In Country Training Programme under "Malé Declaration on Control and Prevention of Air Pollution and its likely Transboundary Effects for South Asia"

Jointly organized by DoE Iran, SEI, SACEP and UNEP RRC.AP, with the financial support from Sida

Report on Iran

Introduction

As a signatory to the Malé Declaration, the Islamic Republic of Iran has agreed to participate in the monitoring of long range transport of air pollution and its likely impacts. Accordingly, Iran was recommended six monitoring stations by the United Nations Environment Programme (UNEP) for this programme. The Department of Environment (DoE) is the National Implementing Agency (NIA). The sample monitoring and analysis will be done by DoE.

Monitoring Site

Site location: The first monitoring station is located at Chamsari, on the Iraq border, in the southern part of Ilam Province. A map of the monitoring site and its surroundings is provided in Fig 1.

During the training period, Mr. M Iyngararasan, Dr. Martin Ferm and Mr. Sagar Dhara went to the site with Mr. M Tohidi and other officials from DoE.

The site is at Chamsari, which is located a few kilometers from the Iraq border. Chamsari is 40 km south of the town Dehlaran and about 200 km south of Ilam, the headquarter of the province. The monitoring site is in a military area.

There are two small villages at a distance of 5-7 km to the north and northwest of site. The site is barren and has loose gravel. The cooking energy used by the villagers is LPG. No biomass burning was reported to occur in the villages.

Chamsari is a deposition-monitoring site. The ecological monitoring site is yet to be identified.

There are two oil wells located about 12-15 km north and south of the site, respectively. The oil wells have flares.

DoE officials had looked for alternative sites to Chamsari. Either the existence of hill ranges very close to the Iraq border or the lack of power lines made Chamsari the only viable site in the proximity of Baghdad, the major emission source across the border.

No meteorological station exists within a 50 km radius of Chamsari. Summer temperatures at the site exceed 50^{o}C.

The site met the following sitting criteria:

1. The deposition monitoring was identified.
2. The site is downwind of emissions sources from countries west of Iran and is very close to the Iraq border.
3. The terrain surrounding the site is flat.

4. The site is sufficiently inland to avoid the influence of sea breezes.
5. The site is secure and has easy access.
6. Sample analysis for the dry deposition samples (HVS) will be done at Dehlaran, which is less than 1 hour away from the site. The wet deposition samples will be analysed in the DoE laboratory at Ilam, which is less than 6 hours away from the site.

The site did not meet the following criteria:

1. There may be some interference from anthropogenic activity, viz, the oil well flares and the villages. However, this needs to be ascertained by modeling and monitoring.

Site characteristics: Because of sparse vegetation at the site and its surroundings, soil dust would also be present in the monitored dust samples.

Monitoring and laboratory equipment

Equipment: The monitoring and laboratory equipment and glassware given in Annex 1.

Installation: Installation of the equipment is planned for March 2004.

Training programme

An "In Country Training Programme under "Malé Declaration on Control and Prevention of Air Pollution and its likely Transboundary Effects for South Asia" was held in the Environmental Research Centre of the DoE between 13-17 September 2003. The programme was organized by the DoE in collaboration with UNEP RRC.AP, SACEP and SEI.

The training programme's objective was to build national capacity to provide hands on experience on sampling and analysis of transboundary pollutants.

The opening section was started with the welcome address by the organizer from DoE. Mr. Sagar Dhara took over the programme as a facilitator for the training.

The technical resource persons were Dr Rajendra Prasad, Mr Rakesh Agarwal and Dr. G. D. Agrawal, Dr. Martin Ferm, Mr M. Iyngararasan and Mr Sagar Dhara. The content of the programme is enclosed in Annex 2.

For security reasons, the training was held in Tehran rather than at the monitoring site.

Participants: The trainees were from DoE laboratories and offices from various provinces. The resource persons were from IVL, Envirotech, UNEP RRC.AP. A list of participants is enclosed in Annex 3.

The trainees had degrees ranging from bachelors to doctorate levels in chemistry and other science disciplines. Many of them had the experience of having worked in chemistry laboratories as chemists. The team exhibited the capacity to learn the practical aspects of the work quickly.

Equipment: Training was provided to handle the following equipment:

Envirotech International: High Volume Sampler– Envirotech APM 460NL—for TSPM, PM_{10}, gaseous sampling.
IVL: Passive Samplers for SO_2 and NO_2
MISU: Wet only collector, Bulk collector

Good hands on training could not be provided as the equipment was sent was not released from customs at the time of the training programme. Some hands-on training was provided on air pumps by making makeshift arrangements using low volume sampler pumps and impingers available with DoE. Hands-on training was provided on the use of spectrophotometer. Hands-on training on the wet only collector was not possible. Classroom knowledge was imparted on the handling of all the monitoring equipment.

Evaluation: A test paper was circulated amongst the trainees to assess how successful the training programme was in imparting knowledge and skills to the trainees. The answers were not marked but the answers were discussed collectively.

A participant evaluation of the programme was also done. The response questionnaire and the tabulated results of the responses are provided in Annex 4.

Recommendations

1. A suitable site has to be identified for water and aquatic ecology monitoring.
2. Possible interference from emissions from anthropogenic sources—flares, emissions from nearby villages—should be ascertained by modeling and monitoring. This exercise can be done at minimal cost.
3. After the training programme, it was felt that a technician-level person should be sent to Iran to provide further training on the PM10 sampler after the equipment is installed at the site. This may be acted upon.
4. A follow-up visit may be done by a technician-level person in the first year after equipment installation only if requested.
5. A follow-up visit by a UNEP representative (MoC-level or equivalent) may be done in the first year after monitoring has begun to sort out problems related to data management and reporting, QA/QC, further capacity building, site change, etc.
6. Theoretical aspects of the subject, e.g., basic chemistry and statistics, QA/QC need to re-covered in future refresher courses.

Annex I

List of Equipments and Consumables

1 Site Equipment

No.	Description	No. of Unit	Remark
1.1	PM10 air sampler	1	Envirotech model APM 460(NL)
1.2	pH meter	1	Hand held WTW model pH 300i (pH meter)
1.3	EC meter	1	Electrical conductivity meter, hand held WTW model COND 330i
1.4	Thermometer	1	Best Indian Make (-20 to 15degree C, least count 0.1 degree)
1.5	Diffusive samplers	2	For measurements at 1 site on a monthly basis during one year
1.6	Bulk sampler	2	
1.7	Wet only Collector	1	Included solar panels, solar shunt regulator

2 Laboratory - Equipment

2.1	Spectrophotometer	1	U/V and Visible Best Indian Make, Elico SL 171
2.2	Oven	1	Best Indian Make (50 to 250 degree range, 220-240V, 0.5KW)
2.3	Balance	1	Electronic Balance, Sartorius Make. Model BL210S Capacity 210g. Readability 0.1 mg
2.4	pH meter	1	Hand held WTW model pH 300i (pH meter)
2.5	Electrical conductivity meter	1	Electrical conductivity meter, hand held WTW model COND 330i
2.6	Desiccator	1	Mark 'Duran' Size 300mm
2.7	Distallation Unit	1	
2.8	Magnetic stirrer 1 L	1	Though listed as being reqd for soil qlty analysis, would be preparing for preparing solutions for DD/WD sample analysis
2.9	pH electrode for low ion concentration	1	
2.10	Calibrators		
	a) Soap Bubble Meter (manual type) (Calibrator for Rotameter)	1	
	b) Top loading Flow Calibrator	1	

3 Laboratory Consumables

A	***Glassware and other consumables***		
3.1	Washing bottle with ground glass stopper 500 ml	2	
3.2	Measuring cylinder 100 ml, 50ml, 25 ml. 10 ml	8	100 ml x 2 nos, 50ml x 2 nos, 25ml x 2 nos, 10ml x 2 nos
3.3	Glass tubes with ground-in stopper (Nessler's tubes)	12	
3.4	Volumetric flask 1000ml, 500 ml, 250 ml, 100 ml	7	1000ml x 2nos, 500 ml x 1 nos, 250 ml x 2 nos, 100 ml x 2 nos
3.5	Pipette 10 ml, 25 ml	4	10 ml x 2 nos, 25 ml x 2 nos

3.6	Filter paper Whatman 41, dia 47 mm	3	1 box = 100 nos
3.7	Bottle polypropylene 1 L, 500 ml	14	1 L x 6 nos, 500 ml x 8 nos
3.8	Beaker 100 ml, 250 ml	16	250 ml x 2 nos, 100ml x 12 nos
3.9	Regaent bottles 100ml	6	100ml x 6nos
3.10	Regaent bottles 250ml	6	250ml x 6 nos,
	Chemicals and other consumables		
3.11	2 monitoring kits		

4 Site Consumables

4.1	Filter paper Whatmans GF/A	2	Size 8"x10", in sealed pkt. Of 100 sheet
4.2	Impingers	4	35ml capacity, 4 will be supplied with hvs, 4 more are reqd as spare
4.3	Syringe 100 ml	2	5.00 each packet, in pkt. Of 10
4.4	Glass/inert plastic tubing	3	per meter, Silicon tube
4.5	Silicon grease	2	for 100 gm packet
4.6	Measuring cylinder 100 ml	2	each
4.7	Pipette 20 ml	3	10 ml x 2 nos, 20 ml x 1 nos
4.8	Polyethylene containers 20 ml	100	each - 60ml
4.90	Funnel	6	50 mm x 3 nos, 75 mm x 3 nos
4.10	Capped bottles 1 L	3	each (Tarson)
4.11	Ice box	2	each (medium size)
4.12	Power Cord 5 meter long	2	
4.13	Junction Box (Extension Board)	1	1 set
4.14	Burette (50 ml)	1	
4.15	Burette Stand	1	
4.16	Cleaning Brush for Glassware	2	
4.17	Printed paper envelopes to keep filters	1pkt	1 pkt. of 12 Nos.
4.18	Graph Pad	1 Pad.	
4.19	Iodine flask (250ml)	2	
4.20	Membrane Filtration Assembly	2	
4.21	Petridish	1	
4.22	Pipette (1 ml)	1	
4.23	Pipette (2 ml)	1	
4.24	Pipette stand	1	
4.25	Plier	1	
4.26	Pipetting Pump	1	
4.27	Silica gel (500 gm)	1	
4.28	Torch	1	
4.29	Tissue Roll	1	
4.30	Tweezer	1	
4.31	Sampling Bag	1	

Annex II

Training Programme

Day	**Contents**	**Class/lab**	**Instructor**
September 13	Inauguration		
Starting at 9:00	Introduction to the Malé Declaration and scope of present program (30min)	C	MI
Lunch 12-13	Impacts of air pollution (30 min)	C	Envirotech
	Malé monitoring network (30)	C	SD
Tea break	Basics concepts of meteorology (30)	C	Envirotech
15:30 -16:00	Units and materials and energy balance (30)	C	Envirotech
end at 17:30	Basics chemistry (30 min)	C	Envirotech
	HVS: features and setting it up (45 min)	C	Envirotech
September 14	Passive sampling: theory and practice (45 min)	C/L	MF
Starting at 9:00	pH meter (30)	C	Envirotech
	EC meter (30)	C	Envirotech
Lunch 12-13	Practical on EC meter and PH meter (60 min)	L	Envirotech
Afternoon	Wet only & bulk collector: theory (30 min)	C	MF
Tea break	Spectrophotometer analysis (30)	C	Envirotech
15:30 -16:00	Basic Statistics (30)	L	Envirotech
end at 17:30	Preventive maintenance of HVS	L	Envirotech
September 15	QA/QC (45 min)	C/L	Envirotech
Starting at	Troubleshooting of WC, BC	C	SD/MF
9:00	Monitoring protocol (20 min)	C	SD
	Data reporting	C	MI
Afternoon	Practical on Spectrophotometer	L	Envirotech
Tea break	HVS Calibration	C/L	Envirotech
15:30 -16:00	Preventive maintenance for HVS	C/L	Envirotech
end at 17:30			
September 16	HVS- Practical	L	Envirotech
Starting at 9:00			
end at 17:30			
September 17	Wet only and Bulk collector practical	L	SD/MF
Starting at 9:00			
end at 17:30	Evaluation and examination	C	MI/ Envirotech /MF
	Discussion, conclusion and issue of certificates	C	MI

MF: Martin Firm, IVL
MI: Mylvakanam Iyngararasan, UNEP/RRC.AP
Envirotech; Dr. Rajendra Prasad, Mr. Rakesh Agarwal, Dr. G. D. Agrawal
SD: Sagar Dhara, MoC

Annex III

List of participants

No.	Name	Institute / Place
1.	Mr Seyd Hassan Safari	Gilan province
2.	Mjid Vafadar	Hormozgan province
3.	Nematollah Ghanbari	Mazandaran
4.	Ms. Saeiyeh Rafiyan	Sistan & Balochestan
5.	Tooraj Hemmati	Ilam province
6.	Hossein Khaleghi	Ilam province
7.	Maziar Solaimannejad	Ilam province
8.	Ms. Zahra Mleke syah cheshm	Lab of DOE
9.	Hadi Hamidiyan	Lab of DOE
10.	Karim Pour asad Mehrabani	Lab of DOE
11.	Shahram Sepehrniya	Lab of DOE
12.	Mashallah Tohidi	DOE
13.	Sadreddin Alipour	DOE
14.	Mostafa Mojghani	DOE

Resource Participants list

1)	Rajendra Prasad,	Envirotech
2)	Martin Ferm,	IVL
3)	Mylvakanam Iyngararasan,	UNEP/RRC.AP
4)	Rakesh Agarwal,	Envirotech
5)	G. D. Agrawal,	Envirotech
6)	Sagar Dhara,	MoC
7)	Naw Wah Wah Htoo	UNEP/RRC.AP

Annex IV

(TEST PAPER)

1. Which are the participating countries of Malé Declaration?
……

2. Name the National Focal Point for Malé Declaration in Iran?
……

3. Name the three main pollutants the Malé Declaration wishes to measure?
……

4. Why are the Malé Declaration monitoring site located in remote areas?
……

5. What effects do air pollutants have on human health?
……
……

6. Air pollution can potentially result in fish kills in lakes.
True or False

7. Air pollution can have both good & bad effects on plants.
True or False

8. Air pollution can cause the corrosion of statues and man made materials such as paints.
True or False

9. Indicate if true or false:

a)	Concentration of air pollutants is measured in ppm by volume.	True	False
b)	5 mg/L is the same as $5g/m^3$.	True	False
c)	High volume sampler is used to measure dry deposition rate.	True	False
d)	Wet only collector is used to measure rainfall.	True	False
e)	EC meter can be used to indicate dissolved solids concentration.	True	False
f)	Impingers are here used to collect SPM in air.	True	False
g)	Unfiltered air is bubbled through Envirotechs impingers.	True	False
h)	Water in the manometer in high volume sampler should be replaced every 6 months.	True	False

10. Indicate the most appropriate or correct answer:

(a) With increase in altitude
(i) pressure decreases (ii) temperature remains constant (iii) density of air increases (iv) wind speed decreases

(b) which of the following is a secondary pollutant
(i) NO (ii) SO_2 (iii) O_3 (iv) Pb

(c) Wind rose diagram is a representation of
(i) Wind temperature (ii) Wind direction and speed
(ii) Wind humidity (iv) Wind pressure

(d) Which of the following instruments measures hydrogen ion concentration
(i) EC meter (ii) Spectrophotometer (iii) Bulk collector (iv) pH meter

(e) The cyclone in Hi-vol sampler

(i) collects respirable dust (ii) protects filter paper from moisture (iii) collects particles less than 10 μm size (iv) collects particles greater than 10 μm size

(f) If 1 mL of a 10 mg/L standard NO_2 solution is added to 9 mL of reagents the concentration will be

(i) 10 μg/L (ii) 1 μg/10 mL (iii) 1 g/m3 (iv) 1 ng/mL

(g) If 10 g S is burnt SO_2 production will be

(i) 10 g (ii) 20 g (iii) 32 g (iv) 64 g

(h) For gaseous sampling using impinger? the air flow rate is usually kept at

(i) 1-3 m^3/h (ii) 1-4 m^3/min (iii) 1-5L/min (iv) 1-4 mL/min

11. Calculate the dust concentration in air in μg/m^3 if 2 g dust is suspended in 1000 m^3 of air.

12. What is the total amount of air in m^3 which is filtered if a Hi-Vol sampler sucks air at an average rate of 0.5 m^3/min for 8 h.

13. What will be the volume of 273 m^3 of air which is at 0°C, if heated to 27°C.

14. What is wet deposition

…….

…….

15. What is dry deposition

…….

…….

16. How can you estimate dry deposition

…….

…….

17. What is the approximate average time a sulfur compound (as SO_2 or sulphate particle) spends in the atmosphere

a) 6hrs b) 1 day c) 4 days d)10 days e) 1 month f) 6 month g) 1 year

18. Can transboundary transport in the atmosphere be a problem for Sri Lanka? ……..
Why? ……

19. Deposition of pollutants from the atmosphere can be a problem. Give some examples?
…….
…….

20. Can diffusive (passive) sampler be used for measuring the SO_2 concentration in air?
…….

21. Do you need a pump for diffusive (passive) sampling?
…….

22. Can you analyse the diffusive (passive) samplers yourself ?
…….

23. How should the diffusive (passive) sampler be mounted?
…….

24. What should you do with the sample if you find bird dropping in the funnel of bulk collector?
…….

25. Why do you need gloves when handling the bulk sampling equipment?
…….

26. Why should you shake the sample a little before taking out a fraction of it from a bulk sampling equipment?
…….

27. When do you take out samples from the wet only collector?
……

28. Suppose that it is raining a lot and the bottle is more than 80% full already after 3 days. What do you do?
……
…….

29. Suppose that after installation of a collection bottle it become fill already the same afternoon. What do you do?
…….
…….

30. What do you do
(a) If the lid becomes damaged?
(b) If the wet only collector does not work properly or not at all and there is no obvious error?

31. Are you aware of the health and safety issues associated with analyzing the samples in the laboratory? Yes and no. Give example.
……
……

Summary of the training program evaluation Result

Question	Not at all (%)	A little (%)	Somewhat (%)	Mostly (%)	Completely (%)
Overall objectives and content					
1. Were the objectives clear and precise				44.4	55.5
2. Were the objectives attained?				66.6	33.3
3. Was the content linked to the objectives?				66.6	33.3
4.Was the content well structured?			22.2	33.3	44.4
5.Was the content presented clearly?			11.1	55.5	33.3
To what extend did these sections of the training workshop meet your expectations?					
6. Basics of air pollution monitoring			22.2	44.4	33.3
7. Sampling PM10 using HVS			33.3	22.2	44.4
8. Gaseous Sampling using HVS			44.4		55.5
9. Sampling with bulk collector		11.1	22.2	22.2	44.4
10. Sampling with wet only collector		11.1	22.2	22.2	44.4
11. Sampling using passive samplers		11.1	22.2	11.1	55.5
Methodology					
12. Was the methodology used appropriate for the training program and you as a professional?			33.3	66.6	
13. Did the methodology help you to share your own knowledge and experience?			33.3	33.3	22.2
How useful did you find the following elements of the training program?					
14. Lab session (Spectrophotometer)			22.2	66.6	11.1
15. Lab session (pH and EC Meters)			22.2	44.4	33.3
16. Facilitated discussions			55.5	22.2	22.2
17. One to one discussions			33.3	66.6	
Logistics					
18. Was the meeting venue adequate?		11.1	22.2	44.4	22.2
19. Was the timing of the agenda comfortable?			22.2	44.4	33.3
20. Was the length of the sessions appropriate?			33.3	44.4	22.2
	Excellent (%)	Good (%)	Average (%)	Unsatisfactory Poor (%)	
21. Overall, how would you rate the training? Please circle one.	22.2	77.7			

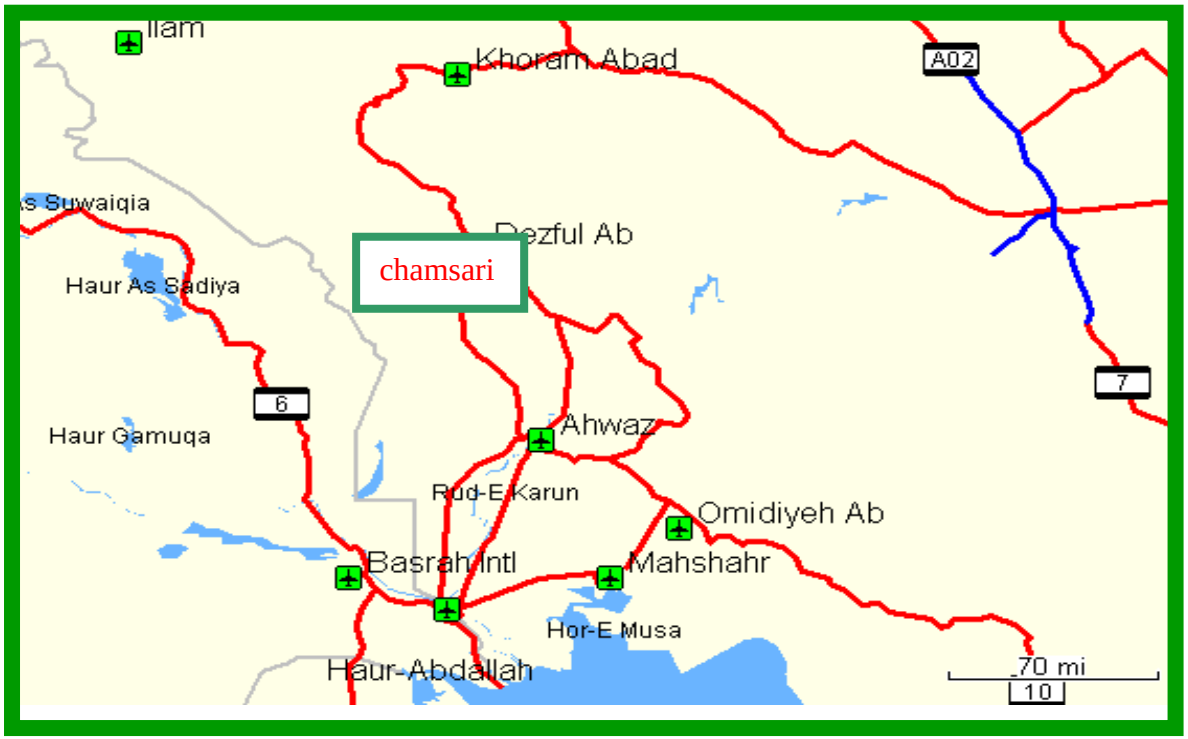

Figure 1: Map of the monitoring site and its surroundings

Some Photographs from the Training Programme