ENVIRONEWS

INTERNATIONAL SOCIETY OF ENVIRONMENTAL BOTANISTS

Newsletter

Golden Jubilee Number

LUCKNOW (INDIA) VOL 13 No 2 APRIL, 2007

IN THIS ISSUE

ENVIRONEWS – 50th Milestone

International Society of Environmental Botanists (ISEB) was founded on 3rd December 1994 to promote and highlight the role of plants in environmental protection, biodiversity conservation and sustainable development. While all environment related problems need multi-disciplinary approach, plants have now come to occupy center stage because of the growing realization about their significance in bioindication and bioremediation of atmospheric pollutants. The newly formed Society was mandated to work at international, national, regional and local levels among researchers, academics, corporate elite as well as rural and urban masses.

Besides organizing three well attended and highly successful international conferences, a large number of societal programmes (lectures, demonstrations, seminars, debates, workshops and competitions etc. were arranged in and around Lucknow, during the past over a decade.

The launching of ***Environews*** on 1 January 1995 was the crowning glory of ISEB. It was published as an in-house Newsletter of ISEB, to promote the aforementioned objectives of the Society. But over a period of time, it has grown tremendously in popularity, high quality of scientific content and in its vast global reach. We have been receiving hundreds of letters from all corners of the world regarding the ***Environews***. Some of these letters/messages, are published in one or the other issue, which bears enough testimony to its growing popularity in the global arena.

The launching of ISEB website (http://isebindia.com), some two years back, is another milestone in the history of this Society. To date, this site has been accessed by nearly 7500 individuals, a great majority of whom are from overseas.

The current issue of ***Environews*** (April 2007) is the **50th** issue of this news magazine. It is being released as a special '**Golden Jubilee Number**'.

The success story of ***Environews*** and **ISEB** is closely linked with the help and cooperation we have received from the authorities and scientists of the National Botanical Research Institute, Lucknow, where this Society is based. Dr. Rakesh Tuli, Director of NBRI and the President of ISEB is providing us all necessary infra-structural facilities. His consistent guidance and patronage are crucial to the success of ISEB and ***Environews***.

K.J. Ahmad
Secretary ISEB.

- Informative news, views and popular articles/write-ups on current environmental researches/issues are invited for publication in ENVIRONEWS.
- 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 • Website : http://isebindia.com**

LETTERS

Enviro news is progressing very well and I'm receiving its electronic copies regularly. This is, indeed, a marvelous newsletter exposing the hidden effects of biotic and a-biotic stresses in the pristine environment, and undoubtedly, this is due to your untiring efforts.

Last year (2006), remained very productive for me, as I worked with Professor Nigel Bell and Dr. Sally Power of Imperial College London for my post-doc studies through Commonwealth of UK, and I also published following papers during this period. Perhaps, your readers may like to go through them:
Science of the Total Environment 371(1-3): 304-313.
Atmospheric Environment 40 (28): 5342-5354.

Dr. Abdul Wahid,
Botany Department, GC University, Lahore, Lower Mall, Lahore, **Pakistan**
E-mail: wahid_64us@yahoo.com

This is to inform you that the Ministry of Health, Ghana has approved of the hosting of 2nd Global Summit on HIV/AIDS, Degenerative Diseases, Traditional Medicine and Indigenous Knowledge in Accra, Ghana from March 10, 2008 to March 14, 2008.

I am pleased to officially invite you and the International Society of Environmental Botanists, to actively participate in, and give technical and financial support, to this event in order to make it successful.

J. William Danquah, President/CEO
Africa First, LLC
517 Asbury Street #11, Saint Paul, MN 55104, **U.S.A.**
E-mail: info@africa-first.com;
Website: http://www.africa-first.com

I've moved to the University of Central Florida. Please update my address for your files.

Betsy Von Holle
University of Central Florida, Department of Biology
4000 Central Florida Blvd., Orlando, FL 32816-2368, **U.S.A.**
E-mail: vonholle@mail.ucf.edu

We would like to inform you regarding the shifting of CEN's office to a new place. The new office location is; 108, Vinayak Marga, Kamladi Ganeshsthan, **Kathmandu** and our Tel No is 4257481.

Secretariat Office:
Clean Energy Nepal, P.O. Box No.24581, 108 Vinayak Marga, Kamladi Ganeshsthan, Kathmandu, **Nepal**
Alternative Email:
Gopal Raj Joshi, Coordinator, Clean Air Network **Nepal**
E-mail: cen@mos.com.np

MASHAV, the Center for International Co-operation of Israel, Ministry of Foreign Affairs has trained over 205,000 course applicants, both in Israel and abroad, in the five different areas of training, namely, Agriculture and Related Sciences; Education and Community Development; Economic and Social Development; Rural and Urban Development; Medicine and Public Health.

Participants coming to Israel for training under the sponsorship of MASHAV are entitled to academic scholarships, which include boarding, lodging, study material, lectures and excursions.
We would highly appreciate your recommendations for the year 2007 for suitable candidates for the courses

The application forms are available on the website: http://newdelhi.mfa.gov.il OR http://mashav.mfa.gov.il. Further queries from interested individuals may be addressed to us at <mashav-sec@newdelhi.mfa.gov.il>

Sonika Lowe
Coordinator MASHAV
Embassy of Israel, 3 Aurangzeb Road, **New Delhi-110011**
E-mail: info@newdelhi.mfa.gov.il

We've entered an exciting new era in the fight against human-induced climate change. As you may now know, the Global Roundtable on Climate Change, hosted recently by the Earth Institute, issued "The Path to Climate Stability: A Joint Statement by the Global Roundtable on Climate Change." This consensus statement spells out a framework for global cooperation to meet the world's growing energy needs while also protecting the environment. Nearly 100 global companies and organizations have already signed on.

The Global Roundtable on Climate Change is now inviting individuals in all parts of the world to join many of the world's leading businessmen, scientists, environmental groups, as supporters of this consensus approach. The aim is to help demonstrate the global will to solve this problem, by showing that a true global consensus is possible, involving individuals, companies, and civil society in all parts of the world. You can learn more here:
http://www.nextgenerationearth.org/signatures/add/

The Earth Institute is deeply committed to bringing the best of science and policy analysis to the great challenge of climate change. We hope that you will join us in this historic effort.

Prof. Jeffrey D. Sachs
Director, The Earth Institute at Columbia University
405 Low Library, MC 4335, 535 West 116th Street, New York, NY 10027, **U.S.A.**
E-mail: director@ei.columbia.edu

We are sending you a copy of the latest issue of the journal *Notulae Botanicae* Vol. 34, 2006 published by our Institute. We wish to establish a regular exchange of publications with the International Society of Environmental Botanists, Lucknow, India

Dr. Ludmila Solomonean
University of Agricultural Sciences & Veterinary Medicine
Cluj-Napoca
Str. Nr. 3, Cluj-Napoca, 400372, **Romania**
E-mail: biblioteca.usamv.cluj@gmail.com

An International course on "Groundwater Exploration, Water Resource Exploitation and Conservation" is being organized in Israel between April 17-July 25, 2007**.** The course offers intensive studies on the techniques and methods for the development and management of groundwater resources.

This unique three months long course will be held at the Hebrew University's Faculty of Agriculture, Food and Environment Quality Sciences. MASHAV and the State of Israel will offer suitable candidates study fellowships, which will cover the studies, boarding, lodging, study material, and excursions**.** If you know of any interested candidates, please have them contact us at the earliest**.**

The candidate or the organization he/she represents in India will have to provide the international air-fare.

The application forms are available on the website: . For further queries you may also write to us at
< mashav sec@newdelhi.mfa.gov.il >

Sonika Lowe
Coordinator MASHAV, Embassy of Israel, 3 Aurangzeb Road,
New Delhi-110011
E-mail: info@newdelhi.mfa.gov.il

I would like to share a suggestion with you that was passed on to me 3 weeks back during an International Conference on "Environment: Survival and Sustainability" held in Nicosia-Northern Cyprus. One of my younger colleagues (Dr. Ahmet AKSOY) working in Central part of Turkey is highly interested in the organisation of an international conference on "Plants and Environmental Pollution" here in Kayseri-Turkey, very close to the famous historical site of Cappadocia. He wants to hold it sometime in mid autumn 2008. I would like to have your opinion before mailing an announcement as you have organised several conferences on this topic. Waiting for your reply.

Prof. Dr. Munir Ozturk
Ege University, Bornova, Izmir-**Turkey**
Phone: + + 0535-3098104
E-mail: munirozturk@hotmail.com

WELCOME NEW LIFE MEMBERS

PROF. K.P. SINGH

Prof. K.P. Singh has been associated with teaching and research in ecology and Environmental sciences, for over 40 years. He obtained Ph.D. degree in 1968 in Botany in the area of Forest Ecology under the supervision of the world-renowned ecologist Prof. R. Misra, the then Head of the Department of Botany at Banaras Hindu University. Prof. Singh began his teaching career at Meerut University and in 1970 he moved to BHU where he rose to the position of Professor of Botany (Ecology) in 1989. During 1996-99 he served as the Head of the Department of Botany at BHU, and established an M.Sc. Course in Environmental Sciences in 1999.

Prof. Singh has made significant research contributions to the ecology of tropical natural and plantation forests, grasslands and croplands. His researches have focused on experimental analysis of natural and man-made ecosystems. He has published 3 books and over 140 research papers in national and international journals. Prof. Singh has supervised eight major sponsored research projects and doctoral research of 20 scholars.

In recognition of his sustained high quality research contributions, Prof. Singh has been honoured with the Fellowships of the National Academy of Sciences, India (FNASc) in 1992 and National Institute of Ecology (FNIE) in 1988. In 1994, he received the prestigious Swami Pranavananda Award in Environmental Science and Ecology, awarded by the University Grants Commission. He was awarded the coveted Pitambar Pant National Environment Fellowship by the ministry of Environment & Forests, Government of India in 2002.

Prof. Singh has been serving since 1990 as the Chief Editor of the international journal *Tropical Ecology*. He has served on many national and international bodies helping with their policies, programmes and publications. He has been elected Vice-President of National Institute of Ecology in 2006. During 1972-74, he served on deputation inthe National Committee for Environmental Planning & Coordination at New Delhi; later this Committee paved way for the establishment of the Ministry of Environment and Forests by the Govt. of India. Prof. Singh has traveled widely to several countries in connection with academic pursuits.

E-mail: kpsingh_28@yahoo.com

DR. S.B. AGRAWAL

Dr. S.B. Agrawal is Reader in the Department of Botany, Banaras Hindu University, Varanasi. He received his M.Sc. in Botany from Agra University and Ph.D. in Botany from Banaras Hindu University. He worked as a Lecturer (Botany) under the Directorate of Higher Education from 1983-84 and also as Assistant and Associate Professor (Botany) at Allahabad Agricultural Institute, Allahabad before joining B.H.U. in 2003. Dr. Agrawal holds a National Scholarship from the Government of India. He was a visiting scientist at USDA/ARS, Beltsville Agricultural Research Centre; Beltsville, U.S.A. during 1990. Dr. Agrawal has made significant contributions on several aspects of chromosomal research and environmental biology, including effects of air pollutants and ultraviolet-B on plants. He has handled several research projects of ICAR and CSIR, Govt. of India as PI and is presently involved in three major research projects. He has published more than 95 research papers in scientific journals and edited few books. Including "Environmental Pollution and Plant Responses" published by CRC/Lewis, U.S.A

E-mail: sbagrawal56@yahoo.com; sbagrawal56@gmail.com;

SHRI R.N. MISHRA, I.F.S.

Shri Mishra did M.Sc. in Botany from Gorakhapur University. He worked as Lecturer in the Dept. of Botany, in the University of Gorakhapur, before joining the Indian Forest Service-IFS, in 1973. He served as Forest Officer in different capacities such as Assistant Conservator of Forests, Deputy Conservator of Forests, Conservator of Forests & Chief Conservator of Forests, in the State of Madhya Pradesh. He was posted on deputation in the Ministry of Agriculture, Govt. of India, New Delhi. He worked as Director, Arid Forest Research Institute, Jodhpur, (Rajasthan), under the Indian Council of Forestry Research & Education (ICFRE) of the Ministry of Environment & Forests, Govt. of India. Presently he is heading the Department of Forests of Govt. of Chhattisgarh as the Principal Chief Conservator of Forests (PCCF).

In connection with different schemes/projects Shri Mishra has been to Australia, China, Canada, Singapore, Thailand and U.K.

E-mail: rnmifscg@yahoo.co.in; cgpccf@sify.com

DR. ANURADHA SINGH

Dr. Mrs. Anuradha Singh is a Project Scientist at the Remote Sensing Applications Centre, Lucknow, U.P. Dr. Singh obtained her Master's degree in Botany from Dr. Ram Manohar Lohia Avadh University Faizabad in 1995. She was awarded Ph.D. degree by N.D. University of Agriculture & Technology, Kumarganj in 2001on her thesis entitled "Physiological and biochemical changes in Rice (*Oriza sativa* L.) associated with Tolerance to and Susceptibility for complete submergence".

Dr. Anuradha Singh was honoured with "Young Agriculture Scientist Award (Female) 2003" by UPCAR. She also attended Breeder's Roundtable Discussion on Drought Tolerance in Rice held in Khon Kaen, Thailand during December 15-19, 2003. She has published a number of research papers in national and international journals and contributed chapters in several manuals. Before joining her present assignment, she had been associated with several research projects as Junior Research Fellow, Technical Associate and Research Associate.

Dr. Singh's current research interest is in the field of stress physiology, especially flooding, sodicity and drought.

E-mail: anu_singh@india.com; sinauradha@gmail.com

NEWS FLASH

Prof. C.K. Varshney, former Dean, School of Environmental Sciences, Jawaharlal Nehru University and Vice President of ISEB, delivered a keynote lecture on "Wetlands and Human Welfare" at a function organized on 2nd February 2007 by Ministry of Environment & Forests, Government of India and Tata Energy and Research Institute, New Delhi. India's Minister of Environment & Forests, Shri A. Raja and State Minister Shri Namo Narayan Meena were present on this occasion.

Prof. Varshney has also been appointed a Member of the Board of Directors of the Indian Institute of Forest Management, Bhopal.

E-mail: ckvarshney@hotmail.co

Prof. R.S. Tripathi, INSA Senior Scientist at NBRI, Lucknow, and Advisor, ISEB was invited to attend the International Symposiums on "Biology, ecology and management of world's worst plant invasive species" organized by the Centre for Environmental Management of Degraded Ecosystems of Delhi University during 10-14 December 2006. He delivered a lead lecture on "Population dynamics of a few invasive plant species in northeast India as influenced by ecological conditions". Prof. Tripathi's talk focused on the population dynamics of three invasive species of *Eupatorium*, viz. *E. odoratum* L. (syn. *Chromolaena odorata* (L.) King & Robinson), *E. adenophorum* Spreng. (syn. *Ageritina adenophora* (Spreng.) King & Robinson) and *E. riparium* Regel. (syn. *Ageritina riparia* (Regel.) King & Robinson) with particular reference to different ecological conditions such as plant canopy cover, competition offered by the neighbouring plants, burning, soil moisture regime, light intensity, and soil nitrogen level. Based on detailed quantitative analysis of the population responses of these exotic weeds to varied ecological conditions, he concluded that they are quite aggressive and offer strong competitive influence on the native species and have undergone tremendous range expansion in northeast India; they are particularly successful on the disturbed, exposed and degraded habitats; they are posing a serious threat to many useful elements of the native flora; they are influencing the structure and function of the ecosystems which they have invaded in the recent past.

Prof. Tripathi delivered three UGC extension lectures in the Botany Department of Dr. Hari Singh Gour University, Sagar, Madhya Pradesh on the following topics on 31st January and 02nd February, 2007

(i) Forest ecosystem diversity in northeast India.
(ii) Plant population ecology in India: retrospect and prospect.
(iii) Role of soil texture and soil organic matter in determining the water and nutrient availability to plants.

E-mail: tripathirs@yahoo.co.uk

Prof. Wangari Muta Maathai, Nobel Prize winner has been presented the Jawaharlal Nehru Award for International Understanding by the President of India recently. Dr. A.P.J. Abdul Kalam who called her a symbol of empowered women of the world and a great environmentalist.

The President observed that Prof. Maathai gave a new meaning to the important act of planting a tree, by extending it to the whole life, when she said that the planting of trees is the planting of idea.

She delivered Rajeev Gandhi Memorial Lecture on 21st March, 2007. In her lecture she emphasized the importance of planting trees and went to extent of suggesting that every person must plant at least 10 trees during her/his life time.

Dr.H.M.Behl, Senior Deputy Director (Scientist 'G') and Head Environment Science & Biomass Biology Group at the

National Botanical Research Institute Lucknow, India, took voluntary retirement from service with effect from October 2006. He had joined NBRI as Assistant Director on January 1988 and, during his distinguished research career, he had done pioneering researches in the fields of Biomass Biology, Neem and Biodiesel.

Dr. Behl is a Life member and, an Executive Councillor of ISEB. He is also the Executive Editor of ***Environews***

E-mail: hmbehl@neem.net

The Protection of the Yabotí Biosphere Reserve, Misiones, Argentina and its Guaraní People

Ghillean T. Prance, F.R.S.*

*The Eden Project, Bodelva, Cornwall, PL24 2SG, **UK***

Introduction

Hidden away in the extreme northeast of Argentina is the Province of Misiones sandwiched between Brazil and Paraguay. This Province is of considerable importance for conservation because it contains what is now the largest contiguous tract of southern Atlantic rainforest. Much of the remaining forest is in the area that has been gazeteered as the Yabotí Biosphere Reserve. The reserve is also home to some of the most traditional villages of the Guaraní peoples who were the original occupants of a large part of Paraguay, Argentina and southern Brazil. For the past four years I have been involved in a cooperative project with the provincial government of Misiones to assist with conservation planning, scientific research and Guaraní affairs in the reserve. ***This is what I would like to report on in this Golden Jubilee issue of Environews, a publication that I have enjoyed and found all forty-nine issues useful. I extend my congratulations to the ISEB for bringing out Environews so regularly over a period of past 12 years and for the important role played by this publication.***

The importance of the area

The Atlantic coastal rainforests of South America are most important because of their high level of endemism of plants and animals. They are one of the designated hotspots of priority for conservation (Mittermeir et al., 2004, Myers et al., 2000). These are the areas considered both biologically richest and the most endangered of all terrestrial ecosystems. This is certainly true for the Atlantic rainforests, especially in the more tropical Brazilian part. Many studies have shown the high level of endemism in the forests (e. g. Mori et al., 1981; Thomas et al, 1998). These forests are also one of the most diverse in the world. Thomas et al. (2007) found that there were 405 species of trees and 53 of lianas with DBH > 5 cm in a hectare of forest in the Brazilian state of Bahia. In spite of such a rich diversity and endemism, only about six percent of the Atlantic forest remains. The protection of the remainder is of vital importance.

It is well known that diversity diminishes with distance from the equator and so the rainforests of Northern Argentina are not as diverse as those of Bahia. Nevertheless, they are vitally important because of the relatively large area that remains and the number of plant species and especially large mammals that survive there.

The Yaboti Biosphere reserve

This reserve contains the largest remaining contiguous tract of southern Atlantic rainforest and so for this reason alone it is important. Some of our collaborators using camera traps have shown that large forest animals still roam the reserve, albeit in too small populations because of pressure from hunting and poaching. We have photos of jaguars, puma, tapir, deer and pigs in the reserve. There are also a few villages of the Guaraní people in the reserve. The core area is a provincial park that is now well protected, but much of the rest of the reserve belongs to various timber concessions. The protection of the reserve is administered by the provincial ministry of ecology. The British Government helped to fund the construction of a field station in the core area. This was completed in 2006 and is an excellent facility for fieldwork and research. I was first asked to visit the reserve in 2001 and to help develop a conservation programme with the ministry of ecology. I was able to obtain a grant from the UK Darwin Initiative to help with capacity building for indigenous issues and management structure of the reserve. This grant is administered through the Eden Project a relatively new British botanical venture that exists to promote the importance of plants to people and to encourage their sustainable use (see: www.edenproject.org). The reserve has also appointed an international advisory committee, which I chair. It comprises experts in conservation from Argentina and four other countries.

The Programme Collaborators

The Eden Project/ Darwin Initiative team began work in the reserve in 2004. Our principal counterpart is the provincial ministry of ecology, but we also work closely with the Forestry Faculty of the Provincial University in the town of Eldorado. Botanical inventory of the reserve is being carried out systematically by the Instituto Darwinion from San Isidro near Buenos Aires and our grant makes a small contribution to this work as well. There are a number of biologists working in the province stationed at Iguazu who have formed the research and conservation NGO called Ceiba. We have also involved some of the Ceiba scientists in the work especially with the monitoring of animal populations. Because work with the Guaraní people is important, the programme supports the work of a Ph. D. student in ethnobotany from the University of Corrientes, Hector Keller. He and I are working on the ethnobotany of some of the Guaraní villages in or near to the

*Prof. Sir Ghillean T. Prance, F.R.S., VMH is a former Director of Royal Botanic Gardens Kew, England. He is a Life Member and an Advisor of ISEB. E-mail: Gtolmiep@aol.com

reserve. Much of our grant is to support the work of local people and so only three of us from the Eden Project are fully involved with the project.

Biological inventory

One of the basics for a logical conservation programme is the adequate inventory of the species in the area. We have been fortunate to have the collaboration of the botanists of the Instituto Darwinion who have carried out a thorough inventory and constructed a data base of this information (www.darwin.edu.ar). The botanical inventory has also been assisted by the ethnobotanical work since many voucher specimens have been collected. Our work has also been able to stimulate the use of camera traps in the reserve to monitor the larger animals.

Training

Our capacity building has taken two forms: in country training and overseas visits. A few Argentineans are being brought to the UK for short courses. So far, two researchers from the faculty of forestry in Eldorado have taken the conservation techniques course offered by the Royal Botanic Gardens at Kew. The presence of these people in the UK also gives them the opportunity to visit the Eden Project and learn from our work there.

So far, four staff members of the Eden Project have visited the reserve and each time we visit we give lectures and talks to appropriate audiences. In October 2006, we worked together with local ethnobotanists to offer a course in the subject for Latin American students. We had seventeen students from eight countries who took the ten-day course taught by six ethnobotanists. Part of the course took place at the new field station in the Yaboti reserve and this helped to see that the work was completed and acted as an inauguration of the Marcio Ayres Field Station. The station was named after the late Marcio Ayres, a Brazilian primatologist, who formed the international advisory committee of the reserve, but died before it was convened. During the next and last year of the project, training will continue to be an important part of our work.

Restoration ecology

Restoration is an area in which the Eden Project has much experience because, what is now a major visitor attraction, was built in an old china clay mine that was a completely barren area. The Yaboti reserve has within it many areas that are degraded mainly through excess timber extraction and so, advice on forest restoration is also important. Peter Whitbread-Abrutat, the restoration ecologist of the Eden Project, has visited the Yaboti reserve and is formulating a programme to help restore degraded areas of the reserve.

Ethnobotany and the Guaraní

The population of Guaraní are an important component of the reserve. When our project began, the relationship between these people and the provincial government was at a low ebb. The Guaraní chiefs were camped in the principal square of Posadas, the provincial capital, to demand an interview with the governor to protest the felling of their traditional forests for timber extraction. Many aspects of our project have helped to change this situation remarkably. This is in part due to the work of ethnobotanist Hector Keller who speaks Guaraní fluently and has worked with many of the chiefs. The provincial government called a moratorium on timber cutting activities in the two concessions that are of most importance to the Guaraní. We are now in the active process of raising funds to purchase the area back to add to the core area of the reserve. This will be of considerable advantage both to the Guaraní and for biological conservation. The attitude of the provincial government towards the indigenous population has made a 180 degree shift during our project and the deputy minister of the environment is frequently seen negotiating with the Guaraní. This increased activity in the reserve has led to the establishment of an integrated sustainable management plan for the reserve (Área de manejo integral).

The ethnobotanical work has documented many plant uses, legends and traditions of the Guaraní. Keller's work had included quantitative ethnobotanical studies that have shown the large extent to which the population uses the forest and its plants. He has also studied their concepts of the different vegetation types that occur in the reserve. One of the goals of our project is to find ways to enhance the income of the Guaraní in a sustainable way.

Exhibition of Guaraní life

One of our aims at the Eden Project is to mount an exhibition about the Guaraní that live in the reserve in order to inform a wider section of the public about them. We already have information about them on display. We are gathering material for such a major exhibition and already the Guaraní feature in some of our interpretive work.

Conclusions

The setting up of this binational collaborative project has drawn attention to the Yaboti Biosphere Reserve and has considerably enhanced the protection given to it by the provincial government. It has also helped to improve the relationship between the indigenous population and the government and the protection that is given to their traditional lands. This is helping to ensure the protection of the most important area of the Atlantic rainforest.

Ackowledgments

I am grateful to the UK Darwin Initiative for support of our work in the Yabotí Biosphere Reserve, to the Eden Project for sponsoring this programme and to the Ministerio de Ecologia RNR y Turismo of the Province of Misiones for

considerable collaboration extended to our work. Special thanks are due to Mario Malajovich, the principal collaborator from the ministry and the coordinator of much of our work, and to Dan Ryan of the Eden Project.

Should we choose to eat Cd contaminated rice or to use GM plant-microbes?

Yoshikatsu Murooka*

Professor of Osaka University San Francisco Center for Education & Research, 120 Montgomery St., Suite 1270, San Francisco, CA 94104, ***USA***

The advancements in science and technology in the 20th century provided us a comfortable and convenient life. At the same time, however, the advancements provided many unexpected problems as well. Mankind has suffered from unknown diseases for the past several decades due to exposure to industrial wastes.

In Asia, a majority of chemical pollutants responsible for several diseases are heavy metals. Similar conditions must exist worldwide. Widespread pollution by heavy metals that are generated by various industries has serious adverse effects on human health and the environment. Decontamination of the soil and water around industrial plants presents major challenges for a long time. Japanese people, especially farmers and fishermen, were confronted with unidentifiable symptoms for years.

Extensive research later identified these symptoms as 'Itai-itai' disease and 'Minamata' disease. Japanese scientists determined that these diseases resulted from rice grains containing large amounts of cadmium and fishes containing methyl-mercury, respectively. 'Itai-itai' and 'Minamata' diseases have yet to be completely eradicated in Japan and their incidence is increasing worldwide.

Anthropogenic sources of heavy metal deposition are on the increase as a result of the current industrial revolution, especially in developing countries. Agriculture, mining, smelting, electroplating, and other industrial activities are to blame for undesirable concentrations of metals, such as As, Cd, Cr, Cu, Ni, Pb and Zn, in the soil. Although trace metals are an important part of the soil ecosystem, accumulation of these metals is harmful to people, animals, plants and other organisms coming in contact with the soil and groundwater

In my laboratory, we analyzed the cadmium content in soil samples from various rice fields in Japan. One soil sample taken from a rice field, located downstream from an old mine which was closed more than 30 years ago, had an extremely high concentration of cadmium. This data is highly confidential and unpublished to date since if I were to release this information to the press, the prefecture governments involved would panic. Consumers won't buy any rice produced from this prefecture, even though most of rice had no contamination of cadmium. It would be better to tell the farmer to stop the cultivation of rice in this kind of field and clean up the soil as soon as possible.

Unlike many other pollutants, heavy metals are difficult to remove from the environment. These metals cannot be chemically or biologically degraded, and are ultimately indestructible.

In the rhizosphere, plant roots secrete various nutrients and attractants stimulating microbes to swarm plant roots. Certain microbes have the ability to gather and carry metal ions to plant roots. The metal ions released by these microorganisms are taken in by plants. These phenomena gave me an idea for bioremediation using plants and their microbes.

Let us recall plant symbiosis. A typical plant symbiosis is a leguminous plant, the soybean, and its nitrogen-fixing rhizobia, *Bradirhizobium japonicum*. 1/4th to 1/3rd of the world's soils are acidic and/or nutrient poor. Since these acidic soils contain far fewer microorganisms and limited species, we need to inoculate soils with appropriate rhizobia.

Dr. Hiep of Cantho University, Vietnam and Dr. Nantakorn Boonkerd, Suranalee Institute of Science and Technology, Thailand have shown the significant formation of nitrogen-fixing nodules on the soybean roots by inoculation of the soils with *Bradirhizobium* species in Mekong Delta in Vietnam and Thailand, respectively. The yields of soybeans were increased.

The soybean plant produces sugars by photosynthesis. The sugars are supplied to their rhizobia as an energy source. Rhizobia present in the nodule fix atmospheric nitrogen converting it into ammonia with energy supplied by the plant, and the ammonia is supplied to the plant as nitrogen source. Most plant roots form mycorrhizal association, which enhances the uptake of water and phosphate ions from water and phasphorus deficient soils. Therefore, you do not supply chemical fertilizer or at least you decrease the addition of chemical fertilizer. These symbioses are beneficial to agriculture and interesting with regard to their molecular mechanisms.

Another idea that we had for heavy metal accumulation in symbiosis was to introduce useful gene, such as metal-binding protein, into a *Rhizobium*. Genes for metal-binding proteins introduced into a Rhizobium will be expressed in bacteroids in nodules.

*E-mail: murooka@bio.eng.osaka-u.ac.jp

We used Chinese milk vetch as our symbiotic host plant. Known as *renge-soh* in Japanese and *Astragalus sinicus* in Latin, Chinese milk vetch is a green manure legume. This plant has been used as soil fertilizer for rice fields in China for 1000 years and in Japan for two hundred years. In the rainy season, farmers immerse *renge-soh* plants with their nodules into the paddy water and plow in the fields. As a result of this, no nitrogen fertilizer is required. *Mesorhizobium huakuii* subsp. *rengei* strain B3 is a bacterium that establishes a symbiotic relationship with *Astragalus sinicus*. It would be of considerable interest if we could use this leguminous plant to increase the soil nitrogen content and, at the same time, to remove heavy metals from the soil.

Inoculation of strain B3 resulted in increased accumulation of cadmium not only in nodules but in *renge-soh* too. We found about 2% cadmium accumulation in this plant per year. Given this accumulation rate for cadmium by *renge-soh,* it would take about 50 years to eliminate cadmium from polluted soil using phytoremediation. We cannot wait for 50 years. So, we began to genetically bread the *renge-soh* plant to increase its ability to accumulate heavy metals.

Genetic engineering suggests the possible use of specially designed microbial biosorbents with suitable selectivity and affinity for heavy metals. Normally we have a mechanism in our bodies which produces metallothioneins, metal-binding proteins, to protect us against toxic heavy metals. For the remediation of heavy metals, we selected the metallothionein protein as a metal binding protein. Overexpression of metal-binding proteins by bacterial cells results in enhanced accumulation of cadmium and offers a promising strategy for the development of microbe-based biosorbents for remediation of metal-contaminated soil.

To increase the binding of heavy metal ions, we designed oligometric metallothioneins and succeeded in expression of the tetrameric metallothionein in bacteroid in root nodules of *renge-soh*. The tetrameric metallothionein bound 4 times more cadmium and other heavy metals than the naturally occurring monomer metallothionein. The presence of 10^6 to 10^8 bacterial progeny of the rhizobia in each nodule on the roots of *renge-soh* is advantageous for the expression of foreign genes that help to sequester heavy metals in contaminated soil. Once symbiosis is established, the heavy metals should accumulate in such nodules.

Phytochelatins are an attractive alternative to metallothioneins since they offer the potential for enhanced affinity and selectivity for heavy metals. The structure of phytochelatins can be represented by $(\text{-Glu-Cys})_n\text{-Gly}$, where n ranges from 2 to 11. Phytochelatins have higher metal-binding capacity than metallothioneins. Thus, phytochelatins are attractive as metal-binding peptides for the development of a microbe-based biosorbents for remediation of metal-polluted soils. We demonstrated the introduction of the *Arabidopsis* gene for phytochelatin synthase (PCS); (*AtPCS*) into strain B3. The gene of *MTL4* or *AtPCS* was expressed under the control of bacteroid-specific promoters, namely, the promoters of the *nifH* gene and *nolB* gene. The gene for *MTL4* or *PCS* was expressed in free-living cells under microaerobic conditions when the promoter was activated by *nifA*. The expression of the *MTL4* and *AtPCS* genes in strain B3 increased the ability of cells to bind cadmium approximately 2-fold and 9- to 19-fold, respectively.

When recombinant strain B3 established the symbiotic relationship with *renge-soh*, the symbionts increased cadmium accumulation in root nodules by 1.5-1.8 fold. The expression of the both *MTL4* and *AtPCS* genes showed additive effect on cadmium accumulation in nodules. In paddy soil, addition of recombinant strain B3 carrying a plasmid with the both *MTL4* and *AsPCS* genes significantly increased the accumulation of cadmium in roots and nodules of *A. sinicus*. Our results showed about 9% cadmium accumulation for this engineered plant. Since we cannot decompose heavy metals, cadmium containing plants are harvested, incinerated, and the ashes are then stocked to recycle the heavy metals.

Thus, this system uses the advantages of both plants and rhizobia, in particular, engineered genes can be transformed to plants through infection with recombinant bacteria.

By our calculations, it would take 3 years to clean up cadmium contaminated soils with the tri-annual cultivation of the engineered plants. However, our government does not permit to use genetically engineered plants and microbes in open fields. GM plants and microbes have great potential for humanity. However, we must carefully test and monitor their safety for humans and the environment. It is not so easy to prove the safety of GM organisms. My contention is that using GM plant-microbes is much safer than taking heavy metal-contaminated grains.

Eiffel Tower turned light off to signal climate risk

The Eiffel Tower turned its famous night-time illuminations off for five minutes on Thursday Feb. 1 2007 to help draw attention to energy consumption and the environment on the eve of the release of a U.N. report on climate change. The 336 projectors that light up the tower at night switched off between 7:55 p.m. and 8:00 p.m. (1855-1900 GMT). The symbolic switch off was part of a campaign organized in conjunction with the Paris mayor's office to highlight the impact of energy consumption on global warming. Illuminations on several other French monuments were also switched off.

Trend in tropospheric ozone concentration and its impact on agriculture: Indian perspective

Madhoolika Agrawal*

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

The increase in tropospheric ozone has been identified to be a serious and critical cause of concern world over. Inter-Governmental Panel for climate change (IPCC) and World Meteorological Organization (WMO) assessment reports have predicted large increases in tropospheric ozone (O_3) resulting from the emissions of O_3 precursors. Ground level concentrations of O_3 have been increasing steadily since the industrial revolution. Ozone concentration has risen by 1-2% per year in the industrialized countries of the northern hemisphere. Most of the countries of western Europe, eastern and mid-western region of USA and eastern Asia are found to show the highest background concentrations of O_3. Most developing countries are facing increasingly severe air pollution problems due to recent emphasis on economic liberalization leading to rapid increases in industrialization and urbanization. Tropospheric O_3 is one of the secondary air pollutants, predominantly formed by photochemical reactions involving precursors like nitrogen oxides (NOx) and volatile organic compounds (VOCs) generated by anthropogenic activities. In polluted air masses, production of Nitrogen dioxide (NO_2) takes place by reaction of NO with HO_2 and RO_2 and then photolysis of NO_2 in the presence of strong solar radiation (< 424nm) releases atomic oxygen, which combines with molecular oxygen (O_2) to form O_3. In the free troposphere, O_3 formation also depends on photochemical reaction of methane, carbon monoxide and non-methane organic compounds with O_2. Tropospheric O_3 concentration also depends upon the stratospheric-tropospheric exchange processes.

Air pollution identified as a localized problem restricted to urban and industrial areas has spread even to rural areas. Tropospheric O_3 is considered to be the most widespread atmospheric pollutant reaching to elevated concentrations at suburban and rural areas. A long-term change in tropospheric O_3 has been implicated as one of the important factors of climate change because O_3 acts as a greenhouse gas. The Indian tropical region is expected to experience higher emissions of O_3 precursors such as oxides of nitrogen (NOx), Volatile organic compounds (VOCs), carbon monoxide (CO) and NMHCs from transport sector and large-scale biomass burning, which enhance the potential of tropospheric O_3 production. The annual emission estimates of different pollutants from transport sector in India showed that during 1990-1997, total emissions increased by 80% for CO, 78% for NO and 104% for hydrocarbons.

Most of the work on long-term variations in tropospheric O_3 in India is based on photochemical models. Quantitative estimates of ground level O_3 variations are limited over the Indian subcontinent. High concentrations of O_3 have been reported for some 90 sides were recorded between 9.4 and 128.3 ppb (parts per billion). Eight hour mean O_3 concentration in Delhi exceeded the World Health Organization (WHO) mean standard of 51 to 102 ppb by 10 to 40%. Annual average O_3 concentration of 27 ppb was reported at Pune during 1994-95. Surface O_3 measured during 1997-2003 at National Physical Laboratory, an urban site in New Delhi showed monthly average maximum concentration in dry summer (April to June) ranging from 62-95 ppb. Another maxima of monthly average was observed during autumn (October November) ranging from 50-82 ppb. Daily maxima of O_3 exceeding 100 ppb was observed on most of the days during summer with values reaching 175 ppb on few occasions. In Varanasi city, annual average O_3 concentrations varied between 8 to 25 ppb during 1989-1990. The range of two-hour mean O_3 concentrations was 11 to 82 ppb. In a study conducted during 1998-2000 average 8 hourly seasonal O_3 concentrations at various urban, suburban and rural sites of Varanasi varied from 10 to 45 ppb during winter and 21 to 59 ppb during summer season. O_3 concentration was highest at rural sites with no specific sources of pollutants. The summer time maximum O_3 concentration can be explained due to meteorological factors such as high solar radiation, longer day light period, warm weather, stagnant wind patterns and low humidity. A detailed monitoring programme conducted at a rural area of Varanasi during 2004-2006 showed average daytime O_3 concentrations of 56, 42 and 32 ppb during summer, winter and rainy seasons, respectively. Upon comparison of this data from earlier monitoring records for the same area, it was observed that average O_3 concentrations increased by 32, 41 and 36%, respectively during summer, winter and rainy seasons from 1989-1990 recorded data. A diurnal maximum of O_3 concentration was found to occur during the early afternoon in winter and during the late afternoon in summer. The night time ground level O_3 concentrations were 8 to 13 ppb throughout the year.

Ozone as a toxic air pollutant was identified long back in 1950s, but now it is recognized as the most important rural air pollutant having negative impact on human health and vegetation including crop plants. The predicted increases in tropospheric O_3 concentrations in India have been implicated with large-scale impacts on agriculture with many social and economic consequ-

*Professor Madhoolika Agrawal is an Excetuve Councillor of ISEB
E-mail: madhoo58@yahoo.com

ences. Changing O_3 concentrations are suggested to be an important component of change in air pollution scenario. Evidence of visible injury due to O_3 on potato leaves in Panjab was recorded by Bambawale in 1986, but its possible consequences for agricultural production have scarcely been explored under natural field conditions till late 1990s.

There are different approaches utilized for studying the impact of ambient O_3 on crop yield. One such approach evaluates the impact of urban air pollutants on selected crop plants grown under standardized conditions utilizing a transect along a gradient of pollution. Test crop plants i.e. wheat (*Triticum aestivum* L. cv HD 2329), mustard (*Brassica campestris* L. cv Pusa Jaikisan), mung bean (*Vigna radiata* L. cv Malviya Jyoti) and spinach, showed significant decrease in different yield attributes at a rural site experiencing high O_3 concentrations compared with that of low O_3 site. Yield (g. plant) declined by 14 % in mung bean and 21 % in palak. Yield of both wheat and mustard did not show significant difference between reference and the rural site. Upon comparison of O_3 concentrations at two sites, it was found that during winter, mean O_3 concentrations were 11 and 32 ppb, respectively at reference and rural sites, whereas during summer, the respective concentrations of O_3 were 17 and 56 ppb. Yield of a late sown cultivar of wheat (M234) decreased by 13.5 % at the above seasonal means of O_3 concentration. The study has clearly shown that O_3 plays a greater role in yield losses during summer when its formation increases due to favourable meteorological conditions. The study has further shown evidence of urban primary pollutants involved in photochemical reactions leading to formation of O_3 causing threat to agricultural production in India. In a field study with pea (*Pisum sativum* L cv Arkel), yield reduction of 13 % was observed at seasonal 8 hourly mean O_3 concentration of 42 ppb as compared to a site having mean concentration of 16 ppb. Yield reduction in pea was directly correlated with loss in photosynthetic rate. Ozone accelerated leaf senescence in pea thus reducing the leaf area.

Another approach of O_3 impact evaluation on crop plants is through the use of protectant chemicals. An antiozonant, N-2- (2-oxo-1- imidizolidimyl) ethyl-N phenyl urea (EDU), is one of the most successful and widely used protective chemicals for assessing crop loss from O_3 under ambient field conditions. EDU is known to suppress acute and chronic O_3 injury on a variety of plants. Mung bean plants (*Vigna radiata* cv Malviya Jyoti) grown at different sites having variable concentrations of SO_2, NO_2 and O_3 showed that maximum protection by EDU treatment occurred at sites showing higher concentrations of O_3. Complete protection in crop yield was not observed because SO_2 and NO_2 were also present. But the results of multiple regression equation between concentrations of pollutant and yield clearly showed significance of O_3 under EDU treatment. Experiments with EDU have also indicated that O_3 can cause significant effects on the yield of tomato (*Lycopersicon esculentum*) in and around New Delhi and potato (*Solanum tuberosum*) in Panjab. Ambient O_3 concentrations present in suburban area of Allahabad city caused negative effects on growth, biomass accumulation and allocation and yield of mung bean plants, but EDU treatment induced tolerance as the treated plants maintained higher levels of photosynthetic pigments, protein and ascorbic acid contents as compared to the non EDU treated plants. To assess the impact of ambient O_3 on growth and productivity of two wheat cultivars, three concentrations of EDU were used under truly ambient field conditions. The slow growing cultivar M533 with lower yield potential maintained the yield at lower dose of EDU (150 ppm), whereas in M234, a relatively short duration crop with high yield potential, 300 and 450 ppm EDU could only cause significant increments in yield. Harvest index, which denotes the reproductive potential did not vary in M533 due to EDU, but increased significantly in M234 at 300 and 450 ppm EDU. The study further confirmed that M234 is a sensitive variety of wheat for O_3 and, therefore, showed better protection only at higher concentration of EDU.

Filtering of ambient air pollution using especially designed open top chambers is another widely used approach of assessing the impact of O_3 on crop plants. National Crop Loss Assessment Network (NCLAN) programme in United States used open top chambers to assess the national economic consequences resulting from the reduction in agricultural yield and to define the O_3 exposure and crop yield response relationship for the major agricultural crops. Basic NCLAN methodology was used in different countries of Europe under European Open top chambers (EOTC) programme on a variety of crops. Results of experimental studies indicated that yield reductions were highly correlated with cumulative exposure to O_3 above a threshold of 40 ppb during daytime. A cumulative concentration of O_3 above a 40 ppb threshold (AOT40) was established as 3000 ppb h for the spring planted crops experiencing high O_3 concentrations at the time of their maximum growth in summer.

Extensive OTC studies were conducted around Varanasi with field grown crop plants for assessing the yield response at ambient O_3 concentrations. Filtration of ambient O_3 with charcoal filter from OTCs led to increments of 23, 28, 11, 22 and 29 %, respectively in the yield of winter spinach, summer spinach, carrot, brinjal and radish. One of the most sensitive cultivars of wheat M234 showed increments of 20.7% in yield and 8.4 % in harvest index due to filtration of O_3 (mean concentration of 45 ppb) from germination to maturity. Wheat plants did not show significant impact of O_3 during the vegetative phase as concentrations of O_3 were below 40

ppb for 90% of the time during December and January. But during reproductive phase daytime O_3 concentrations often exceeded 40 ppb causing negative effect on assimilation in flag leaf and consequently translocation of photosynthate to developing ears. Translocation pattern depends upon sink activities as well as source strength and hence the partitioning priorities at the time of exposure modified the impact of O_3. The timing of O_3 episode is an important factor for determining the sensitivity of plants to O_3. Effect of O_3 in accelerating the leaf ageing particularly of flag leaf has a direct correlation with yield losses in two important cereal crops viz., wheat and rice. Ozone not only adversely affected the yield of crops, but also negatively influenced the crop quality. Pea seeds collected from a site of Varanasi experiencing mean O_3 concentration of 43 ppb showed significant reductions in protein, starch, nitrogen and energy contents as compared to those collected from a site having mean O_3 concentration of 10 ppb. Similarly, reductions in protein and starch contents of wheat and rice seeds, beta-carotene content in carrot and iron content in spinach were observed under elevated ambient O_3 during OTC studies.

Exposure studies were also conducted to evaluate the influence of higher O_3 levels on yield attributes of two major crops of India, wheat and soybean using open top chamber facilities. Plants were exposed to 70 and 100 ppb O_3 for four hours daily from germination to physiological maturity. The extent of reductions in yield was many times higher in soybean cultivars as compared to both the cultivars of wheat. Soybean cv PK 472 showed yield reductions of 13.9 and 33.5 % and cv Bragg of 10 and 25 %, respectively at 70 and 100 ppb O_3 concentrations. In wheat, yield reductions at 70 and 100 ppb concentrations were 4.7 and 15.5 % in cv M234 8 and 17 % in cv HP 1209, respectively. The relationship also indicated that O_3 has a more negative impact on soybean compared to wheat.

A comparison of the yield data of exposure experiments at constant concentrations of O_3 with those obtained through filteration experiment showed that yield reductions are not matching. The reduction in yield of wheat cv M234 at 4 hourly O_3 exposure of 70 ppb from germination to maturity was lower than the reduction in yield of same variety of wheat grown in non-filtered chambers experiencing mean seasonal concentration of 43 ppb O_3. This variation in yield reduction is due to the fact that under ambient conditions O_3 concentrations vary seasonally as well as diurnally during the growth period. Ozone concentration exceeded 70 ppb for several hours during the anthesis period of wheat from February to March, which probably modified the photosynthate translocation to developing ears thus causing greater yield reductions.

The trends of O_3 concentrations recorded at a few stations showed a general tendency of increase over the time, which are capable of causing risk to agricultural productivity in India. However, more systematic and extensive regional work is needed to quantify the crop yield losses in a country like India with wide variations in climatic conditions as well as anthropogenic activities. There is no work available coupling projected increases in tropospheric O_3 with impacts on agricultural yield using modeling. The importance of several factors such as inter- and intra-species variations, climate variables particularly temperature, sunshine hours, soil type, soil moisture, timing of O_3 episodes, stage of plant growth need to be explored in relation to O_3 risk assessment. More detailed studies at the national level are necessary to identify high and low risk zones of O_3 in different regions of the country. Air quality standard for O_3 needs to be established for vegetation including agriculture. There is an urgent need for identifying monitoring centers for O_3 across the rural and semi urban areas of the country.

Plastics in the Environment[†]

M.M. Sharma, F.R.S.* & R.A. Mashelkar, F.R.S**

**Kothari Research Professor, Jawaharlal Nehru Centre for Advanced Research;*
Former Professor of Chemical Engineering and Director UDCT, Mumbai
*** Former Director General, CSIR & Secretary, Department of Scientific & Industrial Research, (Govt. of India)*

Plastics have moulded the modern world and transformed the quality of life. There is no human activity where plastics do not play a key role, from clothing to shelter, from transportation to communication and from entertainment to health care. Plastics, because of its many attractive properties, such as lightweight, high strength and ease of processing, meet a large share of the material needs of man. From practically zero in the fifties, humankind today consumes greater than one hundred and fifty million tons of plastics. We truly live in a 'Plastic Age'. Our daily lives would be very much poorer without these benign and environmentally friendly materials. Plastics possess a unique combination of properties. Plastics can be super tough, rigid as well as flexible, transparent as well as opaque and can allow selective permeation or act as a barrier material.

[†]We are grateful to Indian Centre for Plastics in the Environment for permitting us to reproduced this article, which was recently published in the form of a message by ***Eco-Echoes,*** Mumbai.

Nature has produced 'plastic' like materials for centuries. Silk and cellulose are example of natural polymers. Reference to Shellac, a thermoplastic can be found even in Mahabharatha!

Growing population and consumption in India has put severe pressure on our natural resources and fragile ecosystems. The material needs of our population are growing and plastics offer a cost-effective alternative.

Plastics are employed in myriad applications where they actually conserve natural resources. For example, asceptic packaging of food in barrier packaging films will render refrigeration unnecessary, saving capital and energy. Edible oils and milk are packaged in flexible packages eliminating the use of tin and glass containers. Rigid HDPE barrels are used for bulk chemical storage instead of steel drums. Apart from conserving natural resources, use of plastics in these applications saves transportation fuel as plastics are substantially lighter than tin, glass or steel.

Safe drinking water packaged in PET bottles are a very common sight now-a-days. They provide confidence to consumer on the quality of water and help reduce waterborne diseases. Advanced polymeric membranes help purify water from viruses and bacteria. They also provide potable drinking water from sea and brackish water through a process of desalination.

The fact that plastics are made from hydrocarbons derived from petroleum, which is non-renewable, has raised questions concerning its sustainability. Nevertheless, the consumption of petroleum hydrocarbon for the production of plastics is less than 5%, the balance being consumed as fuels and energy source. Consequently, the concerns about sustainability of plastic materials is somewhat exaggerated. On the contrary, processing of many natural materials (glass, paper, wood, metals) consume far more energy and thus lead to greater consumption of fossil fuels. Additionally, research and development work currently in progress globally, will provide future opportunities to make some of the plastics from biomass and other renewable resources. Thus, plastic manufacture will become even more sustainable in the years to come. It is fair to say that plastics replace several natural materials, which are either scarce, consume more energy for processing or cause damage to the ecosystems during their production. Thus use of plast5ics makes a positive contribution to the sustainability of earth's resources.

Another issue that is often discussed is whether because of their non-biodegradability, plastics will cause damage to our ecosystems. The signature of all natural materials made by biological processes is that they are biodegradable and bio-assimilable. The long life and desirability of plastics, which have made them a material of choice for many applications is seemingly a disadvantage when it comes to their disposal. However, when handled properly, plastics do little damage to our environment.

Plastics have the advantage that they can be easily reprocessed and recycled. In some cases, one can recover even the raw materials that were originally used in their manufacture. Plastics offer the unique advantage that one can recover the fuel value contained in the hydrocarbon polymer after its use. Plastics can also be made environmentally degradable, especially for packaging applications. There are expectations that in the near future plastics will be made even biodegradable and compostable so that waste plastics can be handled the same way as wet food waste and agricultural waste. The overall eco-friendliness of plastics becomes apparent when one evaluated the total 'life cycle, namely, an analysis of raw materials, energy, effluents, methods of disposal, etc., of a material from its origin to its final disposal.

Effect and Risk Assessment of Ozone Air Pollution on Forest Vegetation in Switzerland

Marcus Schaub*

Swiss Federal Institute for Forest, Snow and Landscape Research WSL, 8903, Birmensdorf, ***Switzerland***

Abstract

Many studies investigating the negative impacts of ozone on biomass production and physiological functions have demonstrated the relationships between ozone exposure and reductions in both growth and physiological gas exchange. Such studies have led to an increasing interest in effects of ozone exposure expressed as a critical cumulative exposure of 10,000 ppb hrs above the threshold of 40 ppb (AOT40). Ozone effects on plants mainly depend on atmospheric transport and stomatal uptake. Thus ozone risk assessments should not only use measured ozone concentrations, but should also account for the influence of atmospheric conditions and soil moisture on stomatal conductance and non-stomatal ozone deposition. Following the Level II approach, our on-going studies aim to provide a model to estimate the ozone flux for forest ecosystems throughout Switzerland.

*Dr. Marcus Schaub <marcus.schaub@wsl.ch>

Introduction

Ozone pollution leaves no elemental residue that can be detected by analytical techniques. Therefore, visible injury on the foliage of broad leaf and needle bearing species is basically the only easily detectable evidence of ozone-induced injury in the field. The evidence we have today strongly suggests that ozone occurs at concentrations which cause visible foliar injury to sensitive plants. Even though visible injury does not include all the possible forms of injury to trees and natural vegetation (e.g. pre-visible physiological changes, reduction in growth, etc.), observation of typical symptoms on aboveground plant parts in the field has turned out to be a valuable tool for the assessment of the impact of ambient ozone on sensitive plant species.

During the 1990s, the potential impact of ground-level ozone on plants and human health has come into focus within the European co-operation on reductions of air pollution emissions within the United Nations Economic Commission for Europe (UNECE) and the European Union (EU). This has led to a request from policy-makers to the scientific community for quantitative information concerning ozone effects. The International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests' (ICP-Forests) operating under the UNECE Convention on Long-range Transboundary Air Pollution (LRTAP) requires the assessment, validation, and mapping of visible ozone injury on the Long-term Forest Ecosystem Research plots (Level II plots). Furthermore, the Task Force of ICP-Forests agreed that data on air concentrations of tropospheric ozone need to be implemented in the ICP-Level II monitoring.

International framework

In 1997, based on ten years of monitoring forest condition in Europe for estimating direct effects by air pollution on forest trees, the UN/ECE with the LRTAP has concluded that ozone is the main air pollutant to be considered. The Task Force of ICP-Forests further agreed in June 1999 based on a report prepared by the working group for 'Ambient Air Quality' of the expert panel on deposition that data on air concentrations of ozone need to be implemented in the ICP-Level II monitoring.

In December 1999, ministers from more than 20 countries signed the UN/ECE Gothenburg Protocol to abate acidification, eutrophication and ground-level ozone. A revision on the UN/ECE Gothenburg protocol is expected to take place around 2004-2005. The Sub-Manual of 'Ambient Air Quality', Part II on The Assessment of Ozone Injury on European Forest Ecosystems, was adopted at the 17th Task Force meeting in Ennis, Ireland in May 2001 and first coordinated assessments of visible ozone injury were conducted across Europe during the season of 2001.

State of the Art

Current levels of tropospheric ozone have been shown to cause damage to forest trees, agricultural crops and semi-natural vegetation. A rise in ozone concentrations has steadily occurred over the past decades, and as a result of the likewise continuing rise in the emission of precursor pollutants of nitrogen oxides and reactive hydrocarbons further increases in ozone are expected in many parts of the world. In order to address this, the UN/ECE has adopted an effects-based approach, using the critical loads/levels concept. This effects-based research has resulted in the establishment for critical levels for meeting the Level I standard. The current critical levels are expressed as cumulative ozone exposures using the index AOT40, i.e. the sum of hourly ozone concentrations above a cut off of 40 ppb (nl l^{-1}) during daylight hours when global radiation exceeds 50 Wm^{-2}. The critical level for ozone above the threshold of 40 ppb has been established in the range of 10 ppm.h for a seasonal period of 6 months during the daylight hours to protect ozone-sensitive forest tree species from a 10% biomass loss. This critical level is based on a significant regression of biomass decrease in 0-3 year-old *Fagus sylvatica* L. var. AOT40, established by normalizing data from three separate open-top chamber projects. However, it remains to be determined, whether other deciduous tree species show a similar biomass decrease. Furthermore, it needs to be tested whether a possible biomass decrease with other tree species is indicated by visible foliar injury on a macroscopic as well as on a micro-morphological level, and by changes within their physiological gas exchange process.

It is widely acknowledged that the impacts of ozone are more closely related to the ozone dose absorbed through the stomata than to ozone exposure in the atmosphere. The Level 1 standard is attractive because of its simplicity, but it is limited by the fact that any factor which may influence a plant's response to ozone is largely ignored. These are not limited to plant and site-specific characteristics such as soil moisture content, vapor pressure deficit, wind speed, radiation, and temperature. Hence, a realistic estimate of the actual ozone dose and its impact is not feasible using the Level I approach. In 1999, it was agreed that ozone flux, the instantaneous rate at which surfaces such as leaf- and soil surfaces, and stomatal openings absorb ozone, would lead to the biologically more relevant estimates of ozone risks. This Level II approach proposed several additional environmental parameters to be included due to their modifying influence on tree responses. It was also stated that there was a scarcity of data upon which to base an ozone dose-response function, especially for Level II plots. Thus, the development of a realistic flux-based approach should be the long-term goal of our Level II investigations in order to gain additional data for an accurate ozone risk assessment.

There is evidence that ambient ozone

concentrations as they are monitored in Europe can cause a variety of effects to vegetation such as visible foliar injury, growth and yield reductions, and altered sensitivity to biotic and abiotic stresses. Our surveys at the Level II plots throughout Switzerland and within the WSL open-top chamber research facility at Lattecaldo, southern Switzerland have recorded ozone-like symptoms on numerous native tree, shrub, and forb species since 1997.

Open-top chamber studies (filtration studies) and research using Continuously Stirred Tank Reactors (CSTR's) (fumigation studies) have confirmed that ozone is the cause of the visible injury seen on seedlings of a variety of plant species. We have found that seedlings varied markedly in symptom severity and several species were found to develop ozone-induced symptoms at exposures below the current short- and long-term European air quality standards. However, there is still a lack of adequately documented evidence of ozone-induced foliar injury to tree and shrub species across the whole of Europe. Using the biomonitoring approach while looking for symptoms on native ozone-sensitive plant species, is the main objective of the ICP-Forests Sub-Manual to provide information on the distribution of ozone injury within the European forest ecosystems.

Recent studies have shown that increasing ozone concentrations not only have a negative effect on wood production, but may also lead to unstable conditions in forest ecosystems, which could result in a lowered adaptive capacity to new stresses in the future. Long-term effects of elevated ambient ozone concentrations on trees may weaken the function of forest ecosystems with respect to water and energy balances and soil protection against erosion particularly in the alpine regions. Some of the most important impacts may be the possible shifts in species composition and loss of biodiversity especially in areas with large numbers of endemic plant species with unknown sensitivity to ozone. However, much more detailed and defined site and species exposure/response research is required in order to confirm such hypotheses.

Environmental factors

The negative impacts of ozone on biomass production and physiological functions have been investigated in a number of experiments. Many of these experiments demonstrated relationships between ozone exposure and reductions in both growth and physiological gas exchange. Studies investigating physiological sensitivity to ambient ozone concentrations indicate that ozone stress may reduce carbon fixation, increase foliar and root respiration, shift the partitioning of carbon into different chemical forms, and disrupt carbon and nutrient allocation patterns. There is general agreement that ozone must enter the leaf interior through stomata to cause leaf tissue injury. Therefore, stomatal regulation must be an important factor in controlling ozone sensitivity of plants. The stomata also control carbon uptake, a crucial process for plant growth. When plants close their stomata, thereby avoiding further ozone uptake, they are additionally stressed through the detrimental effects on both plant growth and photosynthate allocated towards the repair of cells injured during ozone exposure. Therefore, it has been suggested that the ratio of net photosynthesis and stomatal conductance is a better indicator of plant sensitivity to ozone than either parameter alone.

Changes in environmental conditions such as light, temperature and humidity influence stomatal aperture and hence also the potential for ozone flux. It has been demonstrated that foliar injury responses were associated with site differences; trees on wetter sites experienced higher visible foliar injury compared to trees on drier sites with two thirds of the trees on wet sites being consistently more symptomatic than the trees on the dry sites. Various other studies have shown greater visible ozone injury on plants grown in moist soil over those grown in drier soil. Differences in the soil water regimes within an OTC-study with four-year-old seedlings of *Prunus serotina* L., *Fraxinus americana* L., and *Acer rubrum* L. seems to be a controlling factor in affecting interactions with ambient ozone and subsequent physiological differences leading to alterations in ozone uptake. Stomatal conductance has also been reported to be affected by tree age and tree size. However, these findings support the hypothesis that negative correlation between ozone uptake and net photosynthesis indicates that water stress and nutrient deficiency may prevent ozone injury by reducing stomatal conductance and ozone uptake. Making matters even more complicated, these findings also confirmed the hypothesis that greater visible foliar injury in the lower versus upper crowns of dominant black cherry trees and saplings was a result of higher ratios of ozone uptake and net photosynthesis when measured within the lower-crown which had shaded leaves.

In conclusion, it is widely accepted that the general receptor-specific maximum leaf conductance is modified by environmental and phenological parameters: soil factors, such as soil moisture deficit and irrigation, plant development factors such as phenological stages, and factors influencing the instantaneous ozone uptake by plants, including temperature, leaf-to-air vapor pressure deficit, global radiation, wind speed and positions within mature tree crowns. In order to improve our ability to identify areas potentially at risk for ozone impacts, an extension of the existing database and a more detailed understanding of the flux-response relationships are needed.

Below-ground plant response

A number of studies have demonstrated

that ozone would adversely affect net photosynthetic rates. Consequently, physiological imbalances in the above-ground parts of the trees exposed to elevated ozone may alter below-ground carbon processes. However, quantification of below-ground pools and fluxes of C has proven to be a difficult task, because of the high spatial heterogeneity and difficulty of observation within the soil.

Decreased allocation of photosynthates to the roots is assumed to be responsible for a reduced root growth, a change in the root-to-shoot ratio and decreased fine root production in various tree species under elevated ozone exposures. Furthermore, a reduced supply of photosynthate to the roots was suggested as a consequence of decreased soil respiration of field-grown aspen trees under ozone exposure. A decline of root exudation of organic compounds due to reduced translocation of photosynthate to the roots under ozone exposure could result in a reduced nutrient supply to soil microorganisms, leading to a lower microbial metabolism and a lower total soil respiration. However, it is still unclear whether the decrease in total soil respiration is mainly attributed to the reduced heterotrophic (microbial) respiration or to the reduced autotrophic (root) respiration, or to both respectively or interactively. It is difficult to distinguish between heterotrophic and autrotrophic respiration, but both components are dependent on the carbon sources transported from the above ground biomass into the soil.

Since the utilization rate of photosynthates is reflected in the respiration rates above and below ground, more research should be directed towards a better understanding of respiration in the below-ground portions. The soil including roots and soil microorganisms not only play a major role in the carbon budgeting of the ecosystem but also in regulating water and nutrient supplies to the tree.

Large-scale risk assessment

It is often difficult to assess the sensitivity of mature trees to ozone, especially when considering the diversity of sites occupied by a species across its entire natural range. In addition, the accuracy of using seedlings to predict responses of mature trees and forest ecosystems to ozone is questionable, considering the long life span of trees and the phenological differences. Although controlled experiments with seedlings have been valuable for revealing the 'principles' of ozone action on woody plants, these findings would lack ecological significance as long as validation at forest sites is missing. Differences in canopy structure and microclimate, exposure to ozone, gas exchange, and transport of water and carbohydrates, nutrient allocation, and recurrent flushing between seedlings and mature trees are some of the complications that must be taken into account.

The current Level I critical level values, which are being used in developing European ozone control strategies both by UN/ECE and the EU, are intended to protect the most sensitive vegetation types under the most sensitive conditions. Exceedance of these critical levels, however, only provides an indication that some risk exists of negative effects to vegetation from ozone; the degree of exceedance cannot be used to provide a measure of the relative risk of negative effects to vegetation in different areas of Europe.

A risk assessment based on ozone flux to receptor sites within the leaf, rather than ozone exposure, could provide an improved estimate of the relative degree of risk of ozone damage to vegetation across Europe. Existing models of ozone flux require detailed micrometeorological information, and are applicable to only a limited number of species, and cannot be readily applied at a large geographical scale. Alternatively, models designed to model ozone deposition on a regional scale have a limited description of the stomatal responses, which are not species-specific and which do not consider the effects of vapor pressure deficit and soil moisture deficit. By limiting the existing data pool to hardwood species, 81% of the variation in observed photosynthetic response could be explained by cumulative ozone uptake alone. Given the strength of this relationship and uncertainties surrounding additional sources of variation, examining its implications across natural forested landscapes represents a valuable way to advance current understanding of ozone effects, even while recognizing the limitations of its simplicity.

Summary and conclusions

It is widely accepted that tropospheric ozone concentrations are expected to increase in the near future. While ozone effects and the underlying mechanisms on plant tissue and single plants are reasonably well understood, there is still a wide gap of knowledge and understanding as to how air pollution in general and ozone in specific, affects forest ecosystems. Furthermore, considering the expected increase of the global average surface temperature and the simultaneous alteration in precipitation patterns, the air pollution effects, and in particular the effects ascribed to tropospheric ozone, may change as well. The application of mechanistic models combined with the respective future findings based on detection, monitoring and evaluation should allow us a more profound understanding to estimate a better risk assessment for forest ecosystems.

Where Have All the Sparrows Gone?

Aqeel Farooqi*
Transport Commissioner's Office, Lucknow, India

The threat to species continues. As the inexorable juggernaut of human development rolls on, it leaves little or no elbowroom for other life forms to cling on tenaciously to the thread of survival. Whether it is the forest or urban environs, so many species are being pushed surely and steadily over the brink of extinction that one now tends to lose count. Although the larger and more well recognized endangered species have strong conservation groups supporting their struggle for existence, for commoner species these threats are so imperceptible that conservationists get the chance of ringing the warning bells only long after the damage is done.

One victim of these imperceptible threats is *Passer domesticus*, the common house sparrow. As its name suggests, it is one of the bird species that have always been closely associated with us in our urban environment. A bird so ubiquitous, that it had almost become a part of our lives. More often than not, it was the sparrow which was the 'chiya' that parents pointed out to the bubbly infant in their arms - sometimes as the first lesson in making him aware of the wonders of his new world, or as a distraction to stop his streaming tears when he cried inconsolably in anger or in pain. As he grew up, they regaled him with stories of 'chiriya-chidda', in which the central characters were none other than sparrows.

Our homes always had sparrows as co-habitants. Any wooden rafter, crevice in the wall or the cup in the ceiling fan, was confidently staked by the sparrow to build its nest. Its initial forays, when it was searching for a nest-site, were strongly repulsed. But once it succeeded in laying its claim to a nesting site, we tended to let it go on unhindered. Although it turned out to be a nuisance for the house mistress because of the wispy nest material falling all over the place, it was tolerated with good humour since it contained eggs, and to demolish it was anathema to most. Later, as the hatchlings emerged, they often wriggled too vigorously in their quest for food and fell out of the nests, but were promptly replaced by us with tenderness and care. The ones that didn't survive found teary eyes and willing little hands that laid them gently to rest in impromptu graves dug in the backyard.

But all that is now a thing of the past. Our homes are now drearily silent without the twitter and chirrup of the sparrows, which seem to have either gone into oblivion or have forsaken us in our mad race in the material world. With our beautifully constructed houses and rooms of isolation, we effectively banished the sparrow from our environs.

The older generation, for whom feeding the birds was akin to puja, has mostly passed away. The younger generation, with its hard-working couples in single unit families, has neither the time nor the inclination to bother about such mundane distractions as putting out food for the birds. Besides, thanks to the fridge and the changed culinary setup, nothing qualifies as leftovers.

And so, with no food and no place to qualify as home, the poor sparrow has all but made a quiet exit from our lives. Only a few die-hard stragglers remain, to make us more acutely aware of their plight. There may not be any research conducted, and no questions may be asked to explain this loss. After all, the sparrow does not have any NGO rooting for its survival as there are for other high-profile species.

But to those of us who grew up chasing sparrows during the hot summer afternoons, after making stealthy escapes from strictly enforced siestas, the cheerful chirrup from even one sparrow today is enough to gladden our hearts.

The author is associated with leading NGOs on several conservation issues and has served as honorary UP State Coordinator of Indian Bird Conservation Network (IBCN) established by Bombay Natural History Society (BNHS) and the UK based Royal Society for Protection of Birds (RSPB).
E-mail - aqeelfarooqi@yahoo.com; Web site - http://www.wildlifeofindia.com/

PLANT TEN TREES IN YOUR LIFE TIME

Human survival is directly proportionate to the amount of carbon dioxide absorbed by ten trees. Those who have not planted 10 trees in their life time are breathing off somebody else's trees.

Humans need forests while forests can do without humans.

World conflicts are about control of limited natural resources including water and grazing ground. There is an intrinsic link between environment, democracy and peace.

Environment has to be incorporated in the equation of governance and peace. The generations responsible for destroying environment are not the ones that pay the price.

Professor Ms. Wangari Muta Haathai, Nobel Laureate
(Eighth Rajiv Gandhi Memorial Lecture delivered on 21 March 2007 in New Delhi)

NEWS AND VIEWS

RADON THE SILENT KILLER

Radon, a colourless, odorless gas in homes is an overlooked public-health risk. Scientists have known since 1950s that radon, at high doses such as those found in uranium mines, cause lung cancer. But recent studies in North America and Europe have provided direct evidence that radon in homes also causes lung cancer. Radon is produced by the decay of natural uranium in rocks and soil and, depending on the underlying geology, can build up to high levels indoors when it slips through cracks and openings in foundation. About 10% of lung-cancer deaths in Canada are due to radon, which kills more Canadians than homicide, drowning or fires. More than 21,000 people die in U.S.A. each year and tens of thousands perish worldwide from radon-induced lung cancer.

The studies found that long-term exposure to radon concentrations of 200 Bq/m^3 (becquerels per metre cube) doubles the risk of lung cancer compared with the risk at average background levels of 10 Bq/m^3.

According to the estimates of a British scientist, building radon-prevention measures into a new home can cost as little as $350 that could bring radon levels down to 50 Bq/m^3. While WHO is poised to release new voluntary guidelines to tame the problem, experts say that mandatory changes in building codes are needed. U.S. Congress had directed Environmental Protection Agency to conduct outreach and education efforts that would eventually lead to the attainment of outdoor levels of radon inside homes.

Source: ***Above The Fold***
Environmental Science & Technology Policy News

LARGEST TIGER RESERVE HIT BY GLOBAL WARMING

There were about 40,000 tigers in India a century ago, but decades of poaching and depletion of their natural habitat have cut their numbers to 3,700. The Sunderbans, a 26000 km area of low-lying swamps on India's border with Bangladesh, dotted with hundreds of small islands cris-crossed by water channels, has the world's largest Tiger Reserve. Once home to 500 tigers in late 1960s, the Sunderbans may only shelter between 250 and 270 tigers now. The tigers of the Sunderbans regularly swim between islands in search of food and sometimes stray into villages.

The area is the world's largest mangrove reserve and is one of the most unique ecosystems in South Asia, recognized as a UNESCO World Heritage Site. As sea levels rise, mangroves have been over exposed to salt water. Many plants have lost their red and green colours and are more like bare twigs, exposing tigers to poachers who hunt them for their skin and bones. Two islands have already disappeared and others are vulnerable.

The destruction of the mangroves has also adversely affected numbers of estuarine crocodiles, fