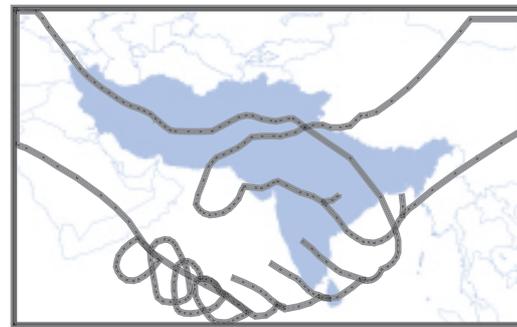


NEWS LETTER

Malé Declaration on Control and Prevention of Air Pollution and Its Likely Transboundary Effects for South Asia

Volume 1 Number 3

April 2003



Air Pollution Monitoring Station Established in Nepal Under the Malé Declaration

The first transboundary air pollution monitoring station under the Malé Declaration on Control and Prevention of Air Pollution and its likely Transboundary Effects for South Asia' has been established in Rampur of the Chitwan district in Nepal. The station was installed during a training/installation programme held during 24 - 28 March 2003. Over fifteen trainees from the Institute of Agriculture and Animal Science (IAAS), the Department of Hydrology and Meteorology (DHM) and the International Center for Integrated Mountain Development (ICIMOD) were trained on sampling and analysis of transboundary air pollutants. Representatives from Envirotech, IVL, SACEP, SEI and UNEP participated as resource persons.

The station has been established within the premises of IAAS, and it is



Envirotech give training on analytical and calibration techniques in the laboratory at IAAS, Rampur.

capable of monitoring air quality as well as rainwater chemistry. Air quality measurements include: the concentrations of Respirable Suspended Particulate Matter (RSPM) or PM_{10} (particulate matter having a diameter $< 10\mu m$), Total Suspended Particulate Matter (TSPM), Sulphur dioxide (SO_2) and Nitrogen dioxide (NO_2). Rainwater analyses include: pH, Electrical Conductivity (EC), and the concentrations of anions (e.g. NO_3^- and SO_4^{2-}) and cations (e.g. Ca^{2+} , Mg^{2+} , K^+ and Na^+).

A High Volume Sampler (HVS) and diffusive samplers (passive samplers) were installed to monitor the air quality parameters. Air concentrations of SO_2 and NO_2 will be measured using both active bubbler techniques and diffusive samplers. Rainwater samples will be collected using an automated wet only collector as well as simple bulk collector techniques. Most sample analysis will be conducted at IAAS following the Malé Declaration quality control and assurance procedures specified by the Monitoring Committee (MoC).

In addition to monitoring transboundary air pollutants, the station will also provide a training facility for the experts in Nepal. It is ex-

In this issue

Air Pollution Monitoring Station Established in Nepal

A few thoughts for the road ahead-2

Initiative to characterize the Composition of Asian Deposition (CAD)

Upcoming events

Visits and Discussion



Trainees observing the installation of the HVS and diffusive samplers at IAAS, Rampur

pected that this facility will also promote research studies on transboundary air pollution in the country.

Similar transboundary air pollution monitoring stations will be established in all the participating countries of the Malé Declaration by the end of this year. The Malé Declaration states the need for capacity building and regional cooperation to study the transboundary air pollution issue in South Asia.

A few thoughts for the road ahead-2

Sagar Dhara

There was a large round of applause when the first set of Malé Network monitoring results came in on the last day of the Nepal training programme for wet and dry deposition monitoring held at the Institute for Agriculture and Animal Sciences (IAAS), Rampur.

The results indicated that the average TSPM concentrations were 60-70 $\mu\text{g}/\text{m}^3$, NO_x : 3-5 $\mu\text{g}/\text{m}^3$ and SO_x : below detectable limit. The results were nothing out of the ordinary for Rampur. More data are required to make a meaningful interpretation of the possible trends at Rampur.

If monitoring results were obtained in just four days of hands-on training, congratulations to the IAAS team and those who were responsible for selecting them, including the Nepal Ministry of Population and Environment, the Dean IAAS and ICIMOD. The IAAS team was not just good, it was, more importantly, very motivated.

A point I had made in the last newsletter, ie, the national teams now being formed should be of the high quality that the multi-national team the countries had earlier contributed to the Malé Network here, has been fulfilled by Nepal.

The IAAS team's zest for learning something new rubbed off on the trainers too. This was evident from the interest and enthusiasm that Envirotech and IVL showed in imparting knowledge and skills to the trainees.

An interesting aspect about the composition of the IAAS team was that it had a mix of experienced as well as young persons. The Dean of IAAS wisely chose the Soils Department to handle the monitoring. They are quite familiar with soil chemistry and this will be very useful both for wet and dry deposition as well as when work on soil and vegetation monitoring begins. Moreover, the department has

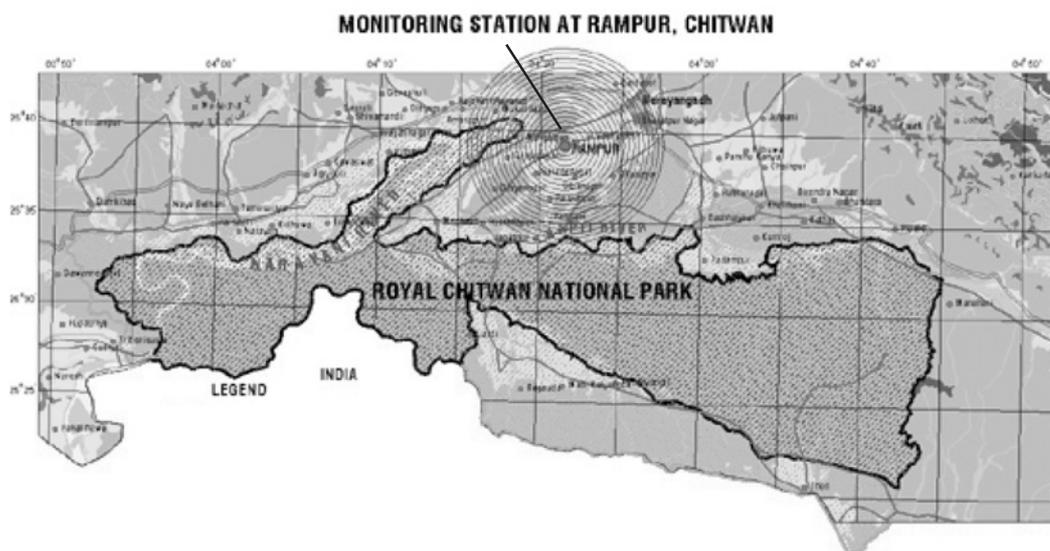
an Atomic Absorption Spectrometer (AAS) and a flame photometer, which will be very valuable for analyzing wet deposition, soil and water samples.

An educational institution handling scientific work, even if it is away from its primary academic areas, has the advantage of a trickle down effect. Students, even though they may not be directly involved in wet and dry deposition monitoring, are bound to learn something about it.

Lastly, the top brass in the Ministry of Population and Environment demonstrated their keen interest in the project. Dr Jigbar Joshi, the Joint Secretary, drove five hours to Rampur to be personally present for the inauguration of the training programme.

On balance, the first in-country training programme went off well and will be a model for the remaining training programmes. I am confident that each successive training programme will make some improvement over the previous ones.

- - below detectable limit



Initiative to characterize the Composition of Asian Deposition (CAD)

Henning Rodhe

(Department of Meteorology, Stockholm University, Sweden)

The first meeting of the Composition of Asian Deposition (CAD) working group was held at the Malaysian Meteorological Service (MMS), Petaling Jaya, Malaysia, on the 21-23 November 2002. The workshop was held as part of the 2001- 2004 phase of the Sida-funded Programme on Regional Air Pollution in Developing Countries (RAPIDC) which is co-ordinated by the Stockholm Environment Institute (SEI). CAD forms part of the International Global Atmospheric Chemistry Programme / Deposition of Biogeochemically Important Trace Species (IGAC/DEBITS) activities of the International Geosphere-Biosphere Programme (IGBP). CAD aims to: (i) determine, primarily through measurements, the atmospheric removal rates by dry and wet deposition of biogeochemically important trace species in South and South-East Asia; (ii) establish, at regional scale, atmospheric budgets of key elements such as sulphur (S), nitrogen (N), calcium (Ca); (iii) relate the deposition fluxes to the sensitivity of soils and surface waters; and (iv) obtain data for testing regional transport models of sulphur and nitrogen pollutants.

