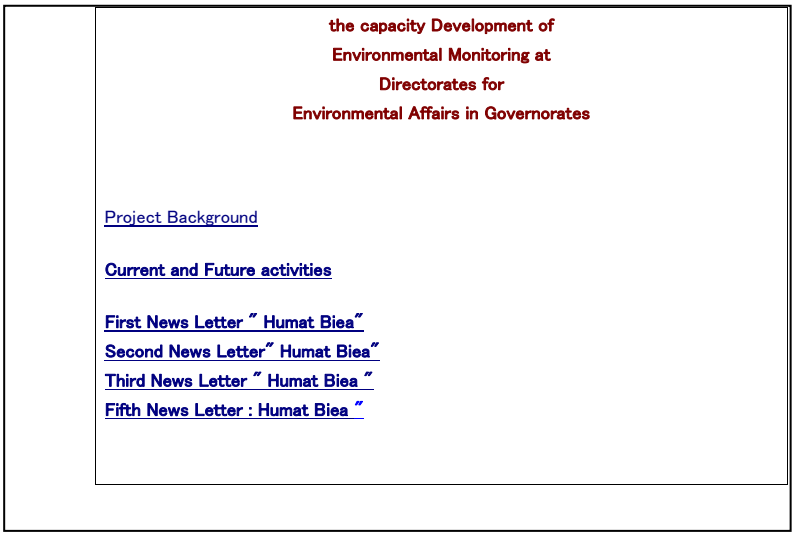
Basically, all monitoring data should be kept in a computer of DFEA and be transferred to data base server in GCEA. Therefore maintenance of computer, especially security management is necessary. The JICA Expert Team explained the importance of risk management of accumulated data in computer keeping in mind for antivirus software and back up.

The JICA Expert Team purchased 15 original antivirus software, and installed it in the computer of each DFEA. Most computers in DFEAs are not connected to internet, so it is difficult to update virus definition file, accordingly the JICA Expert Team carried and pasted it to the computer of DFEA whenever the JICA Expert Team visited DFEAs. Moreover, by using intranet (networking system), some DFEAs such as Idleb, Sweida and Damascus Countryside are getting it from GCEA server twice a week since September 2007, after the Information Technology (IT) section in GCEA had prepared network system between GCEA and DFEAs. This function will support to keep using antivirus software on the computer in each DFEA.

The risk management of hard disk in the computer is also important because it is to be easily damageable. Therefore, the JICA Expert Team recommended preparing a compact disk writer of antivirus software and making a backup copy of the monitoring data periodically, at least twice a month.

Portal of GCEA Website





3.5.2 Products of Activities

(1) Data Transportation and Networking

Currently, 10 DFEAs (except for Hasakeh, Deir ez Zor, Rakka and Damascus) are connecting to GCEA by Intranet (GS-HDSL). However, the Hasakeh, Deir ez Zor, Rakka, and Damascus DFEAs were out of service area by the Syria Telecommunication Establishment (STE). Moving DFEA office to new building is another problem because Aleppo and Tartous DFEAs lost connection to GCEA server. But the lost connection is temporal. Very recently, the Syria Telecommunication Establishment has started Intranet service at Jobar area where the Damascus DFEA located. So it will get the connection soon. In several DFEAs, the connection is unstable and being down frequently despite of great effort of the Information Technology section.

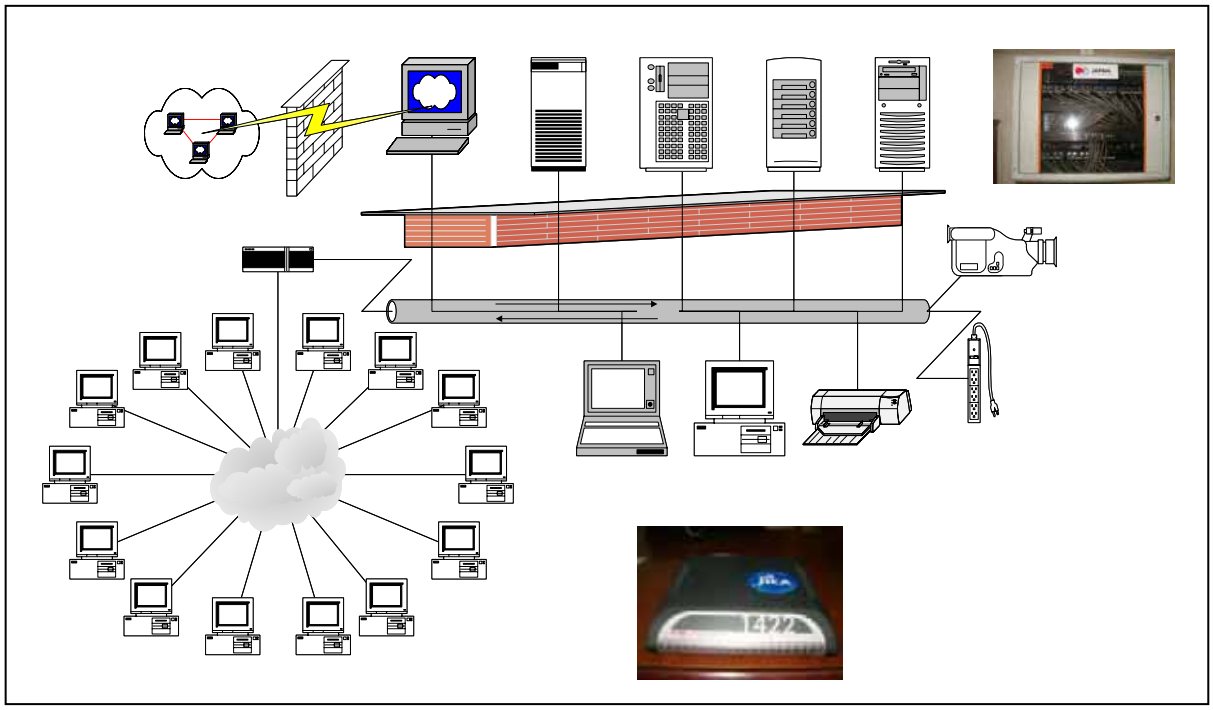
The recovery of connections for DFEA and the improvement of reliability should be dealt with by GCEA as soon as possible. If possible, hiring an Information Technology engineer at DFEA is

recommendable. As for DFEAs out side of network, the data copied in a compact disk is to be sent to GCEA for the time being. Due recognizing the importance of the networking system between GCEA and DFEAs, the JICA Expert Team suggested all DFEAs to input their monitoring data in the system. The Information Technology section is going to start training seminar for monitoring database to 11 DFEAs in mid December 2007. The improvement of reliability is most required in the next step. Current situation of networking is shown below.

Situation of Networking as of 10 December 2007

No	Name	Connection between GCEA and DFEA	Data transmitting	Coping antivirus updating file	Remarks column
1	Damascus DFEA	— → ×	×	×	Device will be prepared soon
2	Damascus Countryside DFEA	○			
3	Aleppo DFEA	×	×	×	Moving to new building
4	Homs DFEA	○	×	×	Moving to new building
5	Hama DFEA	○		×	Moving to new building
6	Lattakia DFEA			×	Router problem will fix soon
7	Deir ez Zor DFEA	—	—	—	Out side of service area (STE)
8	Idleb DFEA	○	○	○	
9	Hasakeh DFEA	—	—	—	Out side of service area (STE)
10	Rakka DFEA	—	—	—	Out side of service area (STE)
11	Sweida DFEA	○	○	○	
12	Dara'a DFEA	○			Moving to new building
13	Tartous DFEA	×	×	×	Recently moving to new building
14	Quneitra DFEA	○	×	○	Moving to new building

Note: ○ : Connecting or Operating, : Operating partially, × : Not yet , — : Out side of service area



Environmental Network System between GCEA and DFEA

(2) Annual Repot Preparation

In February 2007, most DFEAs have prepared an annual report of environmental monitoring on the Basic Water Quality Analysis 2006. The quality of these reports was mostly enough, but it is necessary to improve more based on accumulation of their experiences. The JICA Expert Team had lecture and training for concerned DFEAs on improvement of report in November to December 2007 so that they could upgrade Annual Report 2007. In the beginning of February 2008, annual environmental monitoring report in water and air quality will be prepared.

Up to February 2007, most of DFEAs have prepared annual report, all annual reports are attached in Annex 10, the detail of contents of report and evaluation by the JICA Expert Team is as follows. It shall be upgraded as a water quality annual report together with the Chemical and Biological Water Quality and Heavy Metal. The annual report of water quality is to be prepared in February 2008.

The annual report of the Chemical and Biological Water Quality and the Heavy Metal analysis data shall be included in the annual report of water quality 2007 which shall be prepared in February 2008. Annual report of air quality 2007 is to be prepared in February 2008 at the Damascus, Homs and Aleppo DFEAs.

Contents and evaluation of Annual Environmental Report 2006

NO.	DFEA	Delivery in Feb.	Evaluation	Contents of report				
				Summary	Introduction	Details	Results and Discussion	Monitoring Plan 2007
1	Damascus	On 16 July	B	○	○			○
2	Damascus Countryside	○	C	○	○	―	―	○
3	Aleppo	○	C	―	○	○	―	○
4	Homs	○	B	○	○	―	○	―
5	Hama	○	B	○	○	○	○	○
6	Lattakia	○	B	○	―	―	○	○
7	Deir ez Zor	○	A	○	○	○	○	○
8	Idleb	○	A	○	○	○	○	○
9	Hasakeh	○	A-B	○	○	○	○	○
10	Rakka		B-C	○	○	○	○	○
11	Sweida	○	B	○	○	○	○	○
12	Dara'a	○	B-C	○	○	―	○	○
13	Tartous	○	A	○	○	○	○	○
14	Quneitra	○	C	○	○	―	―	○

Note: A: good, B: Moderate, C: Need more effort, ○: Attached ―: Not attached Evaluated by JICA Expert Team

(3) Lecture Materials and Recording Documents

Lecture materials for data management including some O/M records and explanation on the estimated detection limits (EDL) and recording digit are attached in Annex 2. As data management, the JICA Expert Team prepared recording format and revised it several times. Original recording format prepared in July 2005 and revised recording format latest version are attached in Annex 2.3.

3.6 Environmental Education and Public Awareness

Target of the activities under the Output-5 were focused on the environmental education for the pupils and NGOs in the first half of the Project period because the description of PDM targeted broad range stakeholders for Environmental Education (E&E). However, GCEA and DFEAs have experienced such kind of activities before actual implementation of the Project, and only limited impact for C/Ps could be considered. Therefore, the JICA Expert Team proposed to GCEA and DFEAs to shift the target of activities from pupils and NGOs to industrial pollution sources (factories) based on the recommendation in the Mid-term Evaluation of the Project. The training activities for both environmental education for the pupils and NGOs, and public awareness for industrial pollution control by using monitoring data are summarized below.

3.6.1 Training Activities

(1) Environmental Education for the Pupils and Students

The training activities for the environmental education for the pupils and students conducted in the Project are summarized below. Content of each training activity is explained in subsequent paragraphs.

Summary of Activities

Items	Method	Performance
1) Media event	Open event	29 January, 2005: Convention hall of the Four seasons hotel
2) Lecture on risk communication	Lecture	2 February, 2006: GCEA
3) Demonstration of the water test kit to the Kid's Eco-club	Demonstrations	15 June, 2005: Flower festival at Tishreen Garden
4) Seminar on Environmental Education	Seminar	28 June 2005
5) Collaboration with JOCV	Meeting	23 June, 2005: Girgis village, Quneitra 23 June, 2005: Marloura, Homs
6) Periodical meeting with organizations concerning environmental education	Presentation, interview	21 May, 2006: Ministry of Industry, Vice-minister of the ministry 22 May, 2006: EU-MAM project 23 May, 2006: Damascus Chamber of Industry 24 May, 2006: Lattakia Chamber of Industry 29 May, 2006: Aleppo Chamber of Industry 5 June, 2006: MAWRED
7) Workshop on Environmental education	Demonstration on 'Eco-plant game'	22 May, 2006: Damascus DFEA 23 May, 2006: GCEA 24 May, 2006: Lattakia DFEA
8) Seminars on Environmental Education	Awareness raising targeting the owners of factories, through Chamber of Industries	29 May, 2006: Aleppo Chamber of Industry 3 June, 2006: JUDCO Steel

1) Media Event

In line with the activities of environmental education (E&E) and public awareness (PA) of the Project, a media event titled "Collaboration with Stakeholders on Environment" was held on 29 January, 2006 at the convention hall of the Four Seasons Hotel inviting broad stakeholders shown in the attendants list hereunder.

Attendants List of Media Event (29 Jan., 2005)

No.	Name	Authority and Job Description
1	Ms. Gazwa Matrood	Engineer in Deir ez Zor DFEA
2	Mr. Sameer Alsafadi	Engineer in Syrian Association for Environment.
3	Ms. Nameer Alwarar	Engineer in Hama DFEA.
4	Ms. Huda Zead	Engineer in Damascus Countryside DFEA.
5	Ms. Fayza Hwayge	Chemist at GCEA.
6	Ms. Hala Mustafa	Volunteer in Environment Field
7	Mr. Allam Ebraheem	Engineer in Tartous DFEA
8	Ms. Shaza Alsoofi	Director of Sustainable Development and Environment Protection Association.
9	Ms. Waffa Kreim	Engineer in Aleppo DFEA
10	Mr. Mahmoud taleb	Idleb DFEA
11	Mr. Mouhamd Waleed Malas	Engineer, member at Damascus Industry Chamber
12	Mr. Hesham Alsatee	The head of Damascus Friends Association
13	Mr. Souheel AlFadel	The head of Environment Friends Association in Damascus
14	Mr. Gazi AlAli	Environment Friends Association in Damascus
15	Mr. Sameer Alsafadi	Syrian Association for Environment
16	Mr. Hind Murshed	Correspondent
17	Ms. Ilham Bakeer	Business Woman for Alsayd Gallery
18	Ms .Affaf Baradee	Retired teacher
19	Ms. Moufeeda kazzaz	Social researcher
20	Mr. Mowafek Dagga	General Commission for TV and radio
21	Mr. Maleek Alhaddad	Engineer at Syrian Association for Environment
22	Mr. Shhade Assaf	Engineer at Syrian Environment Protection Association
23	Mr. Gassan Shaheen	Director, the head of Syrian Environment Protection Association
24	Ms. Mervat Bishmani	Reporter at Ministry of Local Administration and Environment
25	Ms. Dunia Alshek Hayder	Reporter at Ministry of Local Administration and Environment
26	Mr. Esmat Ali Jan.	Cameraman
27	Mr. Mouhamd Younes.	Cameraman
28	Mr. Ali Mouhamd Alkhaled	Syrian TV News Editor
29	Mr. Ali Ebraheem	Engineer at Quneitra DFEA
30	Mr. Shfeek Hamza	Engineer at Environment Friends Association in Sweida. DFEA
31	Mr. Gabi Hamza	Syrian Association for Environment/Damascus
32	Ms. Jamma Adeeb	Syrian Association for Environment/Damascus
33	Ms. Thawra Zenia	Journalistic at Althawra Newspaper
34	Ms. Abeer Alshamali	Youth Union
35	Ms. Rawnak Jaboor	Chemist at Environmental Studies Center /Lab Directorate
36	Ms. Reem Zgaeba	Chemist at Environmental Studies Center

The focal point of this event is broad dissemination of collaboration activities among administrative agencies such as GCEA and DFEAs, members of Chamber of Industry, and communities including NGOs, Medias, and the Japan Overseas Cooperation Volunteers (JOCVs). After brief presentation by the General Director of GCEA, the JICA Expert Team explained importance of collaboration by using a display of Japan's experience on environmental pollution. Then, members of JOCV presented their environmental education activities conducted with Syrian NGOs and organizations. A lot of comments and suggestions were raised from the audience for further promotion of activities.

2) Lecture on Risk Communication

In order to promote fruitful understanding of a concept of "Risk Communication" and actual implementation of an action plan, the JICA Expert Team held one day lecture on Public Awareness and Environmental Education on 2 February, 2006 at the meeting room in GCEA targeting C/Ps in charge for public awareness of GCEA and DFEAs. A series of presentation were conducted by the Director of Public Awareness in GCEA and the JICA Expert Team. The attendant list is shown below. Key discussion points are as follows;

a) Risk Communication is defined that informing people about hazard/risk deriving from chemical substances, and sharing information among stakeholders, establishments, citizens, and government about the risk.
b) Key components of communication are audience, medium, and message.
c) Procedures of risk communication is 1) setting goal, 2) targeting audience, 3) profiling target audience, 4) developing a message, 5) selecting media, 6) delivering a message, and 7) feedback from citizens.

Attendant List of Lecture Training of Public Awareness

No.	Name	Authority
1	Mr. Samer Almagoot	Hama DFEA
2	Mr. Hassan Yousef	Hama DFEA
3	Ms. Nameer Alwarar	Hama DFEA
4	Mr. Ali Ibraheeem .	Quneitra DFEA
5	Mr. Majed Zaytoon	Quneitra DFEA
6	Ms. Huda Zaid	Damascus Countryside DFEA
7	Ms. Hala Alkori	Damascus DFEA
8	Ms. Selfa Ardajean	Damascus DFEA
9	Ms. Fateema Alhariri	Dara`a DFEA
10	Mr. Yousef Al shadayda	Dara`a DFEA
11	Ms. Sameera Alhariri	Dara`a DFEA
12	Ms. Rayeefa Aba Zaid	Dara`a DFEA
13	Ms Suha Nawer	Sweida DFEA
14	Ms. Lina Abo Kher	Sweida DFEA
15	Ms. Dunia Gareeb	Aleppo DFEA
16	Ms. Kholoud Aoaied	Aleppo DFEA
17	Ms. Wafa kraim	Aleppo DFEA
18	Ms. Gazwa Matrood	Deir ez Zor DFEA
19	Ms Shaza Alnuokari	Homs DFEA.
20	Mr. Kazem Ahmad Ahmad	Tartus DFEA
21	Mr. Allam Ibraheem	Tartus DFEA
22	Mr. Eiad Alhuseen	Idleb DFEA

3) Demonstration of the Water Test Kit to the Kids' Eco-club

On 15 June, 2005, the flower festival was taken place in Tishreen Garden convened by Damascus Governorate, Ministry of Tourism, and MOLAE. Staffs in Damascus DFEA made a booth presentation at the festival. At the first day of the festival, the JICA Expert Team demonstrated the simple toolkit for measuring water quality. Children in Kids' Eco-club were curious to the water toolkit.

4) Collaboration with JOCV

During the stay in the first assignment, the environmental education expert visited villages of Girgis in Quneitra on 23 June, 2005 and Marloura in the Homs Governorate on 23 June, 2005, respectively. For the visit to Girgis, the team leader joined the trip. The purpose of the visit is to meet the JOCV member dispatched through FIRDOS, to share the knowledge on the environmental education. The major concerns for these JOCV members are the solid waste management in the rural area, which are slightly different from the objectives of the Project. Further considerations are required to collaborate with JOCV members in this field.

A meeting was held on 25 January, 2007 at the JICA Syria office to discuss with JOCV members on environmental education on subsequent cooperation between JICA project and JOCV. In the meeting, continuous cooperation between JOCV and the JICA Expert Team was agreed by sharing information on common issues of environmental education and public awareness such as information related to GCEA and DFEA's activities, though the target group under this project was shifted from school education to Chamber of Industry.

5) Seminar on Environmental Education

A seminar on environmental education was held on 28 June, 2005 at a conference room of GCEA with inviting Environmental NGOs based in Damascus Governorate, public awareness staff in the Damascus DFEA, and JOCV volunteers for environmental education. Twenty-one participants attended the seminar as listed below. Agenda for the seminar comprises of a video display called "Japan Experience on pollution control", presentation by the environmental education expert concerning a proposal on environmental education, and demonstration on the Eco-plant game.

List of Attendances for the Environmental Education Seminar

Name	Organization
Mr. Takoya Sasaki	JICA (FIRDOS)
Mr. Fareed Mawlawi	Damascus Friends Association
Dr. Yaser Al Muhamad	Environment Protection & Sustainable Development Association
Mr. Tareq Al Boushi	Syrian Association For Environment
Ms. Farah Huaijeh	Syrian Association For Environment
Mr. Yamen Awad	Syrian Association For Environment
Mr. Hisham Al Sati	Damascus Friends Association
Dr. Anwar Al Khateeb	Damascus Friends Association
Ms. Maha Nsair	Syrian Association For Environmental life Protection
Ms. Basema Mudawar	Syrian Association For Environment
Dr. Ghassan Shaheen	Syrian Association For Environment
Mr. Ali Ahmad Al Shimali	Fardos – Al Qunietra
Ms. Katia Farah	Damascus DFEA
Mr. Nour Edin Al Shimali	Fardos – Al Qunietra
Mr. Ghassan Al Jaffal	Fardos – Al Qunietra
Ms. Abeer Al Shimali	Youth Union
Mr. Sameeh Abbas	Environment Friends Association
Ms. Marah Murad	JICA Syria Office
Ms. Rasha Al Mehrez	Damascus DFEA
Ms. Sanaa Yaqoub	Environment Protection & Sustainable Development Association
Dr. Warqaa Barmada	Syrian Association for Environment
Mr. Dayetchi Konuma	JICA (Fardos)

a) Proposal on Environmental Education in Syria

A proposal on the environmental education in Syria was presented by the JICA Expert Team introducing the Japanese example of Kids Eco-club, presentation stressed the importance of the partnership and networking among DFEAs and environmental NGOs, and the focus on school children. During question and answer time, Dr. Warmada, a president of the Syrian Environmental Association, mentioned that they have some experience on environmental education, and proposed to hold regular meetings among environmental NGOs, to share the knowledge and activities of environmental NGOs. Some participants are interested in the simple kit for measuring water quality.

b) Introduction of Eco-plant Game

Eco-plant game is a tool to raise awareness on the importance of the balance between the production and environmental counter-measures in the factory production. The rule of the game is as follows:

"Players are assumed to be the owner of the factory and simulate the run of the factory. The game comprises of 12 turns. At the beginning of the game, each player is provided 10 million Syrian Pounds. Players are asked to allocate the budget on production and environmental investment every turn. Per 100 thousand productions, one point of environmental load will increase. When the total environmental load in factories exceeds 100 points, pollution occurs. Less three companies in terms of amount of environmental investment must pay a fine, 6 million, 4 million, and 2 million. Winner of the game is the players that earn most of the money at the end of the turn."

During the seminar, participants are divided into 4 teams, and play the game. At the end of the seminar, participants were asked to make a quick appraisal for the Eco-plant game. These feedbacks were reflected at the next trial of the game.

Feedback Result of Eco-plant Game

Criteria	Averaged Score (full score = 10)
(a) Was the game interesting?	8.09
(b) How much degree enthusiastic?	8.36
(c) Are you satisfied with the score of the team?	8.00

c) Preparation of Materials and Pamphlets on Environmental Education

In advance of the seminar on environmental education, the JICA Expert Team prepared a trial version of the Eco-plant game. The trial version of the game was tested at the meeting on 21 June, 2005, to confirm the effectiveness in Syrian context. The participants of the seminar evaluated good for the use of Eco-plant game as a material for the environmental education and public awareness.

(2) Public Awareness to Pollution Sources

Environmental education and public awareness activities under the Project have been shifted the focus from the school-based environmental education activities to pollution sources through the Chamber of Industry based on discussion with GCEA and DFEAs in the beginning of 3rd Year of the Project.

Since the Project aims to enhance socialising the environmental management and enhance the capacity of environmental monitoring for the effluents from factories, it has been considered to be better to focus more on the activities of enterprises. In addition, disseminating data obtained through the monitoring activities might trigger some social conflicts, mainly contested from entrepreneurs. In this respect, adequate mitigation measures to easen the social impacts should be investigated beforehand. In this context, relatinonship between: a) outcome of 'data dissemination to the public'

and b) activities to achieve its outcome should be streamlined, so as to be relevant to realise the socialisation of environmental manaement, through disseminating monitoring data.

The training activities for the environmental education for the pollution sources conducted in the Project are summarized below. Content of each training activity is explained in subsequent paragraphs.

Summary of Activities

Items	Method	Performance
1) Seminar in DFEA on public awareness raising for industrial sector	Holding Seminar at DFEA ・ Presentation by DFEA ・ Presentation by JICA Expert ・ Video program ・ Discussion	28 January, 2007: Aleppo DFEA 30 January, 2007: Lattakia DFEA 1 February, 2007: Damascus DFEA 5 February, 2007: Homs DFEA
2) Workshop with Chamber of Industry initiated by DFEA	Holding Workshop with Chamber of Industry as following agenda ・ Presentation by DFEA ・ Presentation by JICA Expert ・ Video program ・ Discussion	29 January, 2007: Aleppo Chamber of Industry 31 January, 2007: Lattakia Chamber of Commerce and Industry 4 February, 2007: Damascus Chamber of Industry Homs Chamber of Industry (cancelled)
3) Preparation of environmental education and public awareness materials	Translation into Arabic and simple edit of the video by subcontract work	The following video programs were shown in the above seminars and workshops. 1) Water Treatment Technology in Japan 2) The History of Pollution and Environmental Restoration in Yokkaichi
4) Meeting in DFEA on public awareness raising for industrial sector	Meeting in DFEA on public awareness for pollution source control	18 July, 2007: Aleppo DFEA (cancelled) 19 July 19, 2007: Lattakia DFEA (cancelled) Homs and Damascus DFEAs: (not scheduled)
5) Workshop with Chamber of Industry initiated by DFEA	Holding Workshop with Chamber of Industry as following agenda ・ Presentation by DFEA ・ Presentation by JICA Expert ・ Video program ・ Discussion	・ Aleppo Chamber of Industry: Though the workshop was scheduled on July 25 in the meeting with Aleppo DFEA on July 18, it was cancelled. ・ Lattakia Chamber of Commerce and Industry: According to the meeting on July 19, it was decided that the workshop would not be held this time since low concern on the matter by the Chamber and limited number of the pollution source to be paid attention in Lattakia. ・ Homs and Damascus Chamber of Industries: The workshops were not held since both Homs and Damascus DFEAs considered that continuation of the activity was unnecessary.
6) Meeting with GCEA on relevant matters	Meting with Public Awareness Dept. of GCEA	Inquiries ware conducted on the following matters; ・ Recent activity of the National Committee for Public Awareness ・ Status on approval of the National Strategy for Public Awareness and preparation of relevant action plan at Governorate level

1) Meetings on Public Awareness to the Pollution Sources

The table below shows a list of organisations that the environmental education expert of the JICA Expert Team has undertaken interview. These are classified as: Chamber of Industry; Ministry of Industry, MAWRED, NGO, and EU-fuded project office.

List of Meetings

Organization	Name	Date
Damascus Chamber of Industry	Mr. Walid Malas, Member of the Board Director Mr. M. Ayiman Mawlawi, General Secretary Mr. MHD. Redwan Al-Mourabet,、Deputy General manager	22 May, 2006
Lattakia Chamber of Industry	Mr. Farouk KHALASS, CoI Lattakia Mr. Ali Ali Adib, National Packing & Storage Co. Eng. Akram Karroum, JOUDCO Steel Co. Mr. Ali Maged Jalloul, General Manager of MGM	24 May, 2006
Aleppo Chamber of Industry	Mr. Abdull Mone'M Naser Agh, Member of Executive Bureau of Aleppo Governorate)	29 May, 2006

Organization	Name	Date
	Mr. A. Ammar Said, Chamber of Industry Aleppo	
Ministry of Industry	Dr. Haytham Alyafi （Vice Minister of MoI) Mr. Mr. Salem Ksibeh (Director of Environmental Affairs, MoI)	21 May, 2006
MAWRED (Environmental NGO)	Mr. Nawaf Zeidan (Training & Development Manager of Syrian-European Business Centre) Ms Grace Haranieh (Director of MAWRED)	5 June, 2006
EU-MAM Project	Mr. Christpopher Kaczmarski (Team Leader) Mr. George Hartman (Institutional Development Expert)	22 May, 2006

2) Meeting with MAWRED

On 5 June, 2006, the environmental education expert of the JICA Expert Team visited the Modernizing and Activating Women's Role in Economic Development (MAWRED). MAWRED is a NGO, specializing on empowering women's role in economic development. The NGO is headed by the first lady, and they have experience on raising environmental awareness targeting female entrepreneurs in March 2006 in Damascus. The purposes of the visit are to explain the outline and activities on JICA and SEMP projects and to explore the possibility of collaborating with MAWRED. Through the meeting, Environmental Education expert explained that:

a) SEMP project focuses on the environmental awareness rising targeting the citizens and establishments, especially factory owners and entrepreneurs,
b) SEMP project has developed tools for raising awareness on environmental management, like eco-plant game and Arabic version of the video, entitled 'Japanese experience on pollution control'.
c) SEMP project is now exploring the possibility to collaborate with MAWRED, as a channel for environmental awareness targeting the business women.

Mr. Nawaf Zeiddan, the Training & Development Manager of Syrian-European Business centre, mentioned that their activities on environmental awareness are a part of the LIFE-funded EVECON project, and that there is no room for the collaboration in the fiscal year 2006. However, they might have some possibility in the fiscal year 2007, since the activity plan has not yet been fixed at the time of visit. The environmental education expert mentioned that business women's forum, comprising of the female entrepreneurs in the field of environmental business were launched in 2004, with an initiative of the Minister of Environment in Japan, Her Excellency Yuriko Koike, and stressing that it might be one way of collaborating with Japanese organization,

Ms. Grace Haranieh, a Director of MAWRED, showed some interest in undertaking an awareness raising of the female member entrepreneurs, by using the tools of video or eco-plant game. The meeting ended up with a conclusion to continue exploring the way to collaboration in the field of environmental awareness in the entrepreneurs.

3) Seminar and Workshop on Pollution Source Control by Using Monitoring Data

a) Workshop at Aleppo Chamber of Industry on 29 May 2006

On 29 May 2006, GCEA and Aleppo DFEA organized the workshop on the awareness raising on environmental management of business organizations. Participants of the workshop are the member companies of the Aleppo Chamber of Industry. More than 30 persons attended the workshop. Agenda for the workshop comprised of three parts: presentation by the JICA Expert Team; presentation by GCEA staffs, and presentation by the staffs of Aleppo DFEA.

The workshop stated with an opening remarks by Ms. Rouda Naher of GCEA. It follows the introductory presentation by the environmental education expert on the SEMP project, together with the broadcast of the Arabic version of the video of 'Japanese experience on pollution control'.

Ms. Rouda Nhar of Directorates of Office of General Director, GCEA made presentation on the DELTA project. The DELTA project is aiming to enhance the activities of environmental management of business society in Arab countries. Ms. Rouda is a focal point of this to achieve sustainable business through the project.

Ms. Mariane Toro and Mr. Wasel of Aleppo DFEA also made presentation regarding the concept of eco-efficiency and mini environmental auditing, together with some toolkit like checklists. It is noted that this workshop was organized by the director of DFEA Aleppo and its staffs, in collaboration with GCEA, with their own initiatives.

b) Seminar in Aleppo DFEA and Workshop in Aleppo Chamber of Industry in January, 2007

The workshop in Aleppo Chamber of Industry was held by GCEA and Aleppo DFEA on public awareness for member companies of the Chamber of Industry on 29 January, 2007. Some 30 persons were attended the workshop. The workshop consists of presentation by DFEA, presentation by the JICA Expert Team and showing a video program, and discussions. In the beginning of the workshop, Mr. Monem, head of environmental committee at Aleppo Governorate, Mr. Aziz, board member of Aleppo Chamber of Industry, and Mr. Said, Director of Aleppo DFEA made opening remarks. Then, DFEA made a presentation about general activities of DFEA, laws and regulations related to the industrial pollution, activities under this project, results of pollution source monitoring, and constrains and issues to establish partnership between DFEA and industrial sector for adequate industrial pollution control and management. Subsequently, the environmental education expert of the JICA Expert Team presented a Voluntary Agreement System for Pollution Control in Japan as reference information to consider partnership between local government and enterprises, and showed a Japanese video program on wastewater treatment technology. After the presentations, questions, comments, and proposals were raised from attended members of the Chamber of Industry as follows. Prior to the workshop, a seminar was held in the Aleppo DFEA on 28 January, 2007 to examine how to hold such workshop by using effective presentations with reliable monitoring data. In the seminar, the environmental education expert made some suggestions on the presentation of DFEA.

Questions and Comments in the Workshop of Aleppo Chamber of Industry

Questions and Comments
(1)DFEA should not only obtain information from only factories for the inspection, but also have information for all factories. (Answer by DFEA: DFEA has already implemented a pollution source inventory survey and have information for all factories.)
(2)While importance of role of the Chamber of Industry is understandable for the public awareness raising for industrial sector, reliable expert is required to consult. (Answer by DFEA: A Cleaner Production Center is planned to establish in Damascus in near future. Through the center, technical advice can be obtained.)
(3)DFEA should not come to factories only to collect penalty, but to support the factories.
(4)There were cases where pollution control facility was not operated at all after installation due to failure of the planning for operation. Technical advice system from the planning phase is required through the environmental committee under the Governor.
(5)Can the Japanese pollution control agreement system be introduced in Syria immediately? (Answer from JICA Expert: Immediate introduction may not be possible by considering present situations from various viewpoints. As explained in the presentation, to secure the reliable monitoring data is one of most essential factors which is now being conducted as DFEA's capacity development under the JICA project.)

c) Seminar in Lattakia DFEA and Workshop in Lattakia Chamber of Commerce and Industry in January 2007

The workshop in Lattakia Chamber of Commerce and Industry was held by GCEA and Lattakia DFEA on public awareness for member companies of the Chamber of Commerce and Industry on 31 January, 2007. Some 20 persons were attended the workshop. The workshop consists of presentation by DFEA, presentation by the JICA Expert Team and showing a video program, and discussions. In the workshop, DFEA presented general activities of DFEA, laws and regulations related to the industrial pollution, activities under this project, results of pollution source monitoring, and constrains and issues to establish partnership between DFEA and industrial sector for adequate industrial pollution control and management. Subsequently, the environmental education expert made a presentation and showed a video program same as above. After the presentations, no specific questions, comments, and proposals were raised from attended member of the Chamber of Commerce and Industry, and a closing remark was made by Ms. Lama, Director of Lattakia DFEA. Prior to the workshop, a seminar was held in the Lattakia DFEA on 30 January, 2007 to examine how to hold such workshop by using effective presentations with reliable monitoring data. In the seminar, the environmental education expert made some suggestions on the presentation of DFEA.

As a reason why there was no specific comment from the Chamber of Commerce and Industry, less explanation before the workshop from DFEA to Chamber of Commerce and Industry resulted less participants from enterprises. According to Ms. Lama, coordination should be made directly from Governor's office to each enterprise, but not from the Chamber of Commerce and Industry. However, it is better to arrange such workshop between DFEA and Chamber of Commerce and Industry in terms of sustainable implementation.

d) Seminar in Damascus DFEA and Workshop in Damascus Chamber of Industry in February, 2007

The workshop in Damascus Chamber of Industry was held by GCEA and Damascus DFEA on public awareness for member companies of the Chamber of Industry on 4 February, 2007. Some 30 persons were attended the workshop. The workshop consists of presentation by DFEA, presentation by the JICA Expert Team and showing a video program, and discussions. In the beginning of the

workshop, Mr. Walid, head of environmental committee at Damascus Chamber of Industry and Ms. Wadina, Deputy Director of Damascus DFEA made opening remarks. Then, DFEA made a presentation about general activities of DFEA, laws and regulations related to the industrial pollution, activities under this project, results of pollution source monitoring, and constrains and issues to establish partnership between DFEA and industrial sector for adequate industrial pollution control and management. Subsequently, the environmental education expert displayed a video program same as above. After the presentations, questions, comments, and proposals were raised from attended member of the Chamber of Industry as follows. Prior to the workshop, a seminar was held in the Damascus DFEA on 1 February, 2007 to examine how to hold such workshop by using effective presentations with reliable monitoring data. In the seminar, the environmental education expert made some suggestions on the presentation of DFEA.

Questions and Comments in the Workshop of Damascus Chamber of Industry

Questions and Comments
(1)Technical level of DFEA's staff should be higher to conduct pollution source control management.(Answer by DFEA: Capacity development for DFEA's staff is now being conducted under the JICA project.)
(2)Since there is no specialized company on pollution control facilities in Damascus, adequate pollution control facility can not be installed.
(3)A system that private company can newly enter the market for operation of pollution control facilities such as combined industrial wastewater treatment plant and/or recycle plant for industrial waste, may be required.
(4)A pilot project of industrial wastewater treatment plant for small-scale factory is preferable to conduct under donors' assistance such as JICA to disseminate technology information among factories.
(5)It is suggested that experts for pollution control be hired by a joint committee between DFEA and Chamber of Industry.
(6)The Chamber of Industry considers that expert for the pollution control be required for each factory. For it, the Chamber of Industry provides scholarship to the University which has courses for pollution control expert.
(7)Before discussing water quality from the pollution source, quality of water used in the factory is low. Therefore, the government should solve the issue.
(8)Since it is difficult for small- and medium-scale factories to install pollution control facility individually, the government is better to introduce combined treatment facility.
(9)While the industrial side knows about penalty system on exceed of emission standard, information on overall contents of relevant laws and regulations have not been informed.
(10)Economic tools such as loan for installation of pollution control facility are required.
(11)Since most of major factories are located in countryside of Damascus, Damascus Countryside DFEA should have attended the Workshop.
(12)Since the small-scale factories are not members of Chamber of Industry, they can not be raised their awareness through the Chamber of Industry.
(13)A section on public awareness on pollution control will be included in the magazine published under the Chamber of Industry.
(14)More concrete technology on pollution control measures for specific industrial types such as textile and petrochemical industries is better to introduce in the next workshop. (Answer by JICA Expert: We will provide such information as much as possible in the next workshop or by other means.)

e) Workshop in Aleppo Chamber of Industry in July 2007

The workshop was scheduled on 25 July, 2007 in the meeting between Aleppo DFEA and JICA Expert Team on 18 July, 2007, but it was postponed because of the sudden meeting in the Chamber of Industry and has not been held yet. In the meeting, Aleppo DFEA asked the JICA Expert Team to have a presentation in the workshop to introduce Japanese experience on relevant topic. Based on the request, the JICA Expert Team planed to present a Pollution Control Manager System in Japan and recommendations for further activities as well as show a video on Japanese experience to tackle industrial pollution issues. As recommendations to be presented in the workshop, the following were considered; to hold periodical meeting between DFEA and Chamber of Industry to exchange technical information on specific topic/issue, to prepare an Action Plan for the Comprehensive

Pollution Source Control by DFEA and Chamber of Industry.

f) Inquiry Meeting in Lattakia DFEA in July 2007

A meeting was held between Lattakia DFEA and the JICA Expert Team on 19 July, 2007 to inquiry their opinion and exchange ideas and information since Lattakia DFEA showed hesitation to hold the workshop with Chamber of Commerce and Industry and expected small number of participants in the preliminary communication from the JICA Expert Team. According to the Lattakia DFEA, the Chamber of Commerce and Industry has low concern on the matter. In addition, there are only some 30 industrial pollution sources to be paid attention out of some 200 pollution sources and much increase of the number of industrial pollution source is not expected in the area in near future. Therefore, it was considered by DFEA that practical and effective way to communicate directly with the pollution sources under the circumstances.

According to the Lattakia DFEA, monitoring data has been so far shown directly to the industrial pollution source in some cases to convince and promote to implement adequate pollution control in the case of violation of emission standard. Some pollution sources implemented adequate pollution control after the monitoring result was reported to the governor and penalty was imposed. Regarding the monitoring data open to the public in future, it will be possible after the laboratory of DFEA is approved. However, step by step approach will be required since the public may be panic when all monitoring data of industrial pollution source are open at once. On the other, DFEA has showed monitoring data unofficially to the citizen in some case when the citizen asked DFEA to show the data.

Lattakia DFEA considers that staff in charge of pollution control in each industrial pollution source such as factory should be assigned for smooth and effective communication between DFEA and industrial pollution source.

4) Follow-up Activity on the National Committee for Information and Environmental Awareness

In accordance with the Minister of MOLAE decision No. 2051 dated on 3 October 2005, the National Committee for Information and Environmental Awareness at MOLAE was established and its second meeting was held 1 February, 2006. The JICA Expert Team was invited to the meeting for presenting a result of environmental consciousness survey conducted in the Project. The National Committee shows high interests about quantitative results of questionnaire survey such as environmental degradation in the Damascus Countryside, low recognition of environmental complaint system, TV and radio as most popular tool for environmental information.

The objectives of this National Committee are; discussion on national strategy of public awareness on environment, preparation of a national action plan, dissemination of the plan to DFEAs, taking initiatives for preparation and implementation of DFEA's action plan. A member list of the national committee is shown below.

Member List of the National Committee for Information and Environmental Awareness

No.	Name	Authority and Job Description
1	Ms. Mouhamed Salem Kseeba	Chemist at Industry Ministry.
2	Mr. Ahmad Alkawi	Engineer at Tourism Ministry
3	Ms. Suha Nasar.	Engineer at Transportation Ministry.
4	Mr. Ali Aldahool .	Education Ministry.
5	Ms. Hana Alhaj Ahmad	Ministry of Social Affaires and Work.
6	Ms .Entesar Mardini	Ministry of Housing and Building.
7	Mr. Hasan Allawi	General at Ministry of Interior
8	Mr. Nazeeh Alkouri	Ministry of Culture.
9	Mr. Ammar Gazali	Ministry of Information.
10	Ms. Mariam Meshta	General Commission for The Water Resources.
11	Mr. Mr. Souheel Fadel	The head of Environment Friends Association in Damascus
12	Mr. Mouhamed Naym Kadah	Sustainable Development and Environment Protection Association
13	Mr. Yaser Mouhamed	Head of Sustainable Development and Environment Protection Association.
14	Mr. Sameer Alsafadi	Eng at Syrian Association for Environment
15	Mr. Hesham Alsatee	The head of Damascus Friends Association.
16	Ms. Souheer Alrayes	The head of Syrian Cost Association for Environment Protection
17	Mr. Gassan Shaheen	Dr, the head of Syrian Environment Protection Association.
18	Mr. Faysal Hamed	Dr, The Head of Syrian Association for Wild Life Protection.
19	Ms. Mayson Breemo	Dr, Head of National Association for Environmental Development /Aleppo
20	Ms. Royat Yaseen	The Head of Environment Pioneers Association
21	Mr. Huseen Ahmad	The General Union for Workers Syndicates.
22	Mr. Adnan Atfa	Damascus and Damascus Countryside Industry Chamber.
23	Mr. Muneer Jalanbo	Chamber of Industry.
24	Ms. Abeer Alshamali	Youth Union.
25	Mr. Mowafek Dagga	General Commission for TV and Radio.
26	Ms .Kawkab Aldaya	Dr at The Womanly General Union.
27	Mr. Mishel Kayyat	Journalist at Albaath Newspaper
28	Mr. Kasem Albaridi	Althawra Newspaper.
29	Mr. Nader Gazi	Dr at GCEA.
30	Ms. Klopia Mousa	Engineer at GCEA.
31	Ms. Faten Tarboosh .	Engineer at GCEA
32	Ms. Souhela Salama	GCEA.
33	Ms. Mervat Bishmani.	Reporter at Ministry of Local Administration and Environment.
34	Mr. Mazen Nafaa	Information Ministry.
35	Mr. Mouhamed Abd Kahwagi	Ministry of Agriculture and Agricultural Reforming
36	Mr. Omar Mohee Aldeen Hoori	Ministry of Religious Endowments.
37	Mr. Mouhamed Saeed Alhalabi	Dr at Syrian Arab Red Crescent.
38	Mr. Mouhseen Ali Mosa	Ministry of Oil
39	Mr. Nawar Almagoot	General Commission for TV and Radio.
40	Mr. Omar Alshalet	Head of Environment Association in Homs
41	Ms. Mays Jrjnazi	Engineer for GCEA
42	Mr. Feras Abeedo	Engineer for GCEA

Major issues discussed in this National Committee are as follows;

a) Establishment of internal network among NGOs to coordinate the efforts of NGOs in cooperation with GCEA.
b) Issuance of seasonal newsletter by the national committee for public awareness showing activities of the national committee and NGOs.
c) Partnership among public authorities, NGOs, and communities reaching in personal level.
d) Allocation of complaint mail box with hotline to receive everything by the citizens for the environmental problems.
e) Importance of the constructive criticism to achieve good environment.
f) Proposal of the national strategy for public awareness.
g) Importance of media to distribute public awareness among citizens and the negative action for some local newspapers regarding dealing with environmental problems.
h) Sending the proposal of the national action plan for public awareness prepared by GCEA to the committee members to study it in advance.
i) Instructing all types of media to take care for the environment.
j) Following up the public awareness plan for the year 2006 within the capacity

development project implemented by JICA for the next meeting.

The committee has been hold at nine times so far according to GCEA. Members of committees are composed of various ministries, their line agencies, and other organizations. Based on the minutes of meeting for the committee, the following are mainly discussed.

Discussions in the National Committee for Information and Environmental Awareness

No.	Date	Main Items of Discussion
1st	22 Nov. 2005	・ Necessity of participation of environmental NGOs to the committee ・ Necessity of benefiting from other countries' experience to set a national strategy of public awareness and actions by the committee. ・ Necessity of step-wise approach for industrial pollution control; discussion with industries at first, dialogue on penalties at second and imposing penalties at third. ・ Necessity of coordination between Ministry of Tourism and MOLAE on granting environmental license by MOLAE.
2nd	1 Feb. 2006	・ Presentation on the JICA project. ・ Presentation on national proposal on public awareness ・ Establishment of network among environmental NGOs in cooperation with GCEA ・ Issuance of seasonal newsletter by the committee on public awareness showing the activities of the committee and NGOs ・ Allocation of complaint mail box with hotline to receive from the citizens on the environmental problems ・ The importance of the media for the public awareness raising of the citizens
3rd	26 Apr. 2006	・ Presentation on proposal for the National Strategy for Public Awareness ・ Proposal to cooperate with the Ministry of Interior to allow the members of the Environmental NGOs to monitor the vehicles pollution and sending reports on the monitoring to the Ministry of Interior to take required actions and issue penalties to the violators. ・ Utilization of the media to follow up the environmental problems and activation of the decrees issued in this regard. ・ The full media coverage for the activities of the National Committee of Public Awareness. ・ The committee decided to formulate a special committee to reformulate the proposal of the National Strategy for Public Awareness.
4th	30 May 2006	・ Minister of MOLAE sent a letter to the Minister of Interior regarding the cooperation with the Ministry of Interior on the participation of the NGOs members in monitoring the vehicle pollution and reporting to Ministry of Interior. ・ The Minister sent letters to the governors to formulate sub-committees for public awareness in DFEAs at the governorates. ・ The GCEA has built a web site to be utilized for public awareness. ・ Explanation of the report on principles for environmental education adopted by Ministry of Education to be ratified in meeting of High Council for Environmental Protection and Sustainable Development ・ Explanation on agenda of program for International Day for Environment in Deir ez Zor
5th	3 Oct. 2006	・ Explanation on agenda of program for Arabic Day for Environment on 14 Oct., 2006 ・ Presentation by Environment Pioneer Association on their activities ・ The importance of establishing Environmental Police to follow up the implementation of the Environmental Laws. ・ Necessity for setting action plan for this committee according the national strategy for public awareness.
6th	6 Mar. 2007	・ Discussion on proposal of action plan for the National Committee of the Public Awareness, including objectives, implementation procedures, outlines, and schedule. ・ Introduction on the Syrian Cost Association for Environment Protection ・ The Chamber of Commerce will cover cost on issuing non-periodical newsletter by the National Committee on the Public Awareness. ・ Establishment of small committee consisting of the committee members to discuss on the newsletter and to prepare a TOR for national program to enhance the public awareness activities. ・ Confirmation on importance of preparation of environmental films by collaboration between MOLAE and Ministry of Information.
7th	22 May 2007	・ Explanation on progress of discussion on the issuing newsletter and proposal of capacity development project regarding action plan of public awareness for the industrial sector. ・ Reporting progress of preparation for the ceremony in the International Environmental Day, that title will be the "Climate change"
8th	n/a	n/a
9th	n/a	n/a

note) n/a: data and information is not available at present

(3) Environmental Education and Public Awareness Action Plan

1) Guidance for Preparation of the Action Plan

Through discussion and communication among DFEA, Chamber of Industry, and the JICA Expert Team, it is revealed that more appropriate way for promotion of industrial pollution source control using monitoring data should be developed considering its socioeconomic background situation of each Governorate. Thus, the JICA Expert Team proposed GCEA to prepare a long term action plan for effective use of the monitoring data to pollution source control in each DFEA. Fortunately, all DFEAs are currently preparing a regional strategy on public awareness targeting broad wide stakeholders based on the national strategy prepared by the National Committee for Information and Environmental Awareness, and the suggested action plan is one of parts of this regional strategy targeting pollution sources.

After the series of discussion, GCEA agreed with this proposal and requested the JICA Expert Team to prepare a guideline for preparation for DFEA. The JICA Expert Team prepared the guidance as shown below, and its official request letter was sent to all DFEA by GCEA on 20 August 2007.

Guidelines for Preparation of Action Plan
for Industrial Pollution Source Control by Using Monitoring Data

1. Objectives
   (1) Describe your own objectives in your DFEA for promotion of industrial pollution control by using actual monitoring data. The target year is around 2015.
   (2) Objectives could be around five sentences with simple and clear description.
   (3) Objectives must correspond to the national strategy on public awareness decided by the National Committee for Information and Environmental Awareness.
   (4) Refer to the 10th 5-year plan of the Syrian Arab Republic, if any.

   For Example:
   - Enhancing environmental awareness to the industrial pollution sources,
   - Strengthening inspection using monitoring data,
   - Introduction of voluntary environmental monitoring in factories and enterprises, etc.

2. Strategy
   (1) Describe your own strategies in order to achieve the Objectives mentioned above.
   (2) Strategy is a kind of approach to attain the Objectives.
   (3) Strategies must correspond to the national strategy decided by the National Committee for Public Awareness.

   For Example:
   - Collaboration with the Chamber of Industry (COI),
   - Joint monitoring with target factories and enterprises,
   - Prioritization of target industrial pollution sources,
   - Partnership with industrial pollution sources,
   - Research and development of countermeasures against pollution
   - Development of inspection capability of the DFEA staff, etc.

3. Activities
   (1) Describe your own activities in order to achieve the Objectives.
   (2) Each Objective should have several activities.
   (3) Activities must correspond to the national strategy decided by the National Committee for Public Awareness.

   For Example:
   - Training for DFEA staff on pollution source control,
   - Training by DFEA for factory managers and staff in charge of pollution control such as cleaner production technology,
   - Periodical meeting between DFEA and industrial pollution sources to exchange technical information on specific

topic/issue,
- Introduction of registration system of factories and enterprises,
- Establishment of voluntary environmental monitoring by industrial pollution source and reporting system,
- Establishment of environmental fund to support to install environmental facility to the factory, especially small/medium scale factories,
- Public awareness activity for the citizens by introducing effort by DFEA and industrial firms on pollution control, etc.

4. Responsible and Implementation Organizations by Activity
   (1) Describe organizations collaborating with and concerning to the activity implementation.
   (2) DFEA must take an initiative in all activities.
5. Implementation Schedule (up to 2015)
   (1) Prioritize the activities to be implemented urgently.
   (2) Describe starting year and duration period of each activities.
   (3) Note specific remarks such as basic assumption and pre-condition.
   (4) Prepare a Table shown below.

Activity item		**Implementation Period**				
	Sub-item	**2007**	**2008**	**2009**	・・・	
1. Activity-1	1) Activity XX					
	2) Activity YY					
	・・・					
2. Activity-2	・・・					
・・・						

6. Others
   (1) Joint implementation of the action plan by DFEA and industrial pollution sources.
   (2) Progress of the action plan should be monitored periodically.
   (3) Annual report describing progress and result of the Action Plan should be prepared and submitted to GCEA.
   (4) The Action Plan should be reviewed and modified every year based on the progress.

2) Draft Action Plans Prepared by DFEAs

Based on the guidelines prepared by the JICA Expert Team in mid of August, 11 DFEAs submitted the draft action plans except for the Rakka, Quneitra, and Deir er Zor DFEAs. The draft action plans for 11 DFEAs are shown in Annex 5.

As results of reviewing the draft action plans, main observations are as follows.

- In most of the action plans, it seems that objectives are set to fit present situation in their governorates;
- Logical matching between the proposed strategies and activities are not clearly seen;
- Institutional responsibilities for proposed activities are not mentioned in the most of plans;
- The Chamber of Industry in the respective governorate is recognized as a key organization to link industrial pollution sources, and;
- Some plans do not have implementation schedule.

3) Recommendations

The following are recommended for further deliberation and coordination to implement the proposed action plan based on the planned schedule.

a) Holding series of meetings and/or workshop to share views and opinions on industrial pollution control by using monitoring data between GCEA and DFEAs to make the draft action plan prepared by DFEAs more realistic and effective;
b) Based on detailed action plan (or implementation plan), required budget should be estimated and secured in accordance with scheduled activities in the plan;
c) GCEA should support smooth implementation of the action plan by DFEA from various aspects such as legally, budgetary, and technically, and;
d) DFEA should secure adequate personnel in charge of implementation of the action plan.

3.6.2 Products of Activities

(1) Environmental Education

The output materials are listed below.

1) Demonstration display of "the Japanese Experience on Environmental Pollution" in Arabic Version
2) Full-set of the Eco-Plant Game
3) Brochures and Pamphlets for Demonstration and Dissemination Purpose
4) Environmental Work Manual

(2) Public Awareness to Pollution Sources

The output materials are listed below.

1) Demonstration display of "The History of Pollution and Environmental Restoration in Yokkaichi" in Arabic Version
2) Demonstration display of "Water Treatment Technology in Japan" in Arabic Version
3) Minutes of Meeting for the National Committee for the Public Awareness

(3) Environmental Education and Public Awareness Action Plan

The draft action plans for 11 DFEAs are attached in Annex 3.4.

3.7 Environmental Monitoring Plan

3.7.1 Training Activities

(1) Basic Lecture Training of Environmental Management and Monitoring

A basic lecture training of environmental management and monitoring was held twice (1st round: 5 to 8 June 2005, 2nd round: 12 to 15 June 2005) with the same contents being targeted C/Ps in charge of water quality analysis and data management in GCEA and 14 DFEAs. For the most C/P personnel, it is the first time to receive a lecture related to environmental management and monitoring and to carry out a lab analysis. Thus, a program of the basic lecture training of environmental management and monitoring should be started from fundamental level and be covered broad aspects related to environmental pollution and its management as shown below. In total, 64 C/Ps attended this training course and 54 C/Ps received a certificate. Beside the staff of GCEA and DFEAs, 17 staff coming from Ministry of Irrigation attended this training course. Its program and attendants are listed hereunder. In addition, a supplemental lecture was conducted only for C/P who could not fully attend the training course of the basic lecture training of environmental management and monitoring. Totally, 5 C/P (4 C/P from the Damascus Countryside DFEA and 1 from the Homs DFEA) attended to receive missed lectures and certificates after this supplementary training. Therefore, the staff received certificates are 59 C/Ps in total.

Program of the Basic Lecture Training of Environmental Management and Monitoring

Lecture	1st	2nd	3rd	4th
Day	**08:30-10:00**	**10:15-11:45**	**12:00-13:30**	**13:30-13:45**
1st Day	1.Environmental Management 1) Opening 2) Environment and its Management 3) Historical Lessons 4) Environmental Management in Japan	2.Environmental Monitoring 1) Water Quality Monitoring 2) Air Quality Monitoring	3.Basic W. Quality Analysis 1) Introduction 2) Equipment & Instrument 3) Structure of Monitoring 4) Cost & Budget	Evaluation
2nd Day	4.Sampling Design 1) Station 2) Sampling Method 3) Sampling Parameters 4) Field Record 5) Preservation & Storage	5.Sampling & Field Measurement 1) Procedure 2) Sampling Pattern 3) Measurement & Observation 4) Calibration 5) Recording 6) Experience in Homs	6.Analytical Theory & Skill-1 1) pH, W. Temp, Color, 2) Turbidity, EC, 3) TDS, SS, Cl 4) Equipment 5) Analysis Method 6) Demonstration	Evaluation
3rd Day	7.Analytical Theory & Skill-2 1) DO, BOD, COD, 2) Equipment 3) Analysis Method 4) Demonstration	8. Analytical Theory & Skill-3 1) NH_4-N, NO_3-N, PO_4-P, 2) Equipment 3) Analysis Method 4) Demonstration	9.Laboratory Operation 1) QA/QC 2) Standard Operation Procedure (SOP) 3) O/M 4) Safety	Evaluation
4th Day	10.Data Management 1) Objective 2) Data Management Structure 3) Check & Recording 4) Publication	11.Public Awareness & Environmental Education 1) Objective 2) Methodology 3) Risk Communication 4) Stakeholders	12.Summary & Discussion 1) Summary of Training 2) Discussion 3) Total Evaluation 4) Closing and Certification Conferment	-

Attendance List for Basic Lecture Training Course (1st Round on 5-8 June, 2005)

No.	Name	Authority	Lecture No. and Attendance												
			1	2	3	4	5	6	7	8	9	10	11	12	C
1	Dr. Yasin Moa'alla	GCEA	P	P	P	A	A	A	A	A	A	A	A	A	X
2	Ms. Fathia Mohammad	GCEA	P	P	P	P	P	P	P	P	P	P	P	P	○
3	Mr. Khaled Kassem	Damascus DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
4	Ms. Layla Al Durra	Damascus DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
5	Ms. Iman Sulayman	Damascus DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
6	Ms. Reem Sadr Eddin	Damascus DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
7	Ms. Raniya Sulayman	Damascus DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
8	Mr. Mohmmoud Hasan Essma'el	Aleppo DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
9	Mr. Ahmad Mo'ala Ahmad	Aleppo DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
10	Mr. Ilia Wasel	Aleppo DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
11	Ms. Reem Kanbar	Hama DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
12	Ms. Hebah Khouri	Hama DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
13	Ms. Nameer Warrar	Hama DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
14	Ms. Yesra Taifour	Hama DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
15	Mr. Saher Abdullah	Deir ez Zor DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
16	Ms. Fathia Moine'e	Deir ez Zor DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
17	Mr. Nawaf Othman	Hasakeh DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
18	Mr. George Shabo	Hasakeh DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
19	Mr. Aysar Beniameen	Hasakeh DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
20	Mr. Emad Meslet	Hasakeh DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
21	Mr. Mustafa Al Abu	Rakka DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
22	Mr. Thani Al-Abed	Rakka DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
23	Mr. Omay'mah Al Sha'ar	Sewida DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
24	Mr. Thaer Hamzeh	Sewida DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
25	Ms. Khozama Abo Saab	Sewida DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
26	Ms. Mervat Al Safadi	Sewida DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
27	Ms. Rowdaina Al-Ali	Tartus DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
28	Mr. Dalal Ibrahim	Tartus DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
29	Ms. Ameera Omran	Tartus DFEA	P	P	P	A	A	A	P	P	P	P	P	P	X
30	Mr. Mohannad Dieb	WRIC	P	P	P	P	P	P	P	P	P	P	P	P	○
31	Mr. Nazeer Esmaeil	WRIC	P	P	P	P	P	P	P	P	P	P	P	P	○
32	Mr. Omran Mohammed	WRIC	P	P	P	P	P	P	P	P	P	P	P	P	○
33	Ms.Naheda Fallouh	Directorate	P	P	P	P	P	P	P	P	P	P	P	P	○
34	Mr. Basem Jamaz	Directorate	P	P	P	P	P	P	A	A	A	P	P	P	X
35	Mr.Yasin Tomeh	Directorate	P	P	P	P	P	P	P	P	P	P	P	P	○
36	Mr. Mohammed Refai	Directorate	P	P	P	P	P	P	P	P	P	P	P	P	○
37	Mr. Qasem Sharideh	Directorate	P	P	P	P	P	P	P	P	P	P	P	P	○
38	Ms. Reem Mashta	Ministry of Irrigation	P	P	P	P	P	P	P	P	P	P	P	P	○
39	Mr. Fadi Edris	Ministry of Irrigation	P	P	P	P	P	P	P	P	P	P	P	P	○
40	Ms. Zok'a Ra'ad	Ministry of Irrigation	P	P	P	P	P	P	P	P	P	P	P	P	○

Note: P=present, A=absent, C=certificate, ○=certificate received, X=certificate not received

Attendance List for Basic Lecture Training Course (2nd Round on 12-15 June, 2005)

No.	Name	Authority	Lecture No. and Attendance												
			1	2	3	4	5	6	7	8	9	10	11	12	C
1	Mr. Ahmad Al-Mohammad	GCEA	A	A	A	A	A	A	A	A	A	A	A	A	X
2	Mr. Shaka Soliman	GCEA	P	P	P	P	P	P	P	P	P	P	P	P	○
3	Ms. Aida Halweel	Damascus Countryside DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
4	Ms. Nisreen Dawoud	Damascus Countryside DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
5	Mr. Shireen Aowad	Damascus Countryside DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
6	Mr. Mohammed Hassan Diab	Damascus Countryside DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
7	Mr. Hosam Eddin Al-Barodi	Damascus Countryside DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
8	Mr. Moneer Sarhan	Damascus Countryside DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
9	Ms. Mona Al-Jom'a	Damascus Countryside DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
10	Mr. Ali Ibrahim	Quneitra DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
11	Mr. Bassam Orabi	Quneitra DFEA	P	P	A	A	A	A	A	A	A	A	A	A	X
12	Mr. Majed Zaitoun	Quneitra DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
13	Mr. Hamzeh Soliman	Quneitra DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
14	Ms. Amaal Merhej	Lattakia DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
15	Mr. Wael Jadeed	Lattakia DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
16	Mr. Ahmed Karah Ali	Lattakia DFEA	A	P	A	A	A	A	A	A	A	A	A	A	X
17	Mr. Senan Deeb	Lattakia DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
18	Mr. Adel Habib	Lattakia DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
19	Mr. Mohammad Alhusein	Rakka DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
20	Ms. Shams Aljasem	Rakka DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
21	Ms. Donia Gharib	Aleppo DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
22	Mr. Mohammad Al-hariri	Dara DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
23	Mr. Ahmad Kablawe	Dara DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
24	Mr. Diea Shabat	Dara DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
25	Mr. Ateea Zwayda	Dara DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
26	Mr. Mustafa Al-dghayem	Idleb DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
27	Mr. Sameer Da'boul	Idleb DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
28	Mr. Suhaib Edrees	Idleb DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
29	Mr. Khalid Fashtuk	Idleb DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
30	Mr. Muhamed Ali Al Husien	Homs DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
31	Ms. Sana Mansour	Homs DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
32	Ms. Hanan Naffouj	Homs DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
33	Ms. Alisar Kassab	Homs DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
34	Ms. Itidal Awad	Homs DFEA	P	P	P	P	P	P	P	P	P	P	P	P	○
35	Ms. Leen Norieh (P awareness)	Homs DFEA	-	-	-	-	-	-	-	-	-	P	P	P	-
36	Mr. Shoaib Abdulkarim	WRIC	P	P	P	P	P	P	P	P	P	P	P	P	○
37	Mr. Ali Ass'ad	WRIC	P	P	P	P	P	P	P	P	P	P	P	P	○
38	Mr. Shaher Abdallah	WRIC	P	P	P	P	P	P	P	P	P	P	P	P	○
39	Mr. Tamim Ali	Costal Basin Directorate (Lattakia)	P	P	P	P	P	P	P	P	P	P	P	P	○
40	Mr. Yaroub Al-Saleh	Costal Basin Directorate (Tartous)	P	P	P	P	P	P	P	P	P	P	P	P	○
41	Mr. Yaser Ma'rouf	Costal Basin Directorate (Al-Sein)	P	P	P	P	P	P	P	P	P	P	P	P	○

Note: P=present, A=absent, C=certificate, ○=certificate received, X=certificate not received

(2) Basic Water Quality (BW)

1) Preparation of Environmental Monitoring Plan for Basic Water Quality

According to the Project Design Matrix (PDM) in R/D, an environmental monitoring plan specifying parameters and sites in each laboratory should be prepared by 1 year after the commencement of the Project. Since the end of 2005, following measures have been taken by the JICA Expert Team to train C/Ps for preparing environmental monitoring plan on Basic Water Quality (BW).

- Active use of the results of pollution sources survey;
- Format of environmental monitoring plan;
- Lecture training and OJT for preparation of annual monitoring plan, and
- Lecture training and OJT for preparation of annual budget plan.

The details of the annual environmental monitoring plan prepared by DFEA, and the number of samples actually collected in 2006 and 2007 are shown in the table below.

Summary of Annual Monitoring Plan on BW Prepared by 14 DFEAs

NO.	DFEA	Major Objectives	Sampling Frequency	Number of Samples in 2006			Number of Samples in 2007		
				Plan	Actual	%	Plan	Actual	%
1	Damascus	Industrial wastewater and river water	2 samples/Month 3 samples/Week	138	147	107%	126	54[4)]	43%
2	Damascus Countryside	Industrial wastewater	2-4 times/Year/St	127	114	90%	170	224	132%
3	Aleppo	Industrial wastewater	1-3 times/ Year/St	77	61[2)]	79%	36	36[2-3)]	64%
4	Homs	Industrial wastewater and river water	1-6 times/ Year/St	216-296	90	42%	42	120[3)]	286%
5	Hama	Industrial wastewater	5-10 times/ Year/St	185	81[1)]	44%	179	83[3)]	46%
6	Lattakia	Industrial wastewater and river/lake water	6-12 times/ Year/St	198	114	58%	128	103	80%
7	Deir ez Zor	Industrial wastewater and river water	2-12 times/ Year/St	71	50[2)]	70%	77	31[2)]	40%
8	Idleb	Industrial wastewater and river water	1-2 times/ Year/St	55-57	50[1-2)]	91%	50	32[2)]	64%
9	Hasakeh	River and lake water	12-48 times/ Year/St	176	46[1-2)]	26%	69	65[2)]	94%
10	Rakka	Industrial and domestic wastewater, river water	2-4 times/ Year/St	38	40[2)]	105%	44	40[2)]	91%
11	Sweida	Spring, groundwater and industrial wastewater	2-5 times/ Year/St	94	91	97%	74	73	99%
12	Dara'a	Industrial and domestic wastewater, groundwater	1-3 times/ Year/St	55	47[2)]	85%	51	53[2-3)]	104%
13	Tartous	River and spring water	2-3 times/ Year/St	42	54	129%	69	78	113%
14	Quneitra	Industrial and domestic wastewater, dam water	3-12 times/ Year/St	36	41[2)]	114%	39	30[2-3)]	77%
Total				**1,508**	**1,026**	**68%**	**1,154**	**1,009**	**87%**

Note: 1): The annual monitoring plan is modified based on actual situations.
2): The DFEA in which laboratory C/Ps have to do additional works except basic water quality analysis.
3): The DFEA that relocated the laboratory to new building in 2007.
4): Till November 2007, Damascus DFEA has receiving chemical and biological training, which results C/Ps in Damascus DFEA could not carry out basic water quality monitoring in accordance with annual monitoring plan.

As shown in the table above, in some DFEAs the monitoring activities have been implemented nearly according to the monitoring plan. However, some DFEAs have a gap between planned numbers and collected numbers of samples mainly due to relocation and reset of the laboratory and part-time works of C/Ps. Moreover, C/Ps are required to receive additional trainings provided by GCEA such as for atomic absorption spectrophotometer (AAS) and gas chromatograph (GC) in the Damascus Countryside and the Homs DFEAs, for air quality analysis of mobile laboratory in the Idleb DFEA, and for chemical and biological analysis in the Damascus DFEA.

2) Preparation of Budget Plan for Environmental Monitoring for Basic Water Quality

According to R/D, the Syrian side should allocate the budget for electricity and water tariff, consumable supply for laboratories and equipment such as chemical reagents and spare parts from

2006. In July 2005, the JICA Expert Team prepared an annual budget for 2006. During December 2005 to February 2006, the JICA Expert Team provided lecture training and OJT to 14 DFEAs for preparation of the annual budget plan of 2007. As the result of the training, the annual budget plan of 2007 was prepared by each DFEA. The details of annual budget application and acquisition for basic water quality monitoring in 14 DFEAs are shown in the table below.

Annual Budget for Basic Water Quality Monitoring in 14 DFEAs

NO.	DFEA	Annual Budget in 2006 (×1,000 SP)		Annual Budget in 2007 (×1,000 SP)	
		Required[1]	Received	Required[1]	Received
1	Damascus	520	1,500[3]	No budget from GCEA	
2	Damascus Countryside	520	87	500	600
3	Aleppo	520	127	500	600
4	Homs	520	100	1,000	500
5	Hama	520	104	500	500
6	Lattakia	520	670	1,200	500
7	Deir ez Zor	520	129	500	400
8	Idleb	520	494	300	200
9	Hasakeh	520	502	500	300
10	Rakka	520	75	300	200
11	Sweida	520	600	500	300
12	Dara'a	520	500	200	200
13	Tartous	520	600	500	500
14	Quneitra	520	50	500	200
Total		**7,280**	**5,538**	**7,000**	**5,000**

Note: 1) Prepared by the JICA Expert Team
2) Prepared by each DFEA after receiving annual budget plan training
3) Budget provided by Damascus Governorate.

(3) Chemical and Biological Water Quality Analysis

One of the major objectives of water quality monitoring is to define and evaluate the status and the trend of aquatic environment properly. In order to achieve this objective, the appropriate water quality parameters should be selected and monitored in the monitoring plan. The water quality monitoring has been implemented in each DFEA according to the environmental monitoring plan formulated by each DFEA. The existing environmental monitoring plans now being implemented including only the parameters of the Basic Water Quality Analysis. In order to evaluate the water quality adequately and totally, the monitoring of additional parameters such as chromium and cyanide that are included in the Chemical and Biological Water Quality Analysis will be required.

The laboratory of Damascus DFEA is to be functioned as a central laboratory among 14 DFEAs. One of its functions is to get a capability of analyzing several water pollution parameters which other 13 DFEAs are not able to analyze at present. Fourteen parameters subject to the training for Chemical and Biological Water Quality Analysis in Damascus DFEA have been selected. The training for the measurement of these parameters has completed by the end of the Project. On the other hand, trainings for the measurement of additional parameters, those are almost same as the parameters in the Damascus DFEA, for the use of spectrophotometers and oil content meters have been conducted in three selected DFEAs, namely the Damascus Countryside, Homs and Aleppo DFEAs. The samples collected in the remaining 10 DFEAs are to be transported to the Damascus DFEA and the Damascus

DFEA analyzes the received samples at the request of 10 DFEAs.

Water quality analysis consists of several series of analytical procedures, starting from sampling and ending with reporting. Reliability of the produced data depends on these analytical procedures. In other word, implementation of improper procedure leads a cause of errors of produced data. In the context of the sample transportation/reception system, sampling is a crucial factor to secure a reliability of data. In order to establish the sample transportation/reception system, lecture trainings titled “Sampling Guide” had been made in all DFEAS in November and December, 2007.

The 10 DFEAs are to be required to review and amend the existing environmental monitoring plan of the year of 2007 taking into account the above matters and the additional parameters for the implementation of water quality monitoring in 2008. Four DFEAs, the Damascus, Damascus countryside, Homs and Aleppo DFEAs, are also required to review and amend the existing environmental monitoring plan taking into account the new parameters for the next year. The review and the amendment will be continuously conducted after the termination of the Project. Each DFEA is to conduct the monitoring according to this modified environmental monitoring plan.

(4) Heavy Metal Analysis

Responding to acquisition of analyses for all parameters and activities for metal analysis in other 13 DFEAs, EMO plans had been submitted from 6 DFEAs (Aleppo, Hasakeh, Idleb, Rakka, Sweida and Tartous) to the Damascus DFEA at each DFEA’s option until November 2007. Total numbers of stations were 67 and 98 samples would be collected. At the end of November, 36 of 98 samples had been received and measured in the Damascus DFEA. 442 data had been accumulated up to November 2007..

(5) Air Quality

Because of the delay in procuring the equipments of air quality analysis, the original plan of supporting the preparation of "environmental monitoring plan" was started from January 2006. Considering the progress of the Capacity Development in the Damascus, Homs and Aleppo DFEAs, the original plan had been modified, and the final Environmental Plan of Air Quality Analysis was completed by C/Ps themselves in June 2007.

The effective use of the full-scale Environmental Monitoring Plan of the air quality analysis will be started from the beginning of 2008. Taking the Environmental Monitoring Plan into account, the field training was repeated actively.

The table below summarizes the Environmental Monitoring Plan prepared by the Damascus, Homs and Aleppo DFEAs.

Summary of the Environmental Monitoring Plan

Measuring object	No. of measuring points/(sampling frequency)		
	Damascus	**Homs**	**Aleppo**
A. Industrial region 1) Food plant 2) Textile plant 3) Chemical plant, etc.	(2 points) (once/ 1-2 month)	(2 points) (Once/ month)	(4 points) (Once/2 months)
B. Mobile sources area 1) Arterial road	(7 points) 1) 1 point (once/ 3 months) 2) 6 points[1)] (once/ month)	(2 points) (Once/ month)	(1 point) (Once/ month)
C. Area source zone 1) Residence zone 2) Commercial zone 3) Clean area (BG)	(4 points) 1) 2 points 2) 1 point 3) 1 point[2)] (once/ 3 months)	(3 points) 1) 1 point 2) 1 point 3) 1 point (Once/ month)	(3 points) 1) 1 point 2) 1 point 3) 1 point (Once/2-3 months)
D. Weather condition (Continuous monitoring)	(3 points) 1) Downtown 2) Damascus DFEA 3) WRIC[*1)]	(3 points) 1) Homs Muhafaza 2) Hikma hospital 3) Kattina	(3 points) 1) Downtown 2) Dying Factory 3) Water Treatment Factory
E. Others 1) Large area 2) Dust fall	1) 25 points (4 times/ yr) 2) 7 points (Once/ month)	1) 25 points (4 times/ yr) 2) 4 points (Once/ month)	1) 25 points (4 times/ yr) 2) 4 points (Once/ month)

Note: 1) Planned subway line, 2) Zoo

The table below illustrates the planned monitoring items in the Damascus, Homs and Aleppo DFEAs. The original Environmental Monitoring Plans prepared by each DFEA are shown in Annex 5.

Summary of Items in the Environmental Monitoring Plan

A: Industrial region B: Mobile sources C: Area source D: Others

No.	Parameters	Damascus				Homs				Aleppo			
		A	B	C	D	A	B	C	D	A	B	C	D
1. Field Measurement													
(1) TSP		○	○	○		○	○	○		○	○	○	
(2) SPM		○	○	○		○	○	○		○	○	○	
(3) NO, NO_2, NO_x		○	○	○	○	○	○	○	○	○	○	○	○
(4) SO_2		○	○	○	○	○	○	○	○	○	○	○	○
(5) O_3 (O_x)		○	○	○			○	○			○	○	
(6) NH_3		○											
(7) Dust fall: Dissoluble and insoluble substance		○	○	○		○		○		○		○	
2. Laboratory Analysis													
(1) Pb		○	○	○		○	○	○		○	○	○	
(2) Zn		○	○	○		○	○	○		○	○	○	
(3) Cd		○	○	○		○	○	○		○	○	○	
(4) Cu		○	○	○		○	○	○		○	○	○	
(5) Cr		○	○	○		○	○	○		○	○	○	
(6) Fe		○	○	○		○	○	○		○	○	○	
(7) Mn		○	○	○		○	○	○		○	○	○	
(8) Ca										○	○	○	
(9) V										○	○	○	
3. Weather Station													
(1) Wind Direction		○				○				○			
(2) Wind Velocity		○				○				○			
(3) Temperature		○				○				○			

No.	Parameters	Damascus				Homs				Aleppo			
		A	B	C	D	A	B	C	D	A	B	C	D
(4) Relative Humidity			○				○				○		
(5) Solar Radiation			○				○				○		

(6) Preparation of Environmental Monitoring Guidelines

The Environmental Monitoring Guideline to be prepared by each DFEA should guide a direction of monitoring activities of DFEA, and should instruct technical and administrative matters for preparation of the Environmental Monitoring Plan of DFEA. The DFEA has prepared environmental monitoring plans for 2006 and 2007 in line with the activities of the Project, and obtained a lot of lessons through actual implementation of monitoring activities. Based on the lessons learned and the regional peculiarities on the environment of each Governorate, each DFEA prepared its own Environmental Monitoring Guideline. The Guidelines prepared by DFEA are to be a base for the National Environmental Monitoring Guideline.

This Guideline is one of the Outcomes stated in PDM of the Project, and it should be compiled substantial items and information obtained through the Project for preparation and implementation of environmental monitoring in sustainable manner. The JICA Expert Team prepared Table of Content of the Guideline and its explanatory guidance as per attached in this instruction paper. The DFEA was requested to prepare your own environmental guideline in accordance with the guidance.

The Environmental Monitoring Guideline should explicitly state the following items/ issues considering specific regional characteristics of environmental situations in each Governorate. This Guideline should orient and instruct for sustainability the Environmental Monitoring Plan to be prepared by DFEA every year. Thus, the description of the Guideline must be substantial, concise, and concrete as much as possible, and it should be continuously modified and elaborated by DFEA based on the actual implementation results of the Environmental Monitoring.

1) Objectives of Environmental Monitoring
2) Selection of Coverage Area and Monitoring Stations
3) Demarcation and Collaboration with other concerned Ministries and Agencies
4) Contents and Measuring Plan
5) Collection, Arrangement, Interpretation, and Usage of Monitoring Data
6) O/M of Facilities, Equipment, Instruments, Reagents, and Chemicals including QA/QC
7) Staffing and Budget Preparation
8) Report Preparation and Submission to GCEA
9) Others

3.7.2 Products of Activities

(1) Basic Lecture Training of Environmental Management and Monitoring

This lecture training was carried out for introductory purpose of the Project. Therefore, it consists of mostly basic information related to environmental monitoring and management. The JICA Expert Team prepared training materials by slides and hand out for lecture. Also, the JICA Expert Team conducted a display of the "Japan's Lessons on Economy and Environment" for visual aid. The training materials prepared by the JICA Expert Team are in Annex 2.3.

(2) Basic Water Quality (BW)

The list of the Annual Environmental Monitoring Plan and its Report, and the comments on the plan by the JICA Expert Team are summarized in the tables below. The prepared Annual Environmental Monitoring Plan in 2006 and 2007, and the Annual Reports for basic water quality in 2006 are attached in Annex 3.5 and Annex 3.6, respectively.

List of Products for Basic Water Quality Monitoring in 14 DFEAs

NO.	DFEA	Environmental Monitoring Plan		Annual Monitoring Report
		2006	2007	2006
1	Damascus	O	O	O
2	Damascus Countryside	O	O	O
3	Aleppo	O	O	O
4	Homs	O	O	O
5	Hama	O	O	O
6	Lattakia	O	O	O
7	Deir ez Zor	O	O	O
8	Idleb	O	O	O
9	Hasakeh	O	O	O
10	Rakka	O	O	O
11	Sweida	O	O	O
12	Dara'a	O	O	O
13	Tartous	O	O	O
14	Quneitra	O	O	O
Total		**14**	**14**	**14**

Principal Comment on Monitoring Plan by the JICA Expert Team

Comment/ Evaluation	Environmental Monitoring Plan	
	2006	2007
Contents	- to attach location map and schedule - to reconsider sampling Nos. considering analysis capacity - to mention analysis method in each parameter Contents are mostly acceptable.	- to describe sampling method such as composite sampling including interval time - to include QA/QC activity - to include budget plan Contents are much better than 2006.
Format and others	- to use unified format - to sign by Lab chief Introduction of unified format should be considered.	- no substantial comments Continuous advice and leadership of GCEA is required.

(3) Chemical and Biological Water Quality Analysis

The lecture trainings for the sample transportation/reception system had been made in all DFEAS in November and December, 2007. Purposes of the lecture are; 1) to establish the sample

transportation/reception system between the Damascus DFEA and other 13 DFEAs, and 2) to modify the existing environmental monitoring plan that includes the additional water quality parameters. The following table shows the material used for the lecture.

Sampling Guide/Sample Preservation

Parameter	Analytical Method Adopted	Container	Preservation	Minimum Sample Volume (Preferred Volume)	Holding Time	Container No.
Oil and Grease	Solvent extraction /Infrared absorptiometry	G, wide-mouth (Washed with soap, rinsed with water, and finally rinsed with solvent to remove any residues)	H_2SO_4 (1:1) or HCl (1:1) to pH below 2. (Don't overfill the sample container and don't subdivide the sample in the laboratory. Refrigerate)	1,000 mL (1,000 mL)	28 days	1
Orthophosphate (PO_4^{3-})	Spectral photometric	P or G (Container should have been cleaned with 1:1 HCl and rinsed with Deionized water. Don't use commercial detergents containing phosphate for cleaning glassware used in phosphate analysis)	Analyze samples immediately for best results. If prompt analysis is not possible, preserve samples by filtering immediately and add 5 mL of chloroform per 1 L of sample, and storing at 4. The sample should be at room temperature before analysis.	100 mL	48 hrs	2
Nitrogen, Ammonia (NH_3-N)	Spectral photometric	P or G	Refrigerate at 4°C for samples to be analyzed within 24 hr. H_2SO_4 (1:1) or HCl to pH below 2. (Analyze as soon as possible, refrigerate. If chlorine is present, add one drop of 0.1 N Sodium Thiosulfate for each 0.3 mg/L Cl_2 in a 1-liter sample. Refrigerate. Warm samples to room temperature and neutralize with 5 N Sodium Hydroxide (NaOH) before analysis. Correct the test result for volume additions.)	500 mL	7 days (28 days: stored sample)	3
Surfactants	Spectral photometric	P or G	Store at 4°C or less (refrigerate) Warm to room temperature before testing	(500 mL)	24 hrs	2
Chromium, Total (Cr-T)	Spectral photometric	P or G (acid-washed container)	HNO_3 to pH below 2 (Approximately 2 mL per liter of the acid. Store preserved samples at room temperature up to six months. Adjust the pH to about 4 with 5.0 N Sodium Hydroxide (NaOH) before analysis. Correct the test result for volume additions)	(300 mL)	6 months	4
Chromium, Hexavalent (VI)	Spectral photometric	P or G (Rinsed with 1:1 HNO3, Refrigerate)	Store at 4°C in neutrality up to 24 hours. Must be analyzed within 24 hours.	300 mL	24 hrs	2
Sulfide (S^{2-})	Ion selective electrode	P or G	Fill completely and cap tightly. Avoid excessive agitation or prolonged exposure to air. Add 4 drops of 2N Zinc Acetate ($(Zn(CH_3COO)_2 \cdot 2H_2O)$)solution in the sample bottle per 100 mL sample before sampling. And then adjust pH to above 9 by adding Sodium Hydroxide. Refrigerate	100 mL	7 days	5
Nitrate (NO_3^-)	Ion selective electrode	P or G	H_2SO_4 (1:1) to pH below 2, Refrigerate	200 mL	48 hrs	3
Nitrite (NO_2^-)	Spectral photometric	O or G	Analyze as soon as possible. Add 1 mL of chloroform per 1 L sample. Store 4°C in dark place.	100 mL	48 hrs	

Parameter	Analytical Method Adopted	Container	Preservation	Minimum Sample Volume (Preferred Volume)	Holding Time	Container No.
Chloride (Cl^-)	Ion selective electrode	P or G	No special preservation	100 mL	28 days	2
Fluoride (F^-)	Ion selective electrode	P Glass bottles are satisfactory if previously they have not contained high-fluoride solutions. Always rinse bottle with a portion of sample.	No special preservation	300 mL	28 days	2
Cyanide (CN^-)	Ion selective electrode	P (Amber) or G (Amber)	NaOH to pH above 12, Refrigerate	500 mL		6
pH	Ion selective electrode	(On site measurement)				
Electric conductivity (EC)	Ion selective electrode	(On site measurement)				
Suspended solid	Filtrate weight	P or G Be provided that the material in suspension does not adhere to container walls.	Begin analysis as soon as possible because of the impracticality of preserving the sample. Refrigerate sample at 4°C up to the time of analysis to minimize microbiological decomposition of solids. Transportation and short-term storage of sample will not normally affect the results of the test. Bring samples to room temperature before analysis.			
Settleable solid	Still standing				Preferably do not hold samples more than 24 hr. In no case hold sample more than 7 days.	
COD_{Cr}	Open reflux method	P or G (Preferably collect samples in glass bottles.)	H_2SO_4 (1:1) to pH below 2 Test unstable samples without delay. If delay before analysis is unavoidable, preserve sample by acidification to pH≤2 using conc. H2SO4. Preferably acidify any sample that cannot be analyzed the same day it is collected. Blend samples containing Settleable solids with a homogenizer to permit representative sampling. Make preliminary dilutions for wastes containing a high COD to reduce the error inherent in measuring small sample volume. Refrigerate	100 mL	7 days	3
Total coliform	Membrane filter technique	P or G (Should be properly sterilized, either with alcohol, or using an autoclave)	HCl (1:1) to pH below 2	100 mL	6 hrs	7
Heavy Metals	Atomic absorption photometry	G or P (Preferably collect samples in plastic bottles.)	HNO_3 to pH below 2	100 mL		8

Note: P = Plastic (polyethylene or equivalent); G = Glass
Sampling plan should be made based on kinds of the parameters analyzed.

(4) Heavy Metal Analysis

The Environmental Monitoring Plans had been submitted from 6 DFEAs (Aleppo, Hasakeh, Idleb, Rakka, Sweida and Tartous) to the Damascus DFEA including each DFEA's option until November 2007. The submission of the plans was not obligation considering that some of DFEAs had or would have their own atomic absorption spectrophotometer, and measurements would cost eventually. A summary of the plans is shown below.

EMO Plans for Metal Analysis submitted to Damascus DFEA up to November 2007

Samples		Period yyyy / mm	2007 7	8	9	10	11	12	2008 1	2	3	4	5	6
DFEA	No.	Name												
Aleppo	1	Marwan Al Olabi dying factory		a										
	2	Sokar dying factory					a							
	3	Barakat medicine Factory			a									
	4	Ka'keh dairy factory			a									
	5	Al Samoor factory				a								
	6	Abagee for chemicals				a								
	7	Imad Lotfi paper factroy					a							
	8	Molar Ice-cream factory		a										
	9	Mineral oil factory						a						
	10	Melting and coating factroy						a						
Damascus	1	ihda'ashareea			a				a			a		
	2	wells				a				a			a	
	3	dappaghat			a				a			a		
	4	fa				a				a			a	
	5	alarabi washing car				a				a			a	
	6	khomasia			a				a			a		
	7	bab sharqi dying					a				a			a
	8	gallab					a				a			a
	9	zamzam					a				a			a
Hasakeh	1	Taban spring			a						a			
	2	Bassel Al Assad lake			a						a			
	3	The enterance of Al Khabour river to Syria			a						a			
	4	The enterance of Al Jag Jag river to Syria			a						a			
	5	Al Khabour river before the lake			a						a			
	6	Al Jag Jag at the outlet of Al Kameshli			a						a			
Idleb	1	Sugar factory- Jeser Shougour city	a		a						a			
	2	Idleb zoon waste water		a		a								
	3	Al Asi river before Jeser Shougour city	a		a						a			
	4	Al Asi river after Jeser Shougour city	a		a						a			
	5	Idleb sewage		a		a								
	6	Glass factory- Jeser Shougour city	a											
	7	Unspecified samples												
Rakka	1	Sugar factory			a									
	2	olive press factory						a						
	3	sewage									a			
	4	agriculture waste water										a		
	5	Soda factory												a
Sweida	1	Sewage			a									
	2	Al Jabal juice factory			a									
	3	Alcohol factory				a								
	4	Al Rayan factory				a								
	5	Waste water of Sweida hospital				a								
	6	Areeka spring					a							
	7	Meerib water					a							
	8	Al Room dam					a							
	9	Habran dam					a							
	10	Ein mousa spring					a							
	11	E'ra well					a							
Tartous	1	Al Sheikh Badr spring	a											
	2	Ein Al Za'roor spring	a											
	3	Al Soorani lake	a											
	4	Al Soorani dam	a											
	5	Al Abrash river-Ein Mere'		a										
	6	Al Sheikh Hasan spring		a										
	7	Th stream of Al Sheikh Hasan spring		a										
	8	Markieh river- near Al Kodmous restaurant					a							
	9	Al Hoen river- Karkafte					a							
	10	Khawandah press factory					a							
	11	Al Basel dam			a									
	12	Al Basel lake			a									
	13	Al Sesnieh			a									
	14	Al Hoen river- Al Barbakieh				a								
	15	Al Hoen river- Al Ewnieh				a								
	16	Al Hoen river- Al Zarah				a								
	17	Vegetation oil refinery- Al Jamaseh		a										
	18	Al Arous river- Al Tale'i						a						
	19	Al Ward river-Al Madhaleh						a						
Total		67 sampling stations	98 samples × 14 parameters = 1372 measurments											

Legend a : All 14 items (Ag, Al, As, Ba, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Sb, Zn)

(5) Air Quality

The C/Ps of the Damascus, Homs and Aleppo DFEAs are now capable for conducting air quality monitoring successfully with respect to air pollutants and SPM. Due to training period constraint, establishing an environmental monitoring plan for investigation targets in roads or factories can not be done satisfactorily by C/Ps. In addition, C/Ps can not completely carry out data analysis and

interpretation.

The delay in procuring the equipment of air quality analysis resulted specially in shortening the training period. However, even though the training period was short and C/Ps did not have experience in the air quality analysis, their skill level was improved. On the other hand, C/Ps have a positive attitude with respect to the environmental monitoring, which is considered a project outcome. A summary of the concrete Products of Activities is mentioned in Chapter 3.4.1.

(6) Preparation of Environmental Monitoring Guideline

In order to support for preparation of the Environmental Monitoring Guideline in each DFEA, the JICA Expert Team prepared the following explanatory guidance. Each DFEA prepared its own Environmental Monitoring Guideline in accordance with this explanatory guidance.

The prepared Environmental Monitoring Guideline in each DFEA is in Annex 3.3.

<<Guideline for Environmental Monitoring in XXX DFEA>>

1. Objective of Environmental Monitoring

(1) To …
(2) To …
(3) To …
note:
a) Consider both air and water if you have capability.
b) Principal function of monitoring in MOLAE is pollution source control especially for water quality monitoring.
c) When your objective includes a monitoring in public water bodies (inc. spring, reservoir, groundwater), you should refer collaboration with other concerned ministries and agencies in this Guideline.
d) Remind that Syria has discharge standard for water, and ambient and emission standard in air.

2. Selection of Coverage Area and Monitoring Stations

2.1 Coverage Area
(1)
(2)
(3)
note:
a) All territory of your Governorate in principle.
b) You should specify the prioritized areas/ fields to be monitored considering peculiarity of your Governorate, such as AAA industrial zone, BBB river basin, etc.
c) Attach general map showing location of the prioritized are in this Guideline.

2.2 Monitoring Stations
(1)
(2)
(3)
note:
a) Describe principles to set monitoring station in your Governorate, such as individual pollution source and/ or area base, type and scale of pollution sources, priority on discharge/ emission quality, etc.
b) Specify fix and mobile monitoring stations with their main purposes.
b) Not necessary to show specific monitoring stations in this Guideline. These should be decided in the Environmental Monitoring Plan.

3. Contents and Measuring Plan

Prepare the following Table.

Name of Agency	Ministry	Contents of Collaboration	Remarks
1.	M of Irrigation	1) monitoring plan preparation 2) monitoring of reservoir	1) meeting one time/ year 2) sampling same time one time/ month
2.			

note:
a) Collaboration for QA/QC is to be described in Chapter 6.

4. Contents and Measuring Plan

Prepare the following Table.

Monitoring Type	Sampling Method	Frequency	Parameters	Analysis Method	Remarks
1. Water quality (pollution source)	- direct sampling -composite sampling	- one time/ month	- 14 parameters (BOD, …)	- simple analysis - chemical and bio - AAS	- sending sample to DAM DFEA for analysis
2. Water quality (public water body)					
3. Air quality (pollution source)					
4. Ambient air quality				- simple sampler - mobile station	

note:
a) Describe mostly principles only.
b) Details to be attached in this Guideline, if any.

5. Arrangement, Interpretation, and Usage of Monitoring Data

5.1 Arrangement and Interpretation
(1) To …
(2) To …
note:
a) Describe principle procedure for collection, input, arrangement, and interpretation.
b) Training materials for SOP, O/M manual, data management should be used.

5.2 Usage of Monitoring Data
(1)
(2)
note:
a) Describe your plan how to use monitoring data obtained considering your objectives described in Chapter 1.
b) Refer to the Action Plan of Public Awareness.

6. O/M of Facilities, Equipment, Instruments, Reagents, and Chemicals including QA/QC

6.1 O/M of Facilities, Equipment, and instruments
(1) To …
(2) To …
6.2 O/M of Reagents and Chemicals
(1) To …
(2) To …
note:
a) Describe principle procedures and activities based on SOP and O/M manual including safety.
6.3 Lab Accreditation and QA/QC
(1)
(2)
note:
a) Describe your plan and activity for Lab Accreditation and QA/QC.

7. Staffing and Budget Preparation

7.1 Staffing in charge for Environmental Monitoring
(1) To …
(2) To …
7.2 Budget Preparation for Environmental Monitoring
(1) To …
(2) To …
note:
a) Describe your principle procedures and activities.

8. Report Preparation and Submission to GCEA

8.1 Report Preparation
(1) To …
(2) To …
note:
a) Describe your principle procedures and activities for annual report preparation including time schedule.
b) Describe Table of Contents of annual report.

8.2 Submission of Monitoring Data and Report to GCEA and other concerned agencies
(1) To …
(2) To …
note:
a) Describe your principle procedures and activities to send monitoring data and submit reports to GCEA and other concerned agencies such as Governor Office.

9. Others

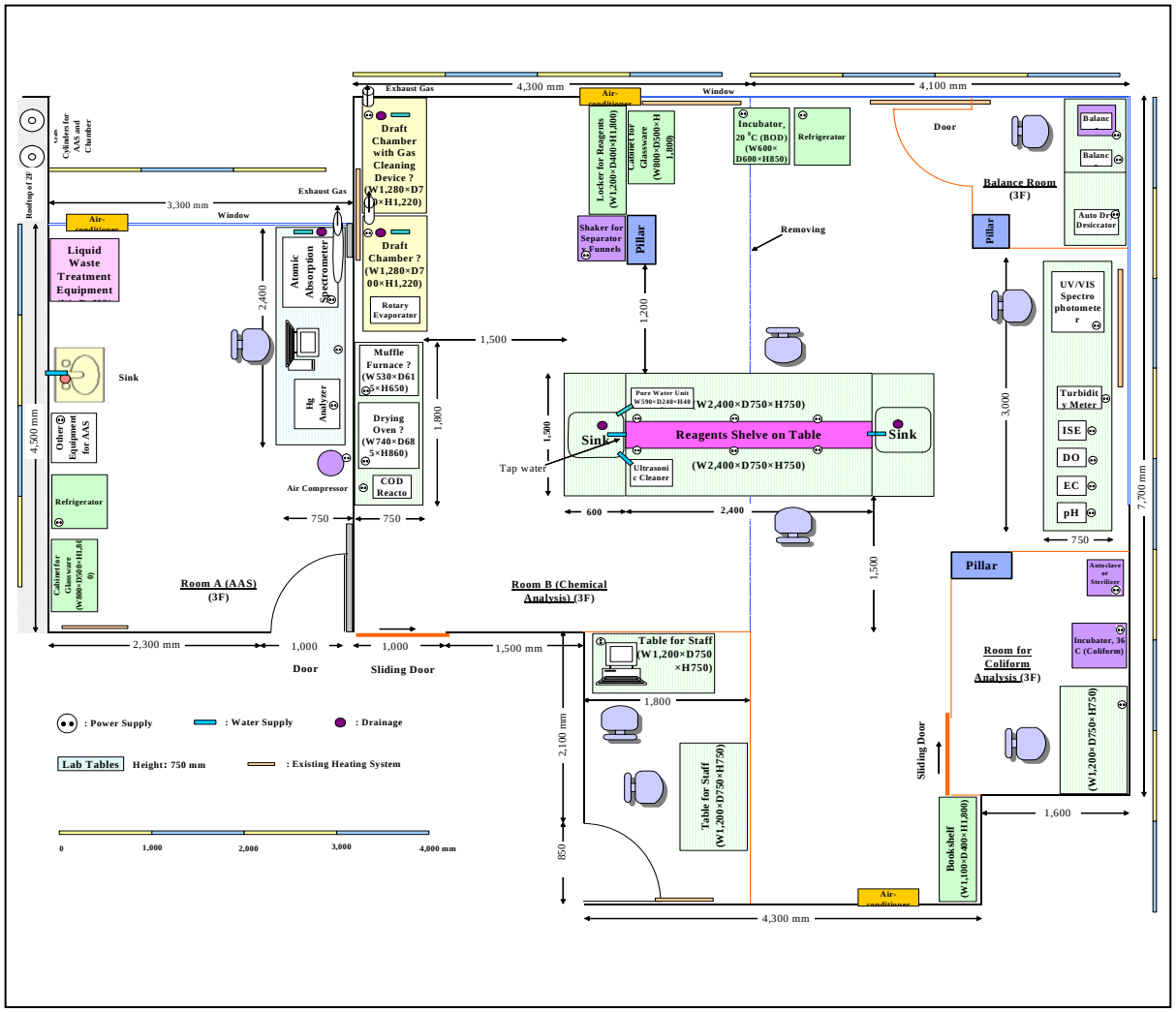
9.1 Current Problems and Constraints to be solved
(1) To …
(2) To …
note:
a) Describe current situation and your idea to cope with these problems and constraints, if any.
9.2 Provision of Environmental Monitoring
(1) To …
(2) To …
note:
a) Describe your future provisions on Environmental Monitoring, if any.

3.8 Advisory Activities

3.8.1 Planning, Construction, and Operation of Laboratory

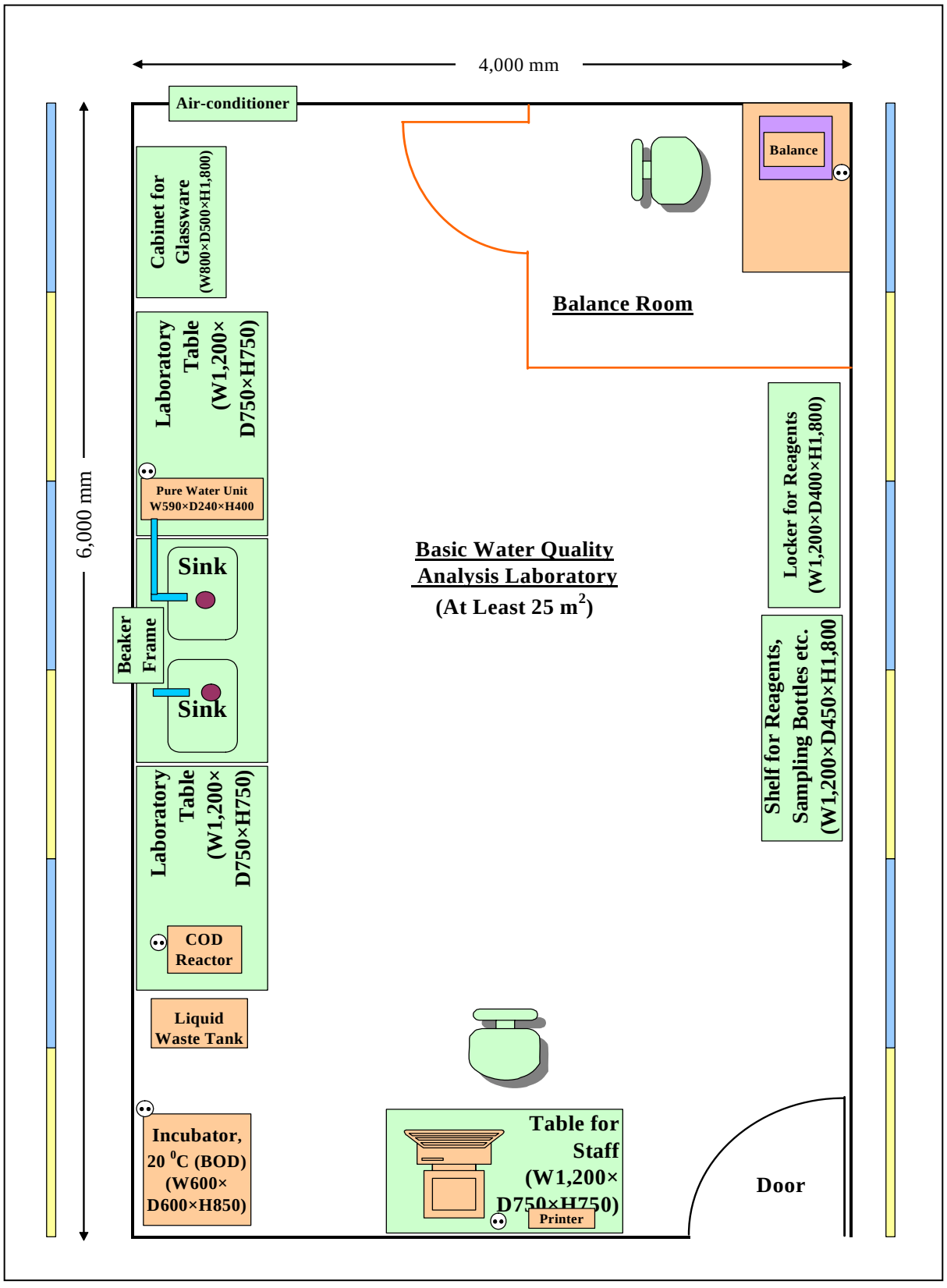
(1) Laboratory Layout Plan for Basic Water Quality

The JICA Expert Team has advised Damascus DFEA on establishment of a laboratory which is expected to be a central laboratory among 14 DFEAs. In the beginning of February 2005, a layout plan of the laboratory shown in following figure was proposed by the JICA Expert Team considering the equipment to be procured in the course of the Project. The construction work of the laboratory was completed in the end of July 2005. Regarding to the laboratories of other 13 DFEAs, a sample layout of laboratory was proposed as shown in following figure. Since December 2006, some DFEAs have moved into new buildings sequentially. The JICA Expert Team has advised DFEAs on establishment of new laboratories. The situations of laboratories in 14 DFEAs at the beginning stage (February 2005) of the Project and current stage (December 2007) are shown in the table below.



Proposed Laboratory Layout for Damascus DFEA

(Prepared by the JICA Expert Team in February 2005)



Proposed Example Laboratory Layout for 13 DFEAs

(Prepared by the JICA Expert Team in February 2005)

Summary of Laboratories for Basic Water Quality Analysis in 14 DFEAs

(in February 2005 and December 2007)

NO.	DFEA	Area (m^2)		Air Condition		Generator		Staff Assigned[3)]		Future Plan of New Lab.	Remarks
		Feb. 2005	Dec. 2007	Feb. 2005	Dec. 2007	Feb. 2005	Dec. 2007	Feb. 2005	Dec. 2007		
1	Damascus	40	O 77 (+14)	X	O	X	X	9 (5)	O 9 (19)	-	Additional room (14 m^2) in basement
2	Damascus Countryside	O 35	O 60	X	O	X	O [2)]	4(3)	O 4(8)	O (2008)	Received AAS+GC provided by GCEA
3	Aleppo	O 40	O New 100	X	O	X	X	6 (3)	O 6 (7)	Moved to new lab. in May 2007	Received AAS+GC provided by GCEA
4	Homs	O 30	O New 80	X	O	X	O [2)]	6 (3)	O 6 (12)	Moved to new lab. in Jan. 2007	-
5	Hama	16 (+9)	O New 60	X	O	X	X	4 (3)	O 4 (6)	Moved to new lab. in Mar. 2007	Received AAS+GC provided by GCEA
6	Lattakia	O 27	O 27	O	O	X	O [2)]	O 4(4)	O 4(8)	O (App. 70 m^2, 2008)	Balance is installed at another room of lab.
7	Deir ez Zor	Under construction	O 45	X	O	X	O [2)]	4 (3)	4 (3)	-	-
8	Idleb	10 (+12)	10 (+12)	X	O	X	X	4 (3)	O 4 (4)	O (2008)	Additional room (12m^2) for balance
9	Hasakeh	20 (20)	20 (20)	X	O	X	X	4 (3)	O 4 (4)	O (2008)	Will receive AAS+GC provided by GCEA
10	Rakka	O 24	O 24	X	O	X	O [2)]	4 (3)	4 (3)	O (?)	Construction of new building is stopped.
11	Sweida	O 35	O 35	X	O	X	O [2)]	4 (3)	O 4 (9)	O (40m^2, 2009)	Additional room (12m^2) is prepared.
12	Dara'a	20	O New 120	X	O	X	X	4 (3)	O 4 (5)	Moved to new lab. in Apr. 2007	Received AAS+GC provided by GCEA
13	Tartous	Under construction	O 35	X	O	X	O [2)]	O 4(4)	O 4(5)	O (End of 2007)	New laboratory without generator.
14	Quneitra	12 (+12)	O New 100	X	X	X	X	4 (3)	4 (3)	Moved to new lab. in Jan. 2007	New laboratory with generator (plan).
								65 (46)	65 (96)		

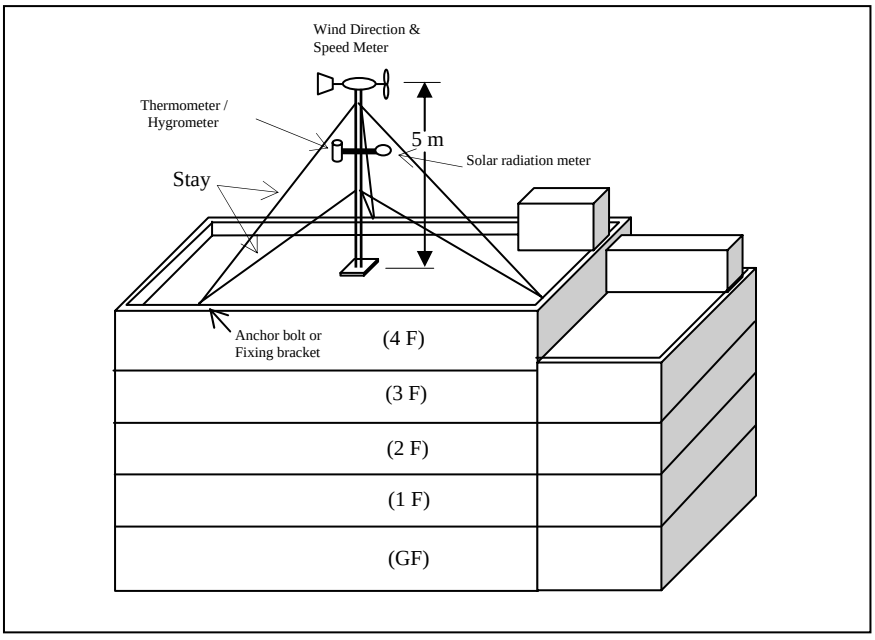
Note: 1) Each DFEA received the sampling car from MOLAE in the end of February, 2006.
2) The generator provided by JICA Expert Team for basic water quality analysis in Mar. 2006.
3) Necessary number of C/Ps required by PDM (current number)
4) O =sufficient, =not enough, X=no preparation

(2) Selection of Meteorological Monitoring Stations

The target governorates for air quality monitoring are Damascus, Homs, and Aleppo, which are located in the central area of Syria characterized by the distinguished west wind all year long. Taking topographic and typical climate conditions, and location of pollution sources into account, the following 9 meteorological monitoring stations are selected through a series of discussion with C/Ps of the Damascus, Homs, and Aleppo DFEAs.

Selected Meteorological Monitoring Stations

No.	Location	Description
Damascus Governorate		
1	Industrial Bank (downtown area)	-rooftop (4F) -measurement of urban climate
2	DFEA Building (suburban area)	-rooftop (3F) -6 km apart from downtown area -measurement of suburban climate
3	Water Resources Information Center (WRIC) of MOI (suburban hillside area)	-rooftop (3F) -11 km apart from downtown area -measurement of area surrounded by mountains in 3 sides
Homs Governorate		
1	Governor Office (downtown area)	-rooftop (3F) -distinguished west wind all year long (80% of emerging rate) -to be affected by mobile pollution source and chimney (180m) of the Homs refinery
2	Al Hekma Hospital (entrance of the city)	-rooftop (3F) -6 km apart from the Homs refinery -to be C max values
3	Private house in Quattina village	-rooftop -to be affected by major fixed pollution sources -raising a lot of complaints from villagers
Aleppo Governorate		
1	Archaeological Museum (downtown area)	-rooftop (3F) -center pf the city
2	Water Treatment Facility (south of industrial area)	-rooftop -5 km apart from city center -nearby area of cement factory causing white plume
3	Dying Factory (north of the city inside a middle and small industrial estate)	-rooftop -10 km apart from city center



General Layout of Meteorological Monitoring Station

(3) Laboratory Improvement of Aleppo DFEA

The office of Aleppo DFEA moved around March 2007, and its laboratory also moved to the same building. It took fairly long time to rearrange of lab mainly due to lack of lab staff having enough capability of lab O/M, and it compelled to postpone and reschedule of the training plan of the JICA Expert Team around one month both in air and water quality. The situation of lab is still in

worse than before, for example no ventilation and air conditioner without airtight structure, no electric generator for analysis and discharge pump, no separation of air and water analysis rooms, no tidy and neat condition of lab, and so on. Although JET restarted the training, its effectiveness might be low because of not good physical conditions of lab in addition to the shortage of C/Ps.

Considering the current situation of lab and its importance as a core lab in the northern region, the JICA Expert Team advised the following recommendations to GCEA and the Aleppo DFEA.

a) Measures to be taken immediately

- Daily cleaning and keeping tidy of lab (responsible of lab chief and staff),
- Installation of ventilation, air conditioner, and electric generator and stabilizer,
- Keeping airtight condition of lab to block dust from outside,
- Preparation of shelves and desks for reagents, chemicals, and glass wears, and
- Arrangement of equip, reagents, chemicals, glass wears.

b) Measures for the short-term (within one or two months)

- Move lab in the first floor of the building from basement,
- Separation of lab into 4 rooms, namely air lab, water lab, atomic absorption spectrophotometer and gas chromatograph (AAS/GC) lab, and pretreatment room,
- Installation of analysis desks, more shelves specific use for chemicals and glass ware, rubber sheet on lab floor, at least two more sinks with two/ three-forked water taps, more numbers of electric outlets,
- Installation of ventilation and draft-chamber for AAS/ GC, and
- Preparation of storage room for gas-cylinders outside of lab.

(4) Heavy Metal Analysis in Lattakia DFEA

Corresponding to the requirement from the Lattakia DFEA, the JICA Expert Team visited the Lattakia DFEA on 29 - 30 November 2006. Presentations had been done and attendants (7 C/Ps) discussed about metal analyses positively. The main agenda of the discussion were how to preserve samples and standard solutions, how to pre-treat samples, safety control, how to decide the method, basic idea of emission method. The activities and results below are reported to the Lattakia DFEA.

1) Activity Contents

- Confirmation of the conditions of machineries, facilities, equipment, apparatus, reagents for heavy metal analysis.
- Confirmation on the past results and quantification limits concerning atomic absorption spectrophotometer (AAS) in selected elements.
- Confirmation on analysis levels of C/Ps and their consciousness.
- Presentations on the outline of metal analysis and basic ideas of AAS.
- Discussion of metal analysis.

- Confirmation on the conditions of machineries and equipment for gas chromatography.

2) Results and Comments

a) Conditions of machineries, facilities and equipment for AAS are almost good. Operations of flame and furnace methods were performed. Equipment for hydride generating method was not operated due to lack of experience, however, operating manuals existed. Gas cylinders were not fixed and put alone. They should be firmly fixed to the wall.

b) According to the past results and quantitation limits, the ideas of QA/QC had not been introduced at all. Operators should be trained.

c) The Operator in charge could operate AAS on both methods (frame/furnace). On the other hand, basic technique treating apparatus didn't seem to be enough.

d) The theoretical comprehension should be obtained to operators to set operating conditions themselves.

(5) Biological Analysis Equipment Procurement in Sweida DFEA

Responding to the request for advice and suggestion on biological analysis equipment procurement in Sweida DFEA, the JICA Expert Team had discussion meetings with C/Ps in Sweida DFEA (Mr. Humam, Ms. Hana, Ms .Raghad, Mr. Samer, Ms. Amal) on 22 November and 21 December 2006.

Key advisory activities are as follows:

1) Understanding of the basic needs for biological analysis in Sweida DFEA, the JICA Expert Team suggested for selection of biological indicators such as total coliform bacteria, fecal coliform bacteria, and E. coli, and provided materials and information related to the selected indicators.

2) Based on actual decision made by C/Ps in Sweida DFEA, the JICA Expert Team suggested for selection of equipment and analysis methods, such as standard and portable method for equipment, most probable number (MPN) method and membrance filter (MF) method for analysis, and also provided following materials and information.

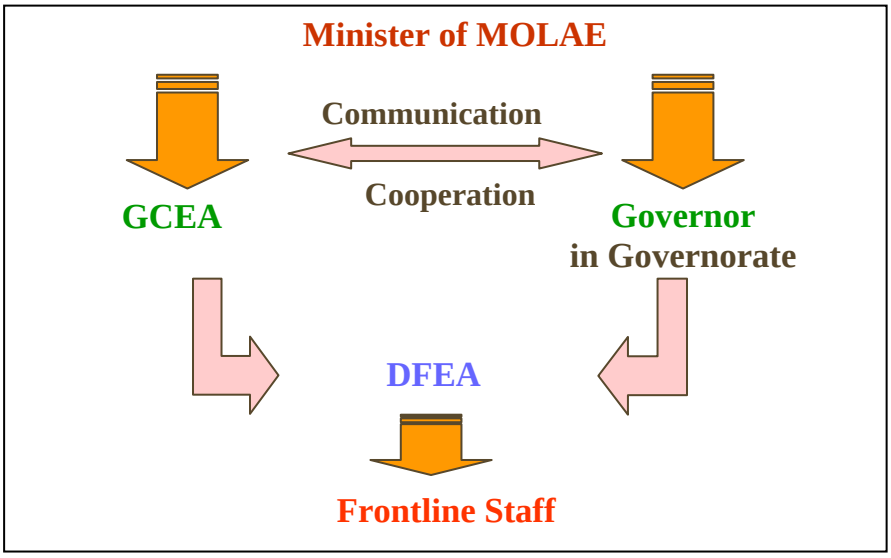
- Standard method: membrane filter technique for total coliform group analysis as well as major necessary equipment
- Portable method: pamphlet of portable method for field total coliform group analysis, and unit price information

3) Considering current situation of lab in Sweida DFEA, the JICA Expert Team recommended to procure the equipment and instruments such as Autoclave, Incubator, Water-bath, Filtration units, Membrane filter, Drying oven, Consumables, and so on.

3.8.2 Project Management

(1) Involvement of the Governor of Governorate

The Ministry of Local Administration and Environment (MOLAE) was established in 2003 by merging the Ministry of Local Administration and the Ministry of Environment. The most institutional functions of the former Ministry of Environment are shifted to the General Commission for Environmental Affaires (GCEA) in MOLAE. The Directorate for Environmental Affaires (DFEA) is under the administration of MOLAE officially, however, DFEA has actually functioned as a regional office dealing with local specific environmental issues as if it could be one of directorates in each Governorate as shown in a schematic figure below. Therefore, to involve the Governorate to the Project and to keep good communication and cooperation between GCEA and the Governorate are considered crucial for successful and sustainable achievement of the Project though the official counterpart agency is designated GCEA in R/D of the Project.



Schematic Governance System of DFEA

In this context mentioned above, the JICA Expert Team carried out to visit the Governor of each Governorate with the director of DFEA for presenting important activities of the Project and for requesting sufficient supports to the Project during the early stage of. As a manner of fact, the Minister of MOLAE is trying to directly contact to the Governor in order to solve various kind of difficulties confronted responding to requests made by GCEA and the JICA Expert Team.

The involvement of the Governor of Governorate has also urged strong commitment and ownership of the Project among the C/P personnel, especially for the director of DFEA. Closer relation and cooperation between DFEA and the Governorate is surely inevitable to cope with regional specific environmental problems and complaints from the citizens.

(2) Budget Planning in DFEA

1) General Preparation Procedure of Annual Budget of DFEA in Governorate

Although DFEA is one of administrative directorate under the Governor office, necessary annual budget is approved and provided directly by MOLAE. The director of DFEA should prepare annual budget plan for the next fiscal year (January to December) to be convinced by GCEA, and submit it to the Planning Directorate in MOLAE around the end of August. The proposed budget plan is to be checked and assessed by the Planning Directorate hearing supportive information from GCEA, and then it is conveyed to the Minister of MOLAE.

The minister of MOLAE should submit its annual budget plan to the State Planning Commission (SPC). After passing through the official procedure in the central government in Syria, the minister of MOLAE receives final decision from SPC. In January, the approved annual budget should be delivered to Governorate and DFEA. The director of DFEA has full responsibility for disbursement of the allocated budget under the full control of the Planning Directorate and the Governor Office, so the director of DFEA should know and control its balance throughout its fiscal year. The current procedure is summarized in the Table shown below.

Official Procedure for Annual Budget Approval System in Syria

Process No.	Agency	Activities	Description	Time
1	DFEA	1)Section chief: to estimate and prepare budget in kind with reason 2)Director: to prepare annual budget plan of DFEA and to send it to the Planning Directorate of MOLAE	-administrative and investment budget -justification such as R/D of JICA project -necessity and objective in kind	-starting before August
2	MOLAE	1)Planning Directorate of MOLAE: to receive a budget plan from all DFEAs, and to check (critical path) 2)Director of Planning: to prepare the budget plan of MOLAE and submit it to Minister for approval 3)Minister: to check and approve the proposed annual budget, and send it to the State Planning Commission (SPC)	-Director of DFEA should explain to the accounting section of the Director of Planning in MOLAE, and prepare detailed plan or break-down -Director of Planning has a casting board -GCEA should also prepare and submit a budget plan to the Director of Planning	-mostly in September.-October
3	State Planning Commission (SPC)	1)SPC director: to receive a budget plan from all ministries, and to check with balance 2)SPC Chaireman: to approve and send it to the Prime Minister's Office (PMO)	-Director of Planning in MOLAE needs to explain to SPC, if any	-mostly in November
4	Prime Minister's Office (PMO)	1)PMO: to reveive a budget plan from SPC and discuss with SPC and Ministry of Finance (MOF) in the Cabnet Meeting	-procedure	-mostly in November
5	Ministry of Finance (MOF)	1)MOF: to receive the approved budget plan from PMO, and to allocate actual budget in accodance with the plan 2)MOF: to prepare the national anuual budget plan and confirm it to PMO 3)PMO: submit the national budget plan to the pariament for approval	-procedure	-mostly in December
6	Parliament	1)offical decision of the national budget 2)to send it to the President only for ratification 3)to send the ratified plan to PMO	-procedure	-mostly in December
7	PMO	1)Prime Minister: to make an order of disburcement of the budget to MOF	-procedure	-end of December
8	MOF	1)MOF: to inform and disburce the budget to ministries	-MOLAE is able to disburce within 10 days after receiving the order	-end of December
9	MOLAE	1)to inform and disburce the budget to governorates	-budget disburcement is quickly enforced by governorates	-after January

Note: 1)This procedure is tentatively prepared by the JICA Expert Team in May 2005 based on inquiry to GCEA.
2)At present, there is no route from DFEA- GCEA- MOLAE.

2) Guidance for Budget Estimation of the Project in 2006

According to the Record of Discussion (R/D), the Syrian side should allocate the budget for electricity and water tariff, consumable supply for laboratories and equipment such as chemical reagents and spare parts from 2006. Therefore, the JICA Expert Team provided guidance for budget estimation. Annual cost for basic water quality monitoring in each DFEA is estimated at around 520,000 SP, as shown below. Cost estimation result including the breakdown was sent to DFEA by the end of July 2005.

Annual Cost Estimation for Basic Water Quality Monitoring in each DFEA

Item		No.	Cost (US$)		Cost (SP)	Remarks
			Unit	Total		
1) Reagents						
1	pH standards, pH 4.01	2	19	38	1,988	500 ml
	pH standards, pH 7.00	2	19	38	1,988	500 ml
	pH standards, pH 10.00	2	19	38	1,988	500 ml
2	Conductivity standards 180 µs/cm	1	24	24	1,259	100ml
	Conductivity standards 1,000 µs/cm	1	23	23	1,193	100ml
	Conductivity standards 18,000 µs/cm	1	23	23	1,193	100ml
3	Turbidity Standards Kit for 2100 P Turbidity Meter	1	644	644	34,119	500 ml for 0.1, 20, 100, 800
4	Reagents (High range 0-1,500 mg/l) for COD_{Cr}	11	84	921	48,826	PK/25
5	Reagents (Low range 0-150 mg/l) for COD_{Cr}	4	84	335	17,755	25/PK
6	Reagents for NO_3^-N	3	56	169	8,944	100 tests/set
7	Reagents for PO_4^{3-}	3	44	131	6,956	100 tests/set
8	Reagents for Cl^-	3	144	431	22,856	100 tests/set
9	Reagents for Ammonia-N	6	175	1,050	55,650	50 tubes/PK
10	Nitrification Inhibitor for BOD analysis	1	256	256	13,581	500g
11	BOD Nutrient Buffer Pillows	6	16	98	5,168	50 pillows/PK
12	BOD Seed Inoculum	6	281	1,688	89,438	50 capsules/bottle
13	NaOH Pack	1	13	13	663	1000g/PK
	Sub-total			5,916	313,561	
2) Glassware and Other Instrument						
1	Glassware (Pipettes, flasks, beakers, cylinders, funnels etc.)	1 set	143	143	7,571	Procured glassware×20%
2	Other Consumables (Batteries, tap, oil pen, cleaning tissue, detergent etc.)	1 set	1,000	1,000	53,000	Estimated from existing data
3	Cost of Equipment Repair and Maintenance	1 set	660	660	34,980	Procured equipment×2%
	Sub-total			1,803	95,551	
3) Operation and Maintenance, Sampling etc.						
1	Water Tariff ($3m^3$/d×5d/w×52w/y)	780	0.29	228	12,090	Only laboratory
2	Electrical Tariff (6 kW×5d/w×52w/y)	1,560	0.05	74	3,900	Only laboratory
3	Petrol (10 km/L, 100 km/d ×3d/w×52w/y)	1,560	0.47	736	39,000	Sampling vehicle
	Sub-total			1,038	54,990	
4) Physical Contingency {[1]+2]+3]]×10%}						
1	Physical Contingency	1 set	876	876	46,410	
	Sub-total			876	46,410	
	Total [1]+2]+3]+4]]			9,632	510,513	

Note: 1) The number of samples is estimated to be 260 per year. (5samples/week×52 weeks/y=260)
2) Unit price of reagent may vary with the number.
3) Exchange rate: 1 US$=53 SP

3.8.3 Quality Assurance and Quality Control

One of the most important subjects of the Project is Quality Control (QC) of analytical data produced in laboratories. In other word, how to secure the reliability of data is the critical concerned matter for all DFEAs. Reliability of data for a water and air quality monitoring program depends on strict adherence to a wide range of operation procedures starting from sample collection, analysis, and

ending by reporting. In order to secure the reliable data produced in laboratories, Quality Assurance (QA) and Quality Control (QC) are employed.

The Quality Assurance (QA) refers to the full range of practices implemented to ensure that laboratory results are reliable. The ultimate objective of a QA is to ensure that the laboratory functions efficiently and effectively. The word "Quality control (QC)" is generally used limited to in the sense of operational techniques and activities to fulfill requirements for quality in the field of chemical analysis. The term "QC" encompasses internal and external quality control. According to "Standard Method for the Examination of Water and Wastewater (18th edition, 1992)", the word Quality Assurance and Quality Control are defined as follows:

Quality Assurance – a definitive plan for laboratory operation that specifies the measures used to produce data of known precision and bias.

Quality Control – set of measures within a sample analysis methodology to assure the process is in control.

As mentioned above, the QA contains several components. Implementation of QA is to put these components into practice. Major components of QA are as follows:

- Clarification of staff organization and responsibility,
- Sample control and documentation procedures,
- Formulation of standard operating procedure for each analytical method (SOP),
- Training of analyst,
- Equipment preventive maintenance procedures,
- Calibration procedures,
- Corrective actions,
- Internal and external quality control activities,
- Performance audits,
- Data assessment procedures for bias and precision, and
- Data reduction, validation, and reporting

For the achievement of the quality control in laboratory, the terms "Internal quality control" and "External quality control" are commonly used. The former refers to activities conducted within a laboratory such as accuracy check using standard solutions to monitor performance, and the latter refers to activities leading to comparison with other reference laboratories or consensus results amongst several laboratories.

In order to perform QA/QC activities, the Atomic Energy Commission of Syria (AEC) is now

carrying out one program titled "Program for Quality Control of the Laboratory Analysis" for the chemical laboratory in Syria. This is the kind of an external quality control system. The DFEAs of Damascus, Homs, Lattakia and Sweida have participated in this program. Outline of the program is shown in the box below. Table below shows one example of the determination results measured by the Damascus DFEA and the rating made by the Atomic Energy Commission of Syria (AEC).

Result of Application to QC Program of Damascus DFEA (Aug 2006)

Sample No.	SEQA-21-062			SEQA-22-062			SEQA-23-062		
Parameter analyzed	**True value**	**Result of DAM**	**Rating**	**True value**	**Result of DAM**	**Rating**	**True value**	**Result of DAM**	**Rating**
Cl (mg/L)	1.00	4.90	N	2.00	8.50	N	3.00	8.25	N
NO_3(mg/L)	0.50	12.40	N	1.00	22.36	N	1.50	5.15	N
PO_4(mg/L)	1.00	1.08	A	2.00	1.97	A	3.00	4.12	N
Sample No.	SEQA-11-062			SEQA-12-062			SEQA-13-062		
NH_4(mg/L)	0.50	0.35	W	1.00	0.87	A	1.50	1.39	A
Sample No.	SEQA-61-061			SEQA-62-061			SEQA-63-061		
pH	5.90	6.15	W	4.80	5.01	A	4.80	4.98	A
EC(µS/cm)	50.00	215.00	N	100.00	433.00	N	150.00	649.00	N
	SEQA-131-062			SEQA-132-062			SEQA-133-062		
TDS(mg/L)	1500.00	7250.00	N	1500.00	7210.00	N	750.00	3880.00	N
Sample No.	SEQA			SEQA			SEQA		
COD(mgO_2/L)	800.00	840.00	A	800.00	839.00	A	400.00	421.00	A

Results above shows that number of the rating "A" and "W", acceptable and warning level respectively, accounts for 11 in total among the 24 determination results. On the other hand, number of the rating of non-acceptable "N" accounts for 13 among the 24 determination results. This means that reliability of the analytical data produced in the Damascus DFEA is still not so high at present. Further efforts for QC are required.

As mentioned, internal quality control consists of the operational techniques used by the laboratory staff for continuous assessment of the quality of the results of individual analytical procedures. Internal quality control is necessarily part of the wider quality assurance program. Whereas quality assurance strives to achieve quality by regulating procedures using what are essentially management techniques, internal quality control focuses on the individual method and tests its performance against mathematically derived quality criteria. The typical operational techniques applied to internal quality control are:

- Recovery of known additions,
- Analysis of externally supplied standards,
- Analysis of reagent blanks,
- Calibration with standards, and
- Analysis of duplicates.

The operational techniques above mentioned have been introduced and trained in this Project as a part of the trainings in each DFEA for internal quality control. However, the skill and knowledge of QA/QC remains in early stage still in all DFEAs. Further training concerning QA and the internal training should be conducted continually in the future.

As mentioned above, DFEAs of Damascus, Homs, Lattakia, and Sweida have participated in the QC program administrated by the Atomic Energy Commission of Syria (AEC). The participants submit the results of analyzed samples prepared and provided by AEC. The AEC evaluates the received results based on the criteria of AEC, and issues a certificate to the participant by specific parameters in the case that the submitted results are judged to be sufficient accuracy. An example of the certificate issued to the Aleppo Sewage Treatment Plant Laboratory is shown below. It is desirable that other remained 11 DFEAs should participate in this program as soon as possible for the implementation of external quality control.

الجمهورية العربية السورية
هيئة الطاقة الذرية
مكتب ضمان الجودة

شهادة مشاركة في البرنامج الوطني لضبط جودة التحاليل المخبرية

Participation Certificate in the Syrian National Proficiency Test (SNPT)

يشهد مكتب ضمان الجودة في هيئة الطاقة الذرية أن " مخبر محطة المعالجة في الشركة العامة للصرف الصحي بحلب "
قد شارك بنجاح في البرنامج خلال العام 2004 وأظهرت نتائجه توافقاً مع القيم المعيارية للقرائن التحليلية الآتية :

(NH_4^+, NO_3, SO_4^{-2}, PO_4^{-3} - OC, COD, BOD ـ EC الناقلية الكهربائية ، pH درجة الحموضة) في المياه

وعليه مُنح هذه الشهادة

دمشق في 03 /أيلول /2005 الموافق لـ 24 / صفر / 1426

المدير العام
الدكتور إبراهيم عثمان

صالحة لغاية 03 / أيلول / 2006 وتعتبر لاغية في حال الانقطاع عن المشاركة في البرنامج

Example of Certificate issued to the Aleppo Sewage Treatment Plant Laboratory by AEC

Box

Quality Control Program by AEC

(1) System

System of a licensing examination using test sample water administrated by the Atomic Energy Commission of Syria (AEC)

(2) Name of Program

Program for Quality Control of the Laboratory Analysis

(3) Outline

Data produced in the laboratory are licensed or given official approval by the Atomic Energy Commission of Syria (AEC)

(4) Procedure

1) Water samples for licensing examination are provided to the laboratory by AEC for the specific water quality elements.
2) Water samples to be provided are mixtures that contain several water quality elements.
3) Three bottles of water sample for one kind of sample water are provided per one time by AEC.
4) The laboratory determines the concentrations of the specific water quality elements in the sample waters provided
5) The results of the determination are submitted to AEC
6) AEC processes the data received from laboratories, and calculates Z score for each data. AEC judges the appropriateness of the determination results submitted from the laboratory using the Z score calculated.
7) The judgment of the results is divided into three classes using three alphabetical abbreviations, namely A, W and N, according to the accuracy of the results. Definition of Z score and the criteria of the classification are given below.

   Z score can be calculated using following formula.

   Z = (X-XavSTD

   Here,
   X: The lab. result of the determined element,
   XavThe average of all participated lab. for the determined element,
   STD: Standard deviation for all labs. results.

   All results produce in the laboratories are classified into three categories using Z score as follows:

   $|Z| \leq 2$: A (Acceptable)
   $2 < |Z| < 3$: W (Warning)
   $3 \leq |Z|$: N (Not acceptable)
8) The license is given to the specific water quality parameter by AEC in the case that the analytical result of the aforementioned specific parameter falls into class A category.
9) The procedure above mentioned is performed repeatedly in every four month

(5) Participant

Number of laboratories that participate in this program is seventy five (75) in Syria as of May 2006. The laboratories that participate this program are not limited to those of MOI, but the laboratories of other related organizations such as MOI and MOH also participate. Among these laboratories, number of laboratories that belong to the MOI is eleven (11).

3.8.4 Visit to AEC for Information on QA/QC

Dr. Yasin Moa'alla (GCEA) and 4C/Ps of Damascus DFEA (Ms. Reem Sadr Eddin, Ms. Sohad Sida, Mr. Talaat Harb and Mr. Samer Khouri) in charge of Heavy Metal Analysis visited the laboratory of Atomic Energy Commission of Syria (AEC) on 22 August 2007 according to the advice given by the JICA Expert Team. This visit was recommended in order to grasp the level of advanced laboratory and conditions to conduct QA/QC. The C/Ps interviewed with questionnaires prepared by the JICA Expert Team that were mainly about QA/QC activities in the AEC laboratory.

As a result, the C/Ps had found out that the level of theirs in Damascus DFEA at present was not too far from AEC's level, and the personnel of the laboratory of AEC had admitted that C/Ps from Damascus DFEA were well trained significantly by the training for only 6 months (4.5 months in reality). Ms. Reem Sadr Eddin, the laboratory chief of Damascus DFEA, mentioned that the C/Ps would be able to reach the same level as AEC after continuing the training that they were doing for one more year. The C/Ps did not get much information on QA/QC program because it was not given

greater importance in AEC. On the other hand, the C/P recognized the organized environment of the laboratory and the procedures for analyses were something they needed to follow.

3.8.5 Laboratory Wastewater Treatment

It is crucial to treat wastewater generated in the laboratories of DFEAs because lab wastewater usually contains hazardous and/or toxic chemicals and high concentrated organic substances in a process of laboratory analysis. The BUDGETARY PLAN OF THE PROJECT in the Minutes of Meetings between the Syrian side and the Japanese side signed on September 9, 2004, explicitly stated that " The Syrian side shall provide space and facilities necessary for the implementation of the Project, including following; <for 14 DFEAs>… 7) laboratory waste (liquid and solid) treatment measures (page 15). In addition, in the letter from MOLAE to the JICA Syria Office attached to the M/M (page 16), "… Regarding point (1) Laboratories waste treatment measures, Syria/ MPLAE has allocated the required finance for the waste treatment plants for 2005, although it is deleted from the Pre-Conditions issues." was described showing indicative budget for 2005 about SP 11,350,000. Moreover, in the Annex-6 Tentative Project Design Matrix (PDM), "… 3. Adequate wastewater treatment plants shall be prepared before starting laboratory chemical analysis training in the target DFEAs." as the column of Pre-conditions.

Based on this agreement, the JICA Expert Team had reminded this matter several times in T/C, St/C, and opportunities taking place. However, no actual action has been taken place by the Syrian side up to February 2006. So, the JICA Expert Team provided additional plastic-tanks to DFEAs for collection of laboratory wastewater as a provisional measure. In addition to the provision of plastic tanks to DFEAs, the JICA Expert Team had proposed the instructions for wastewater treatment to the Syrian side.

Based on the information provided by the JICA Expert Team provided, GCEA had decided to order the installation of wastewater treatment facility in the DFEA of Damascus to the local supplier by the local competition bidding method. In response to the request from GCEA, the State Planning Commission (SPC) agreed and allocated the budget for purchasing a wastewater treatment facility in Damascus DFEA in July 2006. The facility has been delivered and installed in the Damascus DFEA by the supplier in the beginning of 2007. Although, the supplier has started the training for operation of the facility from January 2007 for the staff of Damascus DFEA, no wastewaters generated from DFEAs had been treated by the end of August 2007 using the facility due to the technical problems (mainly troubles on consistent operation of the unit process designed) of the facility.

In order to cope with above problem, GCEA had organized a technical committee that consists of the experts from GCEA, the Damascus DFEA, the supplier, other ministry, and the JICA Expert Team. The committee had examined the facility and has prepared a report that contains the countermeasures for the settlement of mainly the technical problems. The report contained

countermeasures to solve the problems such as materials of facility, place of installation, odor, etc. In this report, the JICA Expert Team had offered and recommended the necessity of a modification of the facility. The report had sent to the supplier through MOLAE for improvement of the facility.

The supplier had repaired the facility in accordance with the comments and the orders made by the committee including advices from the JICA Expert Team by the end of October 2007. However, the committee had ordered a further modification of the facility to the supplier on the end of November 2007. Therefore, no test operation of the facility has conducted by the begging of December 2007. A prompt performance test of the facility is required.

Plan of Wastewater Treatment Facility Prepared by the JICA Expert Team

A treatment facility is to be installed in Damascus DFEA, and other DFEAs should bring their wastewater to the Damascus DFEA for treatment. The wastewater should be treated to meet the discharge standard to sewerage system designated by the Syrian Government. The treated wastewater is to be discharged in the sewerage system and its sludge is to be stored in a specific site and be managed by the Damascus DFEA. The conditions considered for this proposal are;

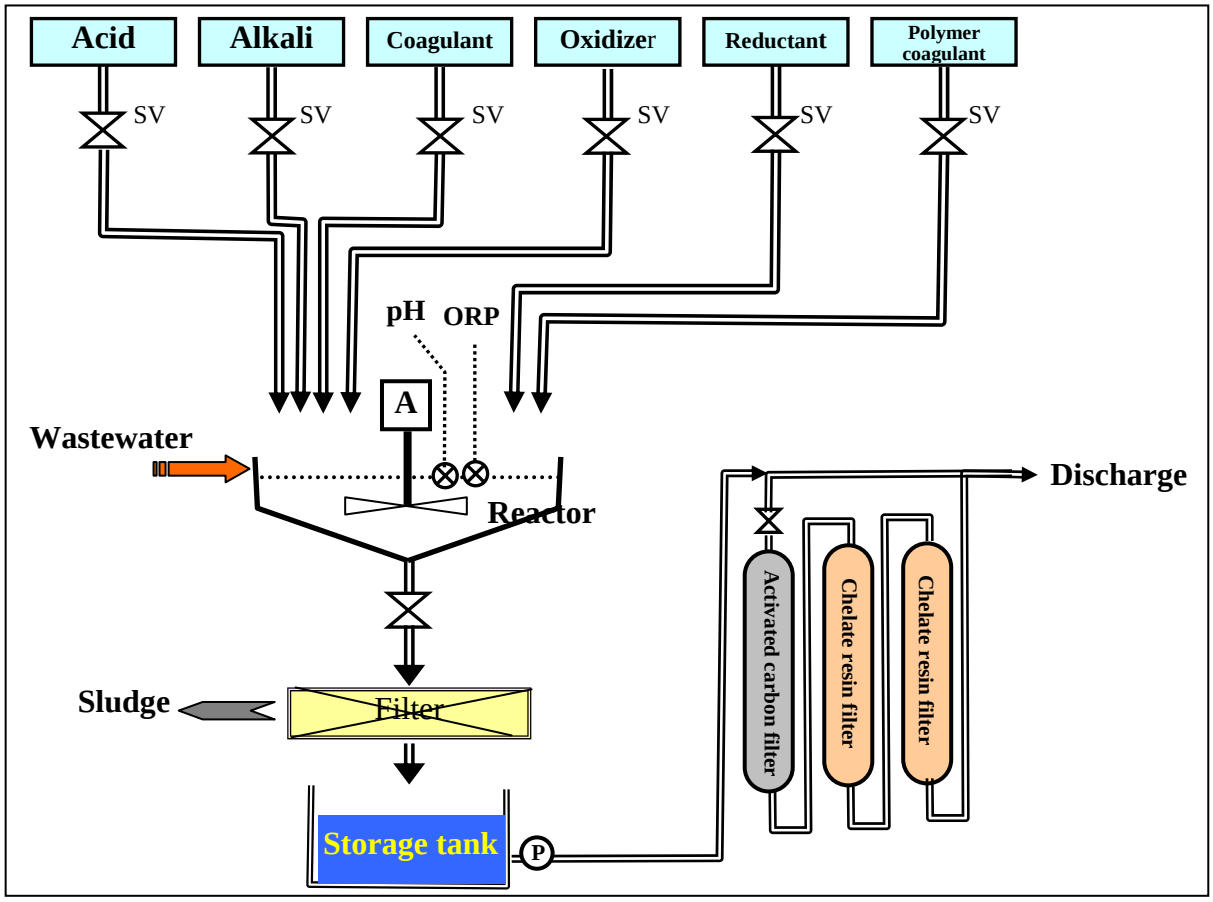
- Damascus DFEA is planned to conduct chemical, biological, and heavy metal analysis.
- Damascus Governorate has a sewerage system and a wastewater treatment plant with activated sludge method.
- Efficient use of the treatment facility can be expected in the Damascus DFEA because of large volume of wastewater from itself and from other DFEAs.
- Other DFEAs can bring their wastewater to the Damascus DFEA using a car.

General Conditions of the Facility

a) Substances to be treated: Heavy metals, Cyanide, Cyanide complex, Chromium (IV) compounds, Mercury compounds, Organic compounds, Acidic and Alkali wastewater.
b) Treatment method: Batch type, Neutralizing coagulation and absorption method.
c) Performance: Metals=less than 1,000 ppm, Cyanide complex=less than 500 ppm, Mercury=less than 50 ppm
d) Principle
   - Heavy metals, Mercury: (Coagulation) + (Absorption by activated carbon) + (Absorption by chelate resin)
   - Chromium (IV) compounds: (Reduction) + (Coagulation) + (Absorption by activated carbon) + (Absorption by chelate resin)
   - High concentration Cyanide: (Oxidation) + (Reduction) + (Coagulation) + (Absorption by activated carbon) + (Absorption by chelate resin)
   - Cyanide complex: (Oxidation) + (Prussian blue method)

e) Treatment capacity: 50 liter per 1 batch operation (1 batch operation: 1 to 2 hrs)

f) Treatment flow is shown below:

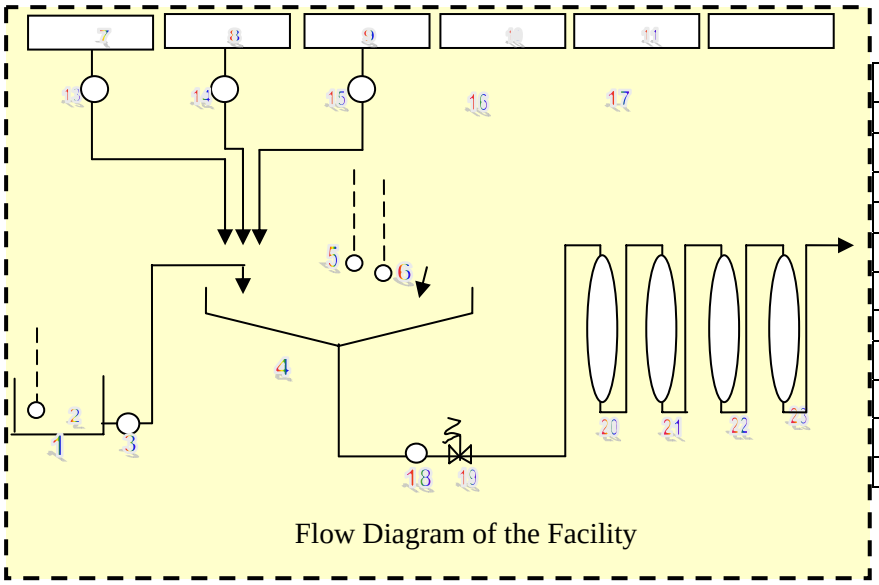


Specifications for Example (Model; DP-50, Shimadzu Rika Instruments Co., Ltd.)

Name	Q'ty	Material	Specifications
Reactor	1	Transparent PVC	Effective capacity: 50 liter
Agitator	1	Liquid contacting part: SUS304	100V 50W Commutator motor
Level switch	2	Liquid contact portion: Phenol foam	Float ON/OFF switch
pH electrode	1		Compound glass electrode made of PVC, with protection cover
ORP electrode	1		Compound platinum electrode made of PVC, with protection cover
Ejection solenoid valve	1	Liquid contacting part: PVC	100V 35W
Filtration container	1	Polyethylene	Whole capacity: 28 liter
Level switch	1	Liquid contact portion: Phenol foam	Float ON/OFF switch
Limit switch	1		Roller lever type
Filtered water storage tank	1	Transparent PVC	Effective capacity: 25 liter
Filtered water feed pump	1	Liquid contacting part: PP	100V 5.5W, Bellows pump 568/692 mL/Min.
Level switch	1	Liquid contact portion: Phenol foam	Float ON/OFF switch
Activated carbon tank	1	Transparent PVC	Charging capacity: 3 liter
Adsorption tank	2	Transparent PVC	Charging capacity: 2 liter
Chemical tank	6	Transparent PVC	Charging capacity: 5.5 liter (Alkali: 7 liter)
Electromagnetic valve	6	Liquid contacting part: PVC	100V 6.5W, 1/8"
Table (control panel built in)	1	SS	
pH meter	1		Digital ED display pH 0 - 14
ORP meter	1		Digital ED display ORP -700 - +700
Sequencer	1		Stored program method I/O contact: 56
Others : External dimension: 800W x 700D x 1445H, Weight: 120 kg, Operation: Full automatic operation			

Flow Diagram of the Facility prepared by the Supplier

Based on the purchase order by GCEA, the supplier delivered laboratory wastewater treatment facility having the following flow diagram in the beginning of 2007.

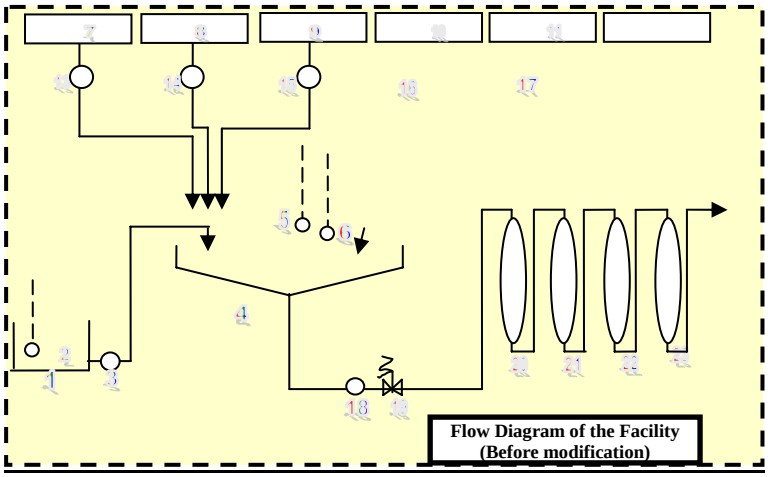


Flow Diagram of the Facility

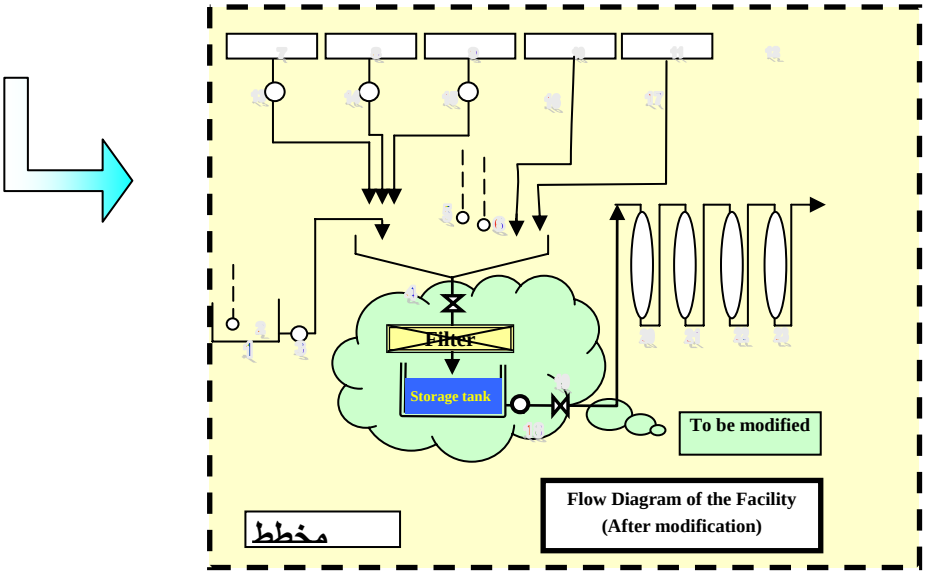
1	Wastewater tank	13	H_2SO_4 pump
2	Level meter	14	$FeSO_4$ pump
3	Centrifuge pump	15	NaOH pump
4	Reactor	16	NaClO pump
5	pH meter	17	Coagulant pump
6	ORP	18	Centrifuge pump
7	H_2SO_4 tank	19	Electromagnetic valve
8	$FeSO_4$ tank	20	Micro filter
9	NaOH tank	21	Activated carbon filter
10	NaClO tank	22	Cation exchanger
11	Coagulant tank	23	Anion exchanger
12	Air Blower		

Advice and Recommendation to the Facility for Normal Operation by the JICA Expert Team

Since the facility does not have problems on its treatment principle and design, the main obstacle of the facility is considered a trouble on the consistent operation of unit process applied in the facility. In order to cope with the current technical problem of the facility, the JICA Expert Team recommended the following modification of the facility as shown below.



1	Wastewater tank	13	H_2SO_4 pump
2	Level meter	14	$FeSO_4$ pump
3	Centrifuge pump	15	NaOH pump
4	Reactor	16	NaClO pump
5	pH meter	17	Coagulant pump
6	ORP	18	Centrifuge pump
7	H_2SO_4 tank	19	Electromagnetic valve
8	$FeSO_4$ tank	20	Micro filter
9	NaOH tank	21	Activated carbon filter
10	NaClO tank	22	Cation exchanger
11	Coagulant tank	23	Anion exchanger
12	Air Blower		



Record of Wastewater Received and Treated in DAM DFEA (as of August, 2007)

DFEA		RECEIVED			TREATED			Note
		1st	2nd	3rd	1st	2nd	3rd	
DAM	Date(Note)	--	--	--				
	Quantity (L)	--	--	--				
DAMC	Date	Feb. 17, '07						
	Quantity (L)	80						
ALP	Date	Apr. 19, '07						
	Quantity (L)	20						
HOM	Date	Jun. 21, '07						
	Quantity (L)	10						
HAM	Date							
	Quantity (L)							
LTK	Date							
	Quantity (L)							
DRZ	Date							
	Quantity (L)							
IDL	Date	Apr. 22, '07						
	Quantity (L)	20						
HSK	Date							
	Quantity (L)							
RAK	Date							
	Quantity (L)							
SWD	Date	Apr. 23, '07						
	Quantity (L)	80						
DAR	Date							
	Quantity (L)							
TAR	Date	Apr. 25, '07						
	Quantity (L)	80						
QNT	Date	Apr. 28, '07						
	Quantity (L)	20						

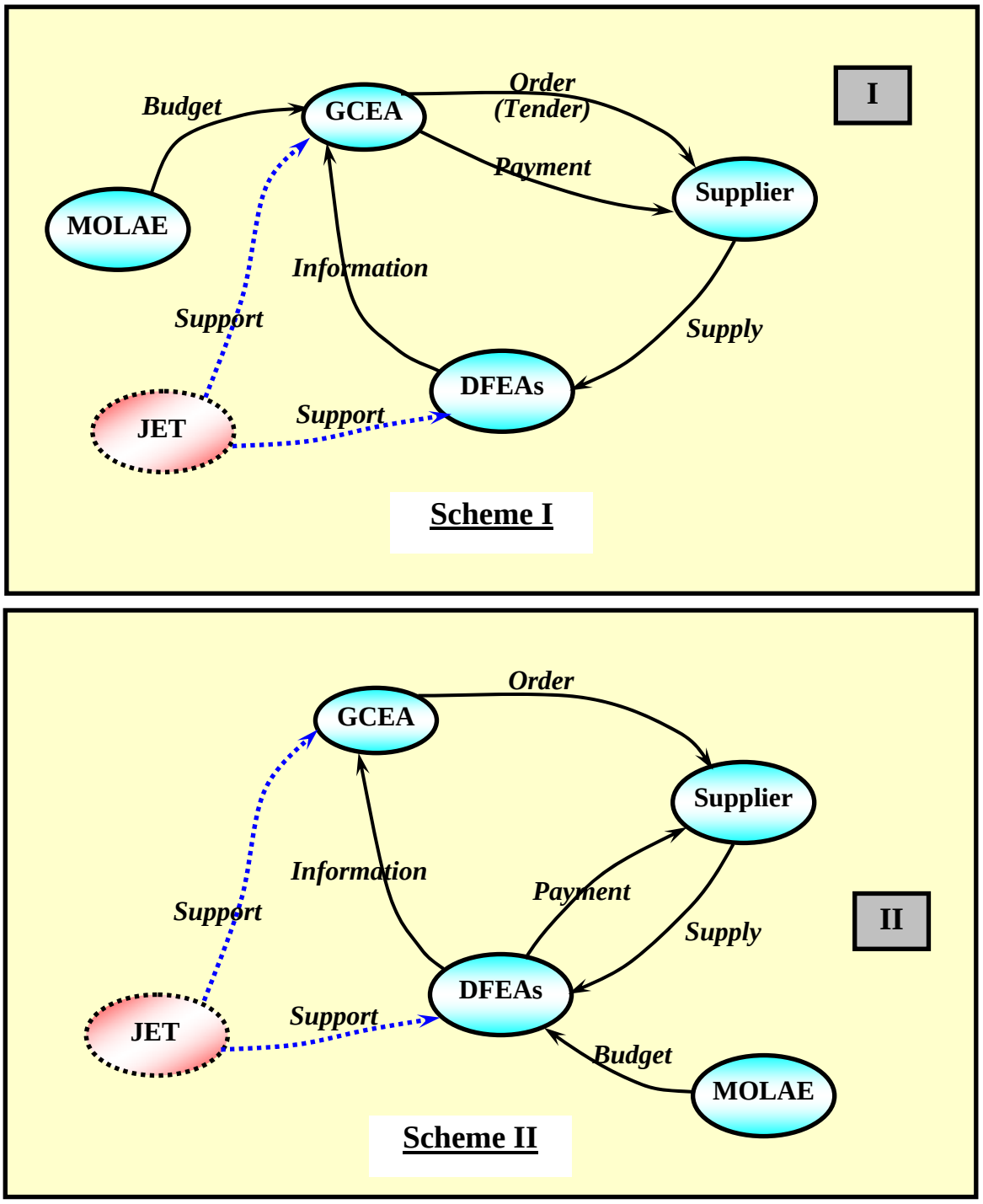
Note: Receiving data at Damascus DFEA

3.8.6 Purchasing of Reagents

(1) Central Order System

According to the Record of Discussion (R/D), each DFEA is to be required to purchase the reagents and the consumables needed by oneself that are arising from the activities of the laboratories from 2006. Although the reagents and the consumables required in DFEA include all kinds of reagents and spare parts etc., the amount of those required in each DFEA are normally small. This means that purchasing of the reagents and the consumables by each DFEA may encounter great troublesomeness. In order to avoid this kind of troublesomeness and to establish the management system of reagents and consumables, the JICA Expert Team has proposed a central order system for purchasing the reagents and consumables to be needed in DFEAs. In this system, GCEA makes a package purchase of all kind of reagents and consumables on behalf of DFEAs. The JICA Expert Team supported GCEA providing the detailed information concerning the reagents and consumables. Two schemes of the central order system proposed by the JICA Expert Team are shown in next page.

The GCEA agreed and implemented this central order system from November 2007. Its effects are not clear in December 2207 because GCEA just started this system.



SCHEME OF CENTRAL ORDER SYSTEM FOR REAGENTS AND CONSUMABLES BY GCEA

(2) Reagent Supplier

In order to measure several parameters such as nitrate (NO_3^-) in the laboratories of DFEAs, the colorimeter (Hach DR890) and/or the spectrophotometers (Hach DR5000, DR4000) are now being used. These instruments require the specific Hach-made reagents for the measurements. Currently,

these reagents can be purchased only through the exclusive agent/supplier, MIMOSA.

The German manufacturer "Merck" is producing the reagents compatible or equivalent to those of Hach-made. This means that the reagents for the colorimeter or the spectrophotometer are not necessarily purchased from the specific agent/supplier. The reagents can be purchased in Syria through the agent/supplier of Merck. However before purchasing the reagents of Merck-made, procedures of measurements, kind of cells, etc. should be checked and confirmed comparing those of Hach-made reagents. Following shows the agent/supplier of Merck and Hach in Syria for reference.

Agent for Reagents

	Name of Agent	Agent of:	Address	Tel/Fax/E-mail	Attn.
1	M.A.N	Merck	Jaber lbn Hayyan St., Damascus, Syria	TelFax: +963 11 4466061 Tel: +963 11 4427071 E-mail: man71sar@scs-net.org Mr. Abdul Hadi Tayyar (094427071, Mob.)	Mr. Abdul Hadi Tayyar
2	DROGUERIE SYRIE	Merck	Kostaki Homsi Str. 106, suite 3, Aleppo	Tel: (021) 229 9000 Fax: (021) 229 9215 E-mail: dikran@drogueriesyrie.com Mr. Dikran Kaprielian	Mr. Dikran Kaprielian (General Director)
3	MIMOSA	Hach	Abu Roummaneh Shakib Arsian Street – Masri Bldg. next to Swedish Embassy	Tel: 3333276 Fax: 3332290 E-mail: mimosa@net.sy Mr. Rayan: 093 272955	Mohamed Rayan (Marketing Manager)