



# ENVIRONNEWS

INTERNATIONAL SOCIETY OF ENVIRONMENTAL BOTANISTS

## Newsletter

LUCKNOW (INDIA)

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*Best wishes for*

*A Very Happy & Prosperous New Year*

**2007**

*From*

International Society of Environmental Botanists, Lucknow, India

### IN THIS ISSUE

Letters . . . . .	02
News Flash . . . . .	04
Sustainable Development and Waste Management <b>Ajit Kumar Jain</b> . . . . .	6
VOC Emission by Plants: Significance and Implications <b>C.K. Varshney</b> . . . . .	7
News and Views . . . . .	9
Conferences . . . . .	12
Books . . . . .	12

### GREENING OF LUCKNOW\*

There is much talk about the "greening" of Lucknow, and to make it regain its reputation as the "Garden City". But yet when it comes to expansion of the town and development of new colonies, the green cover around the town has been a big casualty with the felling of the majestic trees along the highways around the town. The development plan of the town today should involve expanding the contour of the town, preserving the "green heritage", and adding new colonies and roads provided with a green cover. The International Society of Environmental Botanists, which is deeply concerned with the protection of the environment must play a pro-active role in this, point out to the authorities what damage is being done by this felling of the trees and give constructive suggestions, and how this development could be planned in which the present "green" cover would be preserved and more cover added in a planned manner. The Society could even offer the help in the planning process.

**Dr Nitya Anand**

(Former Director, Central Drug Research Institute, Lucknow, India)  
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<nityaanand@satyam.net.in>

\*Lucknow is the capital of India's most populated state of Uttar Pradesh. ISEB is based in Lucknow.

- Informative news, views and popular articles/write-ups on current environmental researches/issues are invited for publication in ENVIRONNEWS.
- Environews is published quarterly on the first of January/April/July/October; and is supplied free to all members of ISEB.
- Environews is also supplied in exchange for scientific literature published by reputed organisations.
- All correspondence should be addressed to : **The Secretary, International Society of Environmental Botanists**, National Botanical Research Institute, Lucknow - 226 001 (India).
- E-mail : [isebnbrilko@satyam.net.in](mailto:isebnbrilko@satyam.net.in) • Website : <http://isebindia.com>



## LETTERS

On checking the details of your 2005 conference from your website I noted with pleasure the presence of Prof. Sagar Krupa who has worked here in Alberta, Canada. Prof. S. Krupa was the keynote speaker at one day workshop on Ecological Effects Monitoring organized by the Clean Air Strategic Alliance last June. The 37th. Air Pollution Workshop was held in Banff last spring and it was of great help to citizens like myself who are concerned with vegetative impacts of air pollution.

**Robert A. Cameron**  
Chairman, South Peace Environmental Association, **Canada**  
E-mail: southpeace@hotmail.com

I have gone through *Environews* of October 2006. It is a quantum jump in printing and distributing a great newsletter. I foresee more developments under your dynamic leadership.

**Anuj Sinha**  
Head, NCSTCD, Department of Science & Technology,  
Govt. of India, **New Delhi**, India  
E-mail: cpranuj@yahoo.com / sanuj@nic.in

I am studying Environmental Science and Chemistry at Tomahawk High School in Tomahawk, Wisconsin, U.S.A. For my Environmental Science class, I am doing a Project report on a future career. I chose Environmental Botany as a career because I enjoy gardening, especially with hybrid-tea roses. Could you please send me information on Environmental Botany as I want to go for my master's degree in this subject?

**Steven Porfirio Roman**  
Tomahawk High School, 1048 East Kings Road,  
Tomahawk, Wisconsin 54487 **U.S.A.**

I am writing to you to inform you of a new community project. Communities Linking Computer Knowledge (CLiCK) started in 2005. CLiCK has now become a community project, which helps students, people who cannot afford computers, and non-profit organisations obtain computers free of charge.

Many people and organisations upgrade their computers on a continual basis, however, the computers and parts which have been replaced, upgraded, or that have become obsolete often collect dust or, are sent to land fill. CLiCK recycles these computers and parts to help community members and groups obtain computer equipment, so they can share in the knowledge and in the use of Computer facilities

CLiCK remains a Computer Recycling Program run entirely by volunteers, all computers and components donated to CLiCK are recycled, including faulty components. Computers and computer parts, which are donated are redistributed to the members of the community who are in need and who would not normally be able to afford or own a computer.

If you know anyone who is in need of assistance or would like to contribute in anyway or to donate please feel free to contact us.

**Matt Vapor**  
Regional Student's Association President,  
Murdoch Guild of Students - Regional Representative,  
National Union of Students Delegate, Murdoch University,

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You may have heard this elsewhere, but if not, I am glad to inform you that papaya juice is a natural cure for dengue fever. As dengue fever is rampant now, I think it's good to share this with all.

A friend of mine had dengue last year. It was a very serious situation for her as her platelet count had dropped to 28,000 after 3 days in hospital and water had started to fill in her lungs. She had difficulty in breathing. She was only 32-years old. Doctor said there's no cure for dengue. We just have to wait for her body immune system to build up resistance against dengue and fight its own battle.

She already had 2 blood transfusions and all of us were praying as her platelet continued to drop since the first day she was admitted.

Fortunately her mother-in-law heard that papaya juice would help to reduce the fever and got some papaya leaves, pounded them and squeezed the juice out for her. The next day, her platelet count started to increase, her fever subsided. She was given papaya juice regularly and she recovered after 3 days. Amazing but true.

Papaya juice has a cooling effect thus, it helps to reduce the heat in one's body. I found that it is also good when one is having sore throat.

**M. Naeem Qureshi**  
President National Forum for Environment & Health  
(Courtesy: Clean Energy Nepal <cen@mos.com.np>)

Thanks for sending the list of Current Life members of ISEB. It will be helpful if E-mail IDs are also provided to us.

**Prof. P.K. Seth**  
Chief Executive Officer, Biotech Park, **Lucknow**, India  
E-mail: pkseth@hotmail.com

It was a pleasure reading your newsletter *Environews*. Kindly include my name in your mailing list.

**Dr. Ms. Shakila Merchant**  
Center Administrator, NOAA-CREST, New York, NY, **U.S.A.**  
E-mail: smerchant@ccny.cuny.edu; merchant@ce.ccnycuny.edu

I am doing research on biomonitoring of air quality (heavy metals) with plants. I would request members of ISEB and readers of *Environews* to share with me relevant information and literature on this subject.

**H. Amini**  
P.O. Box 81595-158  
Islamic Azad University Khorasgan Branch, Esfahan, **IRAN**  
E-mail: h\_aminia472000@yahoo.com

Please accept my heartiest greetings on the occasion of 12<sup>th</sup> Foundation Day function of ISEB.

**Prof. Muhammad Iqbal**  
Head, Department of Botany  
Hamdard University, **New Delhi**, India  
E-mail: iqbalg5@yahoo.co.in

Great many thanks for your invitation for the 12<sup>th</sup> Foundation Day function of International Society of Environmental Botanists. I hope the function was a huge success.

**Dr. L.M.S. Palni**

Sr. Scientific Adviser & Project Director, State Biotechnology Programme,  
Govt of Uttaranchal, **Pantnagar**, India  
E-mail: [lm spalni@rediffmail.com](mailto:lm spalni@rediffmail.com)

I am doing research on Phytoremediation of soil contaminated with heavy metals. Sir, could you please tell me whether it is possible to contact the experts in the field of Phytoremediation, working in International Society of Environmental Botanists, National Botanical Research Institute Campus? Kindly guide me.

**Rathna Kumari**

Email: [rathnaphyto2004@rediffmail.com](mailto:rathnaphyto2004@rediffmail.com)

Congratulations for successful completion of 12 years of the Society, which has contributed immensely in the field of environmental sciences. I am happy to note that Society is involved with lots of extension work like awareness of environmental issues. The newsletter of the Society is also very informative and most importantly very regular. I must congratulate you and your team for the excellent working of the Society.

**Madhoolika Agrawal**

Professor, Department of Botany  
Banaras Hindu University, **Varanasi**, India

The Ministry of Environment in Israel and Embassy of Israel in Delhi are pleased to inform you about the "**Israel Environment Bulletin**" published by Ministry of Environment Protection, Israel.

The Ministry is responsible for formulating an integrated and comprehensive national environmental policy and for developing specific strategies, standards and priorities for environmental protection and resource conservation.

Today, the state has reached a stage where relinquishing environmental issues is tantamount to relinquishing the future of coming generations. For a country as small as Israel, they must invest all their efforts in protecting the environment so that it can

continue to serve present and future generations. Some of the priorities include tackling such subjects as air pollution which has become a national scourge, treatment of Israel's rivers true measures that have been badly damaged in past years, solid waste and recycling and, of course, treatment of hazardous substances.

The Ministry invites your readers to stay informed about environmental developments in Israel. They can visit the website of the Ministry at: [www.environmental.gov.il/english](http://www.environmental.gov.il/english)

For further queries you may also write to us at: [mashav-sec@newdelhi.mfa.gov.il](mailto:mashav-sec@newdelhi.mfa.gov.il)

**Sonika Lowe**

Coordinator, MASHAV, Embassy of Israel, New Delhi  
E-mail: [info@newdelhi.mfa.gov.il](mailto:info@newdelhi.mfa.gov.il)

Please note that my Mailing Address has changed, and the current address is:

**Dr. Darakhshan Ahmad**

364 rue Isabelle Moyen, Ile-Bizard (Quebec) H9C 1T2, **CANADA**.  
E-mail: [darakhshan\\_ahmad@hotmail.com](mailto:darakhshan_ahmad@hotmail.com)

I have recently joined Texas A&M system as department head of Biological and Environmental Sciences. Kindly note my new mail address.

**Dr. Arun Goyal**

Head, Department of Biological and Environmental Sciences  
Texas A&M University, **U.S.A.**  
E-mail: [Arun\\_goyal@tamu-commerce.edu](mailto:Arun_goyal@tamu-commerce.edu)

I have moved! Kindly note my new mailing address and e-mail ID in your records.

**Dr. Jennifer B.H. Martiny**

Associate professor, Dept. of Ecology and Evolutionary Biology  
University of California, 455 Steinhaus Hall, Irvine CA, **U.S.A**  
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Our mailing address has now changed. We will appreciate if the following address is noted in your mailing list and future communications are sent at the following address:

**Dr. U.C. Mishra**, President, Society for Clean Environment  
A-402 Govind Complex, Sector 14, Vashi, **Navi Mumbai**, India.  
E-mail: [socleen@indiatimes.com](mailto:socleen@indiatimes.com)

## WELCOME NEW LIFE MEMBERS

### DR. NITYA ANAND

Dr. Nitya Anand, FNA, doyen of Medicinal Chemistry researches in India and former Director of Central Drug Research Institute, Lucknow has become a Life Member of International Society of Environmental Botanists. Born at Lyallpur (now in Pakistan) in 1925, Dr. Anand did his B.Sc. from Government College, Lahore, M.Sc. (Chemistry) from Delhi University and Ph.D. from the University Department of Chemical Technology, Bombay. Thereafter, he went to Cambridge University, U.K. to do further research with Late Prof. Lord Todd and obtained another Ph.D. degree in 1950. His stay at Cambridge in the atmosphere of nucleic acid research provided the right kind of stimulus to nurture and sustain his interest in the application of organic chemistry research to biological problem.

He returned to India in 1950 and joined the newly inaugurated Central Drug Research Institute Lucknow in March 1951. He was a Rockefeller Foundation Fellow (1958-1959) in the Department of Bacteriology and Immunology at Harvard Medical School where he worked on the mode of action of streptomycin with Prof. Bernard D. Davis.

Dr. Nitya Anand headed the Central Drug Research Institute during 1974-1984. He built an active School of Medical Chemistry research at

CDRI, which contributed much to the design, discovery and development of new drugs. Around 90 students have been awarded Ph.D. degree by various Indian universities on the researches carried out under his supervision. He has published around 400 research papers in national and international journals.

He has received many honours and awards including the coveted Fellowship of the Indian National Science Academy, New Delhi. He has been the President of the Indian Pharmaceutical Congress.

E-mail: [nityaanand@satyam.net.in](mailto:nityaanand@satyam.net.in)

### DR. SARITA SINGH

Dr. Sarita Singh who joined as Life Member of ISEB was awarded Ph.D. degree in Botany, by Banaras Hindu University in 2000 under the guidance of Prof. L.C. Rai. Her research explores the feasibility of using *Microcystis* sp., which is a nuisance in fresh water, causing cyanobacteria for stripping toxic metal ions from waste water. She also established continuous flow bioreactor for removing metal ions from solution. Dr. Singh has published seven research papers in reputed national and international journals.

E-mail: [singhap@adityabirla.com](mailto:singhap@adityabirla.com)



## NEWS FLASH

**Dr. Rakesh Tuli**, F.N.A., Director, National Botanical Research Institute, Lucknow and President, International Society of Environmental Botanists was deputed by Director General, Council of Scientific & Industrial Research, New Delhi as a representative of the Country to participate as a Panelist in a panel discussion in the "Third Biomass Asia Workshop 2006" held during 15-17 November 2006 in Tokyo and Tsukuba, Japan. The Workshop was organized to advance the work on establishing a fundamental strategy for the utilization and technological development of biomass in Asia. Dr. Tuli also delivered a lecture entitled "India: Towards reducing the dependence on fossil fuels".

**Prof. M. Iqbal**, Dean Faculty of Science at Jamia Hamdard and, a member of the Executive of ISEB, has been elected as President of the Academy of Environmental Biology (AEB) for a period of three years (2006-2009). Earlier he has served as Vice-President of this Academy as well as the Indian Botanical Society. He was the Vice-Chancellor of Jamia Hamdard during 2005.

AEB is one of the pioneering organizations in India focusing widely on issues related to environmental health and management. It also publishes a research periodical, "Journal of Environmental Biology".

**Dr. U.N. Rai**, Scientist NBRI, Lucknow and, a Life member of ISEB, delivered a key note-address on "Intellectual Property Management: Some legal aspects of biodiversity and genome conservation" at the National Seminar on Intellectual Property Rights: Plants varieties and genome conservation held at the Department of Botany, University of Allahabad, Allahabad on 14 October 2006. Dr. Rai also chaired a session on the theme "Plant Genetic Resources and Farmers' Rights".

**Prof. Madhoolika Agrawal**, Professor at the Department of Botany, Banaras Hindu University, Varanasi, and a member of the Executive Committee, and Life Member of ISEB was invited by Stockholm Environment Institute, York to provide training for project collaborators in biomonitoring techniques at a workshop convened at North West University, Pochefstroom, South Africa from 12 to 15, September 2006. She gave two lectures on: (i) Overview of air quality and its impact on agriculture in south-east Asia, and (ii) Experience with EDU experiments in Asia. She also attended the 2<sup>nd</sup> Air Pollution Crop Effect Network (APCEN) workshop on Assessing Air Pollution Impacts on Agriculture at Stellenbosch, South Africa from 19<sup>th</sup> to 20<sup>th</sup> Sept. 2006. She chaired a session on "Risk Assessment Modelling and Mapping" and delivered a lecture on "The EDU protocol of biomonitoring" in the session entitled "Developing observational and experimental protocols of biomonitoring".

**Prof. R.S. Tripathi**, FNA, the INSA Senior Scientist at NBRI, Lucknow and a Life Member of ISEB, delivered an invited lecture on "Population dynamics of invasive species of *Eupatorium* in northeast India as influenced by ecological conditions" at the International Symposium on "Biology, Ecology and Management of world's worst Invasive Plant Species" held during 11-14 December 2006 at the University of Delhi. The Symposium was organized by the D.U.'s Centre for Environmental Management of Degraded Ecosystems.

**Professor Stephen D. Hopper** has taken over as Director of the Royal Botanic Gardens, Kew, England. Earlier he was Professor of Plant Conservation Biology at the University of Western Australia. His research experience includes evolutionary, systematic and conservation studies on Australian

plants and evolution of Mediterranean climate plants, pollination ecology and granite outcrop floras. He is currently developing and testing a new hypothesis about the evolution and conservation of biodiversity on the world's oldest landscapes.

Prof. Hopper's predecessor Prof. Sir Peter Crane, F.R.S. left Kew to become the John and Marion Sullivan University Professor at the University of Chicago.

**Dr. R.D. Tripathi**, Scientist NBRI, Lucknow and, a Life member of ISEB, delivered a lecture entitled "Genetically Engineered Plants for Arsenic Phytoremediation and Crops for Cultivation in Contaminated Areas" in the ICAR sponsored training course in 'Advances in Crop Physiology' at N.D. University of Agriculture and Technology, Kumarganj, Faizabad.

**Dr. K.J. Ahmad**, Secretary, International Society of Environmental Botanists has been appointed a Member of the 'National Panel of Consultants' at Environmental Resources Research Centre, Thiruvananthapuram, India.

### ISEB FOUNDATION DAY

The International Society of Environmental Botanists, Lucknow (ISEB) completed 12 years of its existence on 3 December 2006. To mark this occasion, the 12<sup>th</sup> Foundation Day function of ISEB was organized in the Auditorium of National Botanical Research Institute, Lucknow. Shri N.N. Upadhyaya, I.A.S., Principal Secretary, Department of Science & Technology, U.P. Government was the Chief Guest. Dr. Rakesh Tuli, President ISEB & Director NBRI presided over the function.

The Secretary ISEB, Dr. K.J. Ahmad, apprised the gathering about various activities undertaken by ISEB. He mentioned that the Society, during the past twelve years, has made concerted effort towards creating awareness regarding environmental protection and conservation of biodiversity. The ISEB

has been organizing national and international seminars, workshops and conferences to achieve the goals that prompted its establishment. It regularly publishes the quarterly newsletter,

was looking up to India to take initiative in the field of bio-diesel and NBRI has already launched a research programme on biodiesel. The Institute, through its Eco-education division, has been

very regularly. He congratulated the Society for the recognition conferred on it by the IUBS, Paris. He appealed to the functionaries of ISEB to collaborate with the relevant departments of the State Govt. and seek their assistance. The Chief Guest mentioned that there is a big concentration of centers of hi-tech scientific research in Lucknow, but they were working in isolation. He pleaded that these centers of excellence should try to connect with the state government and the masses. These institutes may also involve the State Govt. departments such as DST, Environment, Forest, Agriculture and Rural Development.

**INTERNATIONAL SOCIETY OF ENVIRONMENTAL BOTANISTS  
FOUNDATION DAY DECEMBER 3, 2006**



**Environews**, which contains stimulating semi-technical articles and news and views related to environmental issues. The Society has been involving school children, college and university students and members of public of the city of Lucknow and adjoining rural areas in its programmes. The ISEB has made its presence felt at global level, and has been recently recognized by the International Union of Biological Sciences, Paris as its Scientific member.

Dr. Rakesh Tuli, President of ISEB, welcomed the Chief Guest on behalf of the Society and NBRI. Talking about the Society, he said that the activities of ISEB have much social relevance as the Society has been coordinating with other scientific organizations, educational institutes, NGOs and several government agencies. The character of ISEB is truly international, he added. He said that NBRI was a knowledge-based asset for the state and the country and has made an impact in several disciplines of plant sciences. The international science community

undertaking some useful outreach programmes.

In his thought provoking address the Chief Guest Shri N.N. Upadhyaya expressed his happiness over the remarkable progress made by the International Society of Environmental Botanists. He appreciated the various activities of ISEB, particularly the quality of the articles published in the quarterly news magazine, **Environews**, which is brought out by the Society

Dr. Prakash Chandra, Treasurer of the Society presented a report on the current financial status of the ISEB. Dr. S.C. Sharma, Vice-President, ISEB proposed a vote of thanks. The function was attended by some of the eminent scientists and distinguished citizens of Lucknow including Dr. P.V. Sane, Former Director NBRI & President ISEB, Dr. Nitya Anand, former Director CDRI; Dr. P.K. Seth, Chief Executive Officer of Biotechnology Park; Prof. R.S. Tripathi, former Dean, School of Life Sciences, N.E. Hill University, Shillong; Dr. D.S. Bhakuni, former Scientist in Director's Grade CDRI; Dr. S.K. Grover, Deputy Director General, Lucknow Doordarshan and Dr. B.P. Singh, former Senior Deputy Director of NBRI. Several scientists of NBRI also attended the function.

**ENVIRONNEWS GOLDEN JUBILEE**

April 2007 issue of Environews, will be the 50th issue of this news magazine. It will be a special issue carrying highly informative articles from some of the leading environmental scientists across the globe. Only invited articles will be considered for publication.

Secretary, ISEB

# SUSTAINABLE DEVELOPMENT AND WASTE MANAGEMENT\*

Ajit Kumar Jain, I.A.S.

Senior Advisor, Solid Waste Management Cell, All India Institute of Local Self-Government (AIIILSG)  
Sthanikraj Bhavan, C. D. Barfiwala Marg, Andheri (West), Mumbai - 400 058 (India).

High rate of population growth, declining opportunities in the rural areas and shift from stagnant and low paying agriculture sector to more paying urban occupations, largely contribute to urbanization. The cities have grown haphazardly showing tell tale signs of saturation of services, infrastructure and employment potential. This manifests in congestion, inadequate water supply and sanitation, urban poverty and environmental degradation and poses a challenge to urban planners and citizens alike. The priority assigned to urban environmental issues has traditionally been low, resulting in substantial damage to human health and reduced productivity, development. Cities are considered as the growth engines but growth bereft of environmental concern is self-defeating.

The unexpected immigration has also caused the burgeoning of slums, and the growth of squatters and informal housing all around the rapidly expanding cities of the developing world. In many cities, the rapid population growth has overwhelmed the capacity of the municipal authorities to provide even basic services. Millions of people in cities in the developing countries cannot meet their basic needs of shelter, water, nutrition, sanitation, health and education. Thus urban poverty becomes a characteristic feature of urbanization in the twentieth century. Cities are harnessing the environmental resources at a furious pace, taking their ecological footprints far beyond their geographical limits. Pollution of all sorts is rampant leading to deep degradation of the urban environment. Sustainability of the cities in the developing countries with all the above constraints has become a big question mark and has rightly been placed at the focal point of the millennium agenda.

Balancing developmental needs with

the limitation of natural resource base will be a key parameter in the struggle for survival. This will be a common denominator particularly in water supply, sanitation, air quality and solid waste management. Conceptually the contours of the city growth can be economic growth potential.

Examples of rapidly depleting assets include depleted ground-water, collapsing fisheries, CO<sub>2</sub> accumulation in the atmosphere, and deforestation. It is demand of time that we understand our basic requirements, dependency on resources and sustainability on the life support systems that would be the determinant of our very existence. This integrity takes us to concept of "Sustainable Development".

## Sustainable Development

The most widely known definition of sustainable development comes from the Brundtland Commission, which defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Decision-makers at all levels are faced with the task of how to resolve urban problems from drinking water to waste management, from housing and transportation to the preservation of urban green space. At the same time the cities will need to become more aware of the impact that their consumption patterns have on other regions and ecosystems.

## Urbanization and Waste Generation

Urbanization directly contributes to waste generation, and unscientific waste handling causes health hazards and urban environment degradation. Municipal Solid Waste (MSW) is defined to include refuse from the households, non-hazardous solid waste, discarded by the industrial, commercial

and institutional establishments, market waste, yard waste and street sweepings which are collected by the municipal authorities for disposal. MSW is only a relatively small fraction of all the solid waste that is generated in an advanced economy. Municipal Solid Waste Management, broadly deals with post-consumer waste, in prevention, treatment, recycle, reuse and disposal.

## Health and Environment Impacts

Some of the adverse environmental impacts of unscientific handling and indiscriminate dumping of the solid waste are:

- Ground water contamination by the leachates generated by the waste dumps.
- Surface water contamination by the runoff from the waste dumps.
- Foul odour, pests, rodents and wind blown litter in and around the waste dumps.
- Generation of inflammable gas (methane) within the waste dumps resulting into fires at the landfill and smoke and smog around.
- Release of green house gases such as carbon dioxide and methane.
- Bird menace above the waste dumps affecting air traffic.
- Epidemics through stray animals and other diseases vectors.
- In large agglomerations of the developing countries, inadequate waste management is the cause of serious urban pollution and health hazard.

## Sustainable Solid Waste Management

The conventional approach of solid waste management has been to manage the removal of the solid discards from the immediate vicinity of the human settlements. This resulted in the mechanized systems of collection and transportation of waste in the

\*The article has been reprinted from Eco-Echoes vol.7, Apr-Jun 2006, published by Indian Centre for Plastics in the Environment)

industrialized countries and the landfills to bury the waste. In the later part of the twentieth century, it was realized that the societies will not be able to master the waste avalanche. The waste management had to change its focus from "efficient removal" to waste avoidance, minimization and recycling options with higher priority.

MSW contains organic waste, plastics, papers, glass, metal and inert substance. Carbon and nitrogen-based organic waste from kitchen, market and abattoir is a source of rich organic manure or energy. Plastics, papers, glass, metals are recycled into new products. Debris can be recycled and earth and inert waste used as landfill cover. This helps conserving natural resources and also generates employment. Promotion of waste recycling sector and providing that with an institutional support can, therefore, be in tune with the goals of sustainable development.

### Waste Management and Poverty

Environmental degradation impacts the poor most severely. The urban poor, who do not have a fair access to public health and sanitary services in the city are subject to extremely unhygienic conditions in their settlements and

periodic outbreaks of water and air borne epidemics. Driven by the compulsion of abject poverty, many of them are involved in waste picking and recycling through an informal chain of scrap dealers and recycling industry. While the scrap dealers have an access to the recyclable waste of the industry and commercial establishments, they depend on the rag pickers for retrieving recyclable waste from the households. In the absence of source segregation, the waste pickers collect the recyclables from the garbage bins.

The rag pickers can be instrumental in the collection and processing of organic waste also, within the localities. Organized groups of rag pickers can be trained and given logistic support for decentralized waste management. This may reduce the transportation and landfill requirement.

In Bogota, Columbia rag pickers called 'card boarders' have been organized into waste recycling cooperatives. With the help of the non-governmental agencies, these cooperatives have formed a 'National Recyclers Association' representing over 50,000 waste collecting families. The cooperatives have ensured minimum wages to the waste collectors. They

have set up their own company for selling recyclable waste material and have provided daily care and health cover to their members.

### Community Participation

Community participation becomes paramount in an innovative and sustainable approach to Municipal Solid Waste Management. Increasingly, local governments in the developing countries are encouraging community participation.

To achieve the objective of sustainability it is necessary to establish systems of solid waste management, which harmonize the technical requirements with the objectives of environment protection and the needs and interests of different stakeholders especially the urban poor. As the city population increases and its economic profile changes, the quantity of waste and the resources requirement to manage it will increase. Given their financial limitations and competing demand of other services, the urban local bodies may find it challenging to raise and sustain additional allocations for this sector. Thus waste minimization and a community-based waste management seems the only sustainable way to manage the waste.

## VOC Emission by Plants: Significance and Implications

C.K. Varshney

Former Dean and Professor, School of Environmental Sciences, Jawaharlal Nehru University, New Delhi 110067. email: [ckvarshney@hotmail.com](mailto:ckvarshney@hotmail.com)

It is widely known that green plants play a critical role in global carbon cycle by sequestering carbon dioxide from the atmosphere and converting it into organic compounds by using solar energy through the process of photosynthesis and releasing oxygen as a by product. In addition to oxygen plants from their green leaves have been shown to emit a number of complex organic compounds collectively called volatile organic compounds (VOCs). VOCs are a complex mixture of carbon; hydrogen compounds containing chemical species (excluding elemental carbon, carbon monoxide, and carbon dioxide), which are volatile at normal temperature and pressure. In precise terms VOCs are

those organic compounds whose vapor pressure range from 0.13 kPa to 101.3 kPa at 293K. VOCs also include oxygenated, halogenated and sulphur containing hydrocarbons. VOCs are basically grouped into methane and non-methane hydrocarbons (NMHCs). VOCs are emitted both from anthropogenic and natural sources. The important anthropogenic sources on NMVOCs include, fossil fuel combustion, processing of organic chemicals and organic wastes. From anthropogenic sources globally 103 Tg NMVOCs are emitted yearly. The author and his co-workers at Jawaharlal Nehru University (JNU) have estimated that from India about 8 million tones instead of tone of

NMVOCs are emitted per annum.

The natural sources of VOCs include terrestrial plants and marine organisms. Biogenic VOC emission predominantly occurs in tropics (23 S 23 N) with small amounts emitted in the northern mid-latitudes. Almost 99 per cent of the total biogenic NMVOCs are emitted from terrestrial sources including forests, grasslands, shrub-lands and croplands. Biogenic NMVOCs comprise isoprene, monoterpene, alkane, alkene, carbonyls, alcohols, acids, esters, ethers and aromatic hydrocarbons. Global emission inventories show isoprenoids (isoprene and monoterpene) as the most dominant biogenic volatile organic compounds

(BVOC). Isoprene is one of the most abundant NMVOCs emitted from vegetation. Alcohols and carbonyls follow the isoprenoids as the predominant groups. Isoprene is predominantly emitted from deciduous (hardwood/ broad leaf trees such as Oak, poplar, aspens and willows. Isoprene is not stored in plants and emitted in sunlight during photosynthesis. Monoterpenes are emitted from coniferous (softwood) trees such as pines, cedars and firs. Monoterpenes can be stored in plants; hence, they are emitted both during day and night. There are several species such as spruce and eucalyptus, which emit both isoprene and monoterpenes. Information on VOC emission by plants from old world tropics is sadly lacking except for the studies carried out at JNU New Delhi, by the author and his coworkers who have measured foliar emission of volatile organic compounds (VOC) from common Indian plant species. Fifty-one local tree species were screened, out of which 36 species were found to emit VOC (4 high emitter; 28 moderate emitter; and 4 low-emitter), while in the remaining 15 species no VOC emission was detected or the levels of emission were below detection limit (BDL). VOC emission was found to vary from one species to another and a marked seasonal and diurnal variation was observed. The minimum and maximum VOC emission values were  $< 0.1$  and  $87 \text{ microgg}(-1) \text{ dry leaf h}^{-1}$  in *Ficus infectoria* and *Lantana camara* respectively. Out of the 51 plant species studied, 13 species were reported to be VOC emitters for the first time. Among the nine tree species (which were selected for detailed study), the highest average hourly emission ( $9.69 \pm 8.39 \text{ microgg}(-1) \text{ dry leaf}$ ) was observed in *Eucalyptus* species and the minimum in *Syzygium jambolanum* ( $1.89 \pm 2.48 \text{ microgg}(-1) \text{ dry leaf}$ ).

Tropical and sub tropical regions are regarded as dominant source of biogenic volatile organic compounds emission (BVOC). However, measurement studies from these regions are limited and largely confined to South Africa and Amazonia. Consequently, global BVOC estimates are mainly based on modeling studies. BVOC emission estimates are altogether

lacking for any region of South and South-East Asia. The Author and his students have made an attempt to estimate isoprene emission from the forest of the State of Haryana (India). Isoprene emission capacity in individual plant species was found to vary from below detection limit (BDL) to  $12.01 \text{ mg Cm}^{-2} \text{ h}^{-1}$ . Maximum emission capacity ( $12.01 \text{ mg Cm}^{-2} \text{ h}^{-1}$ ) was observed in case of *Dalbergia sissoo*. The area average isoprene emission capacity for the Haryana forest was found to be  $19.98 \text{ mg Cm}^{-2} \text{ h}^{-1}$ , which is significantly (2.4 times) higher than the reported isoprene emission value of  $8.2 \text{ mg Cm}^{-2} \text{ h}^{-1}$  for the Kalahari woodland of Africa.

NMVOC emission from vegetation is influenced by many factors, including ambient temperature sunlight  $\text{CO}_2$  concentration, genetics, leaf development, and phenology events. NMVOCs emission rates are species specific, which vary by as much as four orders of magnitude depending upon plant species. Variation in biomass density and physiological status of vegetation may also affect emission. Accordingly, NMVOC emission from vegetation is sensitive to land cover changes (plant species composition and dominance) and environmental conditions.

The functional role of NMVOC emission from plants is not much understood. The isoprene emission has been implicated in a variety of roles including protection of photosynthetic apparatus from sudden temperature fluctuations, as flowering hormone, as an antioxidant or simply as an overflow to get rid of excess of carbon. Plants emit monoterpenes under specific circumstances for various purposes. Some of the monoterpenes released from plants have an allelopathic function i.e. control of seed germination and growth of other species to avoid competition. Monoterpenes are also known to act as defense compound against pathogens and herbivores. It has been reported that corn seedlings, which do not release terpenoids under normal growing conditions, provide a fascinating example of insect defense by monoterpenes. Corn seedlings emit monoterpenes when attacked by certain caterpillar, reacting specifically to the insect's saliva. This emission signal

attracts wasp, which deposits its eggs into the caterpillars. Thus, the corn seedlings defend their population against their predators.

Atmospheric residence time of VOCs is short from few hours to months- hence, their direct impact on radiative forcing is relatively small, but their indirect impact due to their involvement in atmospheric photochemistry i.e. production of ozone in presence of  $\text{NO}_x$  and light and production of secondary aerosols is quite significant. Biogenic volatile compounds add to the photochemical smog in the same way as emissions from human sources - there is no discrimination. Oxidation of NMVOC in the atmosphere (a) produces large quantities of  $\text{CO}$ ; organic acids; hydrogen peroxide; oxygenated hydrocarbons, and secondary organic aerosols (b) increase of lifetime of methane in the atmosphere. VOCs play an important role in determining tropospheric chemistry, aerosol burden and oxidizing capacity of the atmosphere, global carbon cycle, and global climate.

In recent years studies on VOC emission by plants are receiving increasing attention on more than one account. Foliar emission of volatile organic carbon compounds from leaf directly into the atmosphere represents an interesting "atmosphere leaf atmosphere" sub-loop of global carbon circulation. An assessment of the magnitude and ecological significance of this atmosphere leaf atmosphere" sub-loop of carbon cycle for plants and for the atmospheric chemistry represent a fascinating area of study. Secondly, because of the dramatic increase in atmospheric  $\text{CO}_2$  concentration and impending global climate change, plant metabolism is expected to alter seriously. These changes are likely to induce unpredictable alterations in biogenic emission of non-methane hydrocarbons (NMHCs), oxygenated hydrocarbons (OxHCs) and halocarbons. It is important to ascertain the effect of elevated  $\text{CO}_2$  and temperature regime on future biogenic emissions. Such information is essential for developing reliable model simulations of carbon dynamics of plants in relation to global climate change as well as for generating scenarios of future air quality.





## NEWS AND VIEWS

### IMPACT OF GULF WAR

The Gulf War demonstrated the manner in which natural resources could be manipulated as weapons of war. The Arabian Gulf's shallow and highly productive waters and the surrounding region suffered an unprecedented environmental onslaught, triggered by Gulf War. Black slicks and toxic smoke from blazing oil wells combined to create one of the world's largest ecological catastrophes, severely affecting both people and wildlife. The war nearly pushed some species to the very edge of extinction.

The daily burning of three million barrels of crude oil created half a ton of air pollutants that filled the entire atmosphere. The heavy smoke even hid the sun. Evaporation of the spilled oil also added toxic chemicals in the atmosphere. The water cycle of Gulf was affected and the quantity of bacteria at the seashore level increased significantly causing great damage to availability of purified drinking water.

The fires also deposited a layer of soot over the desert and its plants. In places, everything was coated with an oil mist, while in others there were extensive oil slicks with a thick layer of crude oil lying across the soil.

In addition, the movement of huge military tanks, the digging of trenches by Iraqi troops, the bombardment, and even the subsequent movement of fire-fighting equipment into well areas, damaged the soil layer and affected its ability to sustain life in the desert. Plants and animals were crushed to death. Besides, the extensive use of sea water in combating the oil fires led to increased salinity in areas close to wells which had been on fire.

The soil composition and porosity were

also altered, both by the oil soot, mist and sludge resulting from the blow-out of the oil wells and by the earth movement. In a region, which has high incidences of dust storms, increased erosion had its own catastrophic consequences.

The War affected the desert in many ways, not all of them as immediately obvious as the towering infernos of the oil fires. Every form of life in the desert suffered. For instance, thousands of birds, especially migratory species such as herons, swallows and cormorants, were trapped by the shiny surface of the oil lakes, as were mammals.

The Kuwaiti desert still remains littered with hidden mines, which are being discovered even now. The oil lakes, created by flowing oil wells, have wreaked severe damage on soil, plants and underground reservoirs. The gallons of oil spilled in the Gulf, has already threatened the oceanic marine ecosystem.

(Source: Kuwait Information Office, New Delhi, India)

### NITROGEN EMISSIONS THREATEN BIODIVERSITY

Global emissions into the atmosphere of nitrogen compounds primarily nitrogen oxides and ammonia have increased in recent years as result of human activities such as transportation, industrial processes, and agriculture. This has consequently enhanced the deposition of nitrogen compounds in terrestrial ecosystems.

The increase in nitrogen deposition poses a significant threat to biodiversity in natural and semi-natural ecosystems, as it affects the nutrient content of the soil. Increased availability of nitrogen results in a decrease in plant diversity, either due to nutrient enrichment, by causing soil acidification, or by making

some plants more susceptible to other stress factors such as drought.

Nitrogen emissions from industrialized countries are stabilizing and nitrogen deposition is even declining in some regions, but in developing countries emissions are rising due to rapid population growth and industrialization.

A group of scientists from around the world has recently analyzed the threat of nitrogen deposition to biodiversity at the global scale. Using global chemistry transport models, they estimated the rate, extent, and distribution of recent (mid-1990s) and future (2050) nitrogen deposition within the newly defined 34 world biodiversity hotspots. These biodiversity hotspots cover just 2.1 per cent of the Earth's land area, yet are home to half of its plant species.

The results suggest that the average amount of nitrogen deposited across these biodiversity hotspots was 5.3 kg nitrogen per hectare per year (kg/ha), which is almost 50 per cent higher than the global terrestrial average in the mid-1990s. By 2050, the average annual nitrogen deposition in hotspots is projected to have more than doubled, to 11.8 kg/ha.

By this year, 17 out of the 34 hotspots could have between 10 and 100 per cent of their area receiving more than 15 kg/ha, which is a critical level known to have damaged some European ecosystems. These seventeen hotspots contain 81,981 (27%) of the world's endemic plant species and include three of the top five hotspots for endemic plants: the Tropical Andes, the Mediterranean Basin and the Atlantic Forest (Brazil).

**Christer Agren**  
Acid News

(Source: Phoenix G.K. et al., *Global Change Biology* 12: 470-476)

## HOTTEST IN 12,000 YEARS

The world's temperature has increased to levels not seen in at least 12,000 years, US climate scientists reported in the September issue of "**Proceedings of the National Academy of Sciences**". Rapid warming has occurred in the past 30 years, the researchers said, and there is little doubt that human activities are the primary factor.

The study concludes the Earth is now reaching and passing through the warmest levels in the current interglacial period, which has lasted nearly 12,000 years. This warming is also forcing a migration of plant and animal species, the researchers said. Furthermore, the warming in recent decades has brought global temperature to a level within about 1 degree Celsius of the maximum temperature over the past million years.

Worldwide instrumental temperature measurements during the past century show the planet warmed at a rate of 0.2 degree Celsius per decade for the past 30 years. The observed warming is similar to the warming rate predicted in the 1980s in initial global climate model simulations with changing levels of greenhouse gases, the researchers said.

### Acid News

(Source: Environmental News Service  
(www.ens-newswire.com))

## ENDOSULPHAN MAY FINALLY HAVE A DESTROYER

Scientists at Indian Institute of Technology Madras have discovered a bacterial mixture, which breaks down the deadly pesticide, endosulphan, into environment friendly inorganic chemicals. This happens under both aerobic and anaerobic conditions. Endosulphan enters the air, water and soil during its manufacture and use. Exposure can lead to birth defects, hyperactivity, nausea, dizziness, headaches and sometimes even convulsions.

**Ligy Philip and Mathava**  
(From: IIT, Madras)

## FORESTS REGROWING

According to a study report published by some Finnish scientists, a large number of countries are reversing the longstanding trend toward destruction of their forests. Forests, can act as pollution sinks, easing the emissions' effects to some degree. Twenty years ago most scientists believed that deforestation was an inexorable result of industrialization and that the earth would soon be virtually denuded of trees. However, the scientists have recently documented that many countries have turned the corner and forests are gradually coming back.

The report acknowledges that in a few countries, notably Brazil and Indonesia, the destruction of forests remains a serious and worsening problem because of the continuing cutting in those countries. Yet the researchers, using new analytical techniques calculated that in the last 15 years forests had actually expanded in 22 of the 50 countries and that many others were poised to make the transition from deforestation to reforestation in the coming decades.

The reversal is partly a result of social changes that occur as countries develop and become wealthier. As rural dwellers move to the cities there are fewer people in the countryside to cut down trees for uses like heating and building activities. But in nations like China, India and Turkey the shift also involved a strong measure of public policy, including tree-planting campaigns, restrictions on clear-cutting and more efficient agricultural practices, which means that less land needs to be cleared for growing food.

On a global level deforestation will be reversed if we maintain this trend.

**Elis Rosenthal**

(Source: The New York Times)

## MANIPULATING EARTH'S CLIMATE

The Earth's temperature has risen about 1.4 degrees in the past century, largely because

of emissions of carbon dioxide from power plants and cars become trapped in the atmosphere. Scientists predict that at the current rate of growth of carbon dioxide emissions, the global temperature could increase between 3.5 and 7 degrees in the next 50 years. Obviously we are on a mass extinction path that would take several centuries to unravel.

To overcome this catastrophe the scientists are discussing an idea which seems like something out of a superman comic: A machine or a missile shoots tons of particles into the atmosphere that would block the Sun's rays, cool down the overheated Earth, and reverse global warming. The idea is called geoengineering: using technology to tinker with the Earth's delicate climate balance. Many scientists doubt if it is possible. Even those who have studied the idea worry about the possible misuse of their research. Those who believe it could work point to the eruption of volcanoes, in which masses of particles have deflected sunlight and reduced global temperatures by an average of 0.9 degrees.

If we block 20 per cent of the sunlight over the Arctic Ocean, it would be enough to restore sea ice. That would be blocking only 1/300<sup>th</sup> of the entire sunlight hitting the Earth, but focusing it on the Arctic would prevent the ice from melting. The costs vary, from \$ 100 million to tens of billions, and scientists say the intervention may have to be done annually

The notion of tinkering with the Earth's climate is not new, dating back to 1839, when James Espy, who was first American meteorologist, tried to produce rain using updrafts from large fires.

The best way to fight global warming is to lower the emissions of the green house gases. However, so far, attempts in that direction have been grossly unsuccessful.

**John Donnelly**

(Source: The Boston Globe)

## THE PRICE OF POLLUTION

A poor environment is directly responsible for around 25 per cent of all preventable ill health in the world today and two-thirds of those affected are children. Some pollutants such as pesticides, traffic emissions and industrial solvents are created by human activities. Others, including arsenic or ultraviolet radiation occur naturally in the environment although exposure can be made worse by human activities. These pollutants can undermine health in various ways, by causing diseases such as bronchitis, or asthma, contributing to cancer or birth defects or perhaps by damaging the body's immune system, which makes people more susceptible to a variety of other health risks. The emergence of some 30 new diseases in the past 20 years including HIV, Ebola and haemorrhagic illnesses, has become a growing public health issue. Tobacco now kills over 11,000 people a day worldwide.

Rapid or persistent population growth is one of the major driving forces acting on environmental health. It can result in severe environmental damage, and increased pressures on local infrastructure and services. Also, there is increased pressure to develop agriculture, roads and transport systems in previously unsettled areas. This land conversion can encourage the spread of diseases. For example, leishmaniasis, an infectious disease transmitted through a sand fly bite, has increased to 12 million cases each year alongside land development in Africa, Latin America and West Asia. The incidence of mosquito-borne dengue has also increased, and forest clearance is associated with a higher incidence of diseases such as malaria. Unable to afford clean fuels or efficient stoves, poor people rely instead on smoky biomass fuels for cooking and heating.

Such problems, historically considered rural, have now become urban as well, as sprawling slum settlements surround the world's major cities.

Source: **People & the Planet 2000-2006**,  
London, U.K.  
[www.peopleandplanet.net](http://www.peopleandplanet.net)

## NEW CROPS NEEDED TO AVOID FAMINES

The Consultative Group on International Agricultural Research (CGIAR) warns that famines lie ahead unless new crop strains adapted to a warmer future are developed. It says yields of existing varieties will fall.

The most significant impact of climate change on agriculture is probably changes in rainfall. Some regions are forecast to receive more rain, others to receive less; above all, it will become more variable. But increasing temperatures can also affect crops. Photosynthesis slows down as the thermometer rises, which also slows the plants' growth and capacity to reproduce.

Research published two years ago shows rice yields are declining by 10% for every degree Celsius increase in night-time temperature. A study from the International Maize and Wheat Improvement Center (Cimmyt) in Mexico, yet to be published, projects a major decline in South Asia's wheat yield. The vast Indo-Gangetic plain produces about 15% of the world's wheat - but the area suitable for growing is forecast to shrink by about half over the next 50 years, even as the number of mouths to feed increases.

The livelihoods of billions of people in developing countries, particularly those in the tropics, will be severely challenged as crop yields decline due to shorter growing seasons. Conversely, rising temperatures will open up areas of the world, which are currently too cold for crop cultivation, in regions such as Siberia and northern North America. And the same Cimmyt study forecasts that wheat will become viable in parts of Alaska. But the CGIAR figures suggest that extra yield from these regions will not fill the shortfall in the tropics - added to which there are questions of how poorer tropical countries will afford to buy food from richer temperate states.

Within the CGIAR network, various research initiatives are already under way to develop "climate-proof" varieties. Scientists at IRRI in the Philippines have developed strains which can survive floods for several weeks. Serious flooding is forecast to worsen in some Asian countries, notably Bangladesh. Conversely, some arid regions of Africa are forecast to become even drier. With sorghum, the line of research being pursued at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is to develop strains, which can survive drought.

Rice is a so-called C3 plant. Other crops, including maize, use a better photosynthesis mechanism called C4, and IRRI scientists aim to develop rice strains, which also use the C4 mechanism. Boosting the photosynthetic efficiency of rice by changing it from C3 to C4 photosynthesis will be like supercharging a car's engine by fitting a new fuel injection system. Despite reservations in some parts of the world, genetic modification is becoming one of the staple tools of researchers aiming to enhance developing world agriculture.

Nitrous oxide (N<sub>2</sub>O) is a more potent greenhouse gas than CO<sub>2</sub>, and is released when fertiliser breaks down. Scientists with Cimmyt and the International Center for Tropical Agriculture (CIAT) have developed a hand-held sensor using light and infra-red radiation which can tell farmers whether plants need more fertiliser or not; less fertiliser use means less N<sub>2</sub>O produced.

It's much easier to solve a problem before we get to a crisis. With climate change we're definitely talking about a crisis, and it's coming within our lifetimes.

**By Richard Black**

Environment correspondent, BBC  
News website



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