One of the original tasks of IGAC (Galbally, 1989) was entitled "Composition and Acidity of Asian Precipitation" (CAAP), with the objectives:

- 1) to quantify the wet deposition of S, N, C, P and sea-salt species, and
- 2) to assess the state of rainwater acidity in south and south-east Asia.

The prime motivation was a concern that rapidly increasing emissions of S and N compounds in south and south-east Asian countries could create acid

deposition and other regional pollution problems (Rodhe and Herrera, 1988). At that time the number of regionally representative observations of the chemical composition of precipitation was very limited (to a large degree this is still true).

CAAP/CAD has operated as a rather loosely coordinated network, primarily of observational activities, but supplemented more recently by modeling studies. In parallel with well-focused national and bi-national measurement programs, mainly in India, Thailand, Malaysia, Singapore and Indonesia, a most important component of CAAP/CAD has been the convening of workshops, the last one held in Kuala Lumpur in November 2002.

The backbone of CAAP/CAD has been, and still is, precipitation chemistry measurements. In recent years several of the observational stations have included measurement of the gases SO₂, NO₂ and NH₃ to enable dry deposition of these gases to be estimated. At a few sites measurements are also made of aerosol particles, separated into sub-micrometer and super-micrometer sizes.

In addition, CAAP/CAD has provided a legacy that includes a modest network of people within S and SE Asia who are now knowledgeable about reactive atmospheric chemistry and modern measurement techniques as it relates to sources and sinks of anthropogenic S and N emissions. [For more information on CAD and to order a copy of the proceedings of the first workshop see: www.rapidc.org]

Some of the highlights of results of the CAAP/CAD studies reported in the open literature publications

- Identification of areas of very high acidic deposition (in Malaysia and in Indonesia) (Ayers et al., 2002; Gillett et al., 2000).
- Assessment of the impact of Indonesian smoke haze episodes on regional air quality (Balasubramanian et al., 1999).
- Identification of areas where calcium carbonate and ammonia were important sources of alkalinity in rainwater (e.g. India: Pillai et al., 2001 and in Thailand: Granat et al., 1996).
- To the extent that ecosystems are nitrogen saturated, soils in regions with high ammonia deposition (e.g. northern India) may be receiving a substantial input of acidity even though the pH of rainwater exceeds 5.0 most of the time (Granat et al., 2001).
- Identification of high levels of organic acidity in rainfall throughout tropical regions, and the role played by these acids in changing apparent rainfall composition after collection (Zhung and Balasubramanian, 2001).
- Characterization of the relative roles of S and N in various regions, related to regional source balance.

Some Useful References related to CAD

- Ayers, G.P., Gillett, R.W., Ginting, N., Hooper, M., Selleck, P.W. and Tapper N. (1995) Atmospheric sulfur and nitrogen in West Java. *Water, Air, and Soil Pollution* 85, 2083-2088.
- Ayers G.P. (1991). Atmospheric Acidification in the Asian Region, *Env. Monitoring Assessment* 19, 225-250.
- Ayers G.P. and Yeung K.K. (1996). Acid deposition in Hong Kong, *Atmos. Environ.* 30, 1581-1587.
- Ayers G.P., Fukuzaki N., Gillett R.W., Selleck P.W., Powell J.C. and Hara H. (1998). Thymol as a biocide in Japanese rainwater, *J. Atmos. Chem.* 30, 301-310.
- Ayers, G. P., Leong Chow Peng, Lim Sze Fook, Cheah Wai Kong, R.W. Gillett and P.C. Manins (2000), Atmospheric concentrations and deposition of oxidised sulfur and nitrogen species at Petaling Jaya, Malaysia, 1993-1998, *Tellus B* 52, 60-73.
- Ayers, G. P., Leong Chow Peng, R.W. Gillett and Lim Sze Fook (2002), Rainwater composition and acidity at five sites in Malaysia, in 1996, *Water, Air and Soil Pollution* 133, 15-30.
- Balasubramanian, R., Victor, T. and Begum R. (1999) Impact of biomass burning on rainwater acidity and composition in Singapore, *J. Geophys. Res.* 104, 26,881-26,890.
- Balasubramanian, R., Victor, T. and Chun, N. (2001) Chemical and Statistical Analysis of Precipitation in Singapore, *Water, Air, and Soil Pollution* 130, 451-456.
- Carmichael GR, Ferm M, Thongboonchoo N, Woo J-H, Chan LY, Murano K, Viet PH, Mossberg C, Bala R, Boonjawat J, Upatum P, Mohan M, Adhikary SP, Shrestha AB, Pienaar JJ, Brunke EB, Chen T, Jie T, Guoan D, Chow Peng L, Dhiharto S, Harjanto H, Jose AM, Kimani W, Kirouane A, Lacaux J-P, Richard S, Barturen O, Cerda JC, Athayde A, Tavares T, Cotrina JS and Bilici E (2003) Measurements of sulfur dioxide, ozone and ammonia concentrations in Asia, Africa, and South America using passive samplers. *Atmospheric Environment* 37 1293-1308
- Engardt, M. and Leong, C. P. (2001) Regional modelling of anthropogenic sulphur in Southeast Asia. *Atmos. Environ.* 35, 5935-5947.
- Ferm, M. and Rodhe, H. (1997). Measurements of air concentrations of SO₂, NO₂ and NH₃ at rural and remote sites in Asia. *J. Atmos. Chem.* 27, 17 - 29.
- Galbally, I. (ed.) (1989) *The International Global Atmospheric Chemistry (IGAC) Programme*, ISBN 0 643 05062 0.
- Gillett R.W., Ayers G.P., Mhwe T., Selleck P.W. and Harjanto H. (2000), Concentrations of nitrogen and sulfur species in gas and rainwater from several sites in Indonesia, *Water, Air and Soil Pollution* 120, 205-215.
- Granat, L., Suksomsankh, K., Simachaya, S., Tabucanon, M., Rodhe, H. (1996) Regional background acidity and chemical composition of precipitation in Thailand. *Atmospheric Environ.* 30, Nos 10/11, 1589-1596.
- Granat, L., Das, S.N., Tharkur, R.S. and Rodhe, H. (2001). Atmospheric deposition in a rural area in India - net and potential acidity. *Water, Air, and Soil Pollution* 130, 469-474
- Norman, M., Das, S.N., Pillai, A.G., Granat, L. and Rodhe, H. (2001) Influence of air mass trajectories on the chemical composition of precipitation in India. *Atmos. Environ.* 35, 4223-4235
- Pillai, A.G., Naik, M.S., Momin, G.A., Rao, P.S.P., Safai, P.D., Ali, K., Rodhe, H. and Granat, L. (2001). Studies of wet deposition and dustfall at Pune, India, *Water, Air, and Soil Pollution* 130, 475-480
- Rodhe, H. and Herrera, R. (1988) Acidification in tropical countries. SCOPE Report No. 36, John Wiley & Sons Ltd., Chichester, 405 pp.
- Zhong, Z., Victor, T. and Balasubramanian, R. (2001) Measurement of Major Organic Acids in Rainwater in Southeast Asia During Burning and Non-burning Periods, *Water, Air, and Soil Pollution* 130, 457 - 462.
- Hu, G.-P. and Balasubramanian, R. (2003) Wet Deposition of Trace Metals in Singapore. *Water, Air, and Soil Pollution*, 2003 (January).

Malé People



Visit and Discussions

PSC Meeting

The Program Steering Committee (PSC) meeting of SEI's RAPIDC Program was held on 25 January 2003 in Stockholm. UNEP RRC.AP and SACEP participated at this meeting via videoconference from RRC.AP's office in Bangkok. Mahboob Elahi, Director General, SACEP and Surendra Shrestha, Director, RRC.AP, presented the progress on Phase II implementation of Malé Declaration.

MoC Meeting

A Monitoring Committee (MoC) meeting was held at RRC.AP, 24 January 2003 for the finalization of preparatory arrangements for the establishment of monitoring network. Participants included Sagar Dhara (MoC member), Mahboob Elahi and Pradyumna Kotta from SACEP, M. Iyngararasan and Wah Wah Htoo from RRC.AP. Karin Sjoberg participated at this meeting via videoconference from Sweden.

SEI Visit

Dr. Johan Kuylenstierna and Harry Vallack from SEI-York visited RRC.AP on 3-4 April 2003. Progress in the establishment of monitoring network and development of integrated assessment model were discussed.



Upcoming Events

- **Annual Collaborators' Meeting of RAPIDC** will be held on 10 June 2003. SACEP and UNEP RRC.AP will make a presentation to the Swedish stakeholders on current initiatives in tackling the transboundary air pollution in Asia with the focus on Malé Declaration on transboundary air pollution.
- **Annual Network Meeting (2003) and the regional Stake-holders workshop** of Malé Declaration are to be held tentatively on 6-8 October. The network meeting will be attended by National Focal Points and National Implementing Agencies of Malé Declaration during 6-7 October and follow by the regional Stakeholders workshop on 8 October.
- **National Stakeholders Meetings** are proposed to be held in Pakistan and Bangladesh within year 2003.
- **Wet Deposition Training Program and refresher course** will be held on August 2003 in India. The objective is to familiarize the participants with the handling the instruments that will be used for sample analysis of rainwater.

Update on the establishment of monitoring stations

- **Bhutan:** Installation cum training on monitoring transboundary air pollution will be held in Bhutan during the last week of May 2003. The Monitoring station will be established in Gelephu (South Central of Bhutan).
- **Maldives:** Installation cum training on monitoring transboundary air pollution will be held in Maldives during the third week of June. The Monitoring station will be established at the island of Hanimadhoo in Haa Dhaalu Atoll.
- **Sri Lanka:** Installation cum training on monitoring transboundary air pollution will be held in Sri Lanka during the fourth week of June. The Monitoring station will be established in Dutuwewa which is 40 km away from nearest town (Anuradhapura).

Visit us at

www.rrcap.unep.org/issues/air/maledec/

National Focal Points (NFP) and National Implementing Agencies (NIA)

Bangladesh

NFP: Ministry of Environment & Forest

NIA: Department of Environment
Dhaka

Bhutan

NFP & NIA: National Environment Commission
Thimphu

India

NFP: Ministry of Environment and Forests

NIA: Central Pollution Control Board
New Delhi

Iran

NFP & NIA: Department of Environment
Tehran

Maldives

NFP & NIA: Ministry of Home Affairs, Housing & Environment
Malé

Nepal

NFP: Ministry of Population & Environment

NIA: International Center for Integrated Mountain Development
Kathmandu

Pakistan

NFP: Ministry of Environment, Local Govt. & Rural Development

NIA: Pakistan Environment Protection Agency, Islamabad

Sri Lanka

NFP: Ministry of Forestry & Environment

NIA: Central Environment Authority, Colombo

Coordinating Agencies

UNEP Regional Resource Center for Asia and the Pacific (UNEP RRC.AP)
Bangkok, Thailand



South Asia Cooperative Environment Programme (SACEP)
Colombo, Sri Lanka



Stockholm Environment Institute (SEI)
Stockholm, Sweden



Financial Support

Sida, the Swedish International Development Cooperation Agency, is funding this part of the Malé Declaration implementation as part of the Regional Air Pollution in Developing Countries (RAPIDC) programme.



Malé Declaration Newsletter

Further information may be requested from:

Surendra Shrestha
Director, UNEP RRC.AP
Outreach Building, AIT, P.O. Box: 4
Klongluang
Pathumthani 12120
Thailand
Fax: (66) 2 516 2125
E-mail: info@rrcap.unep.org

To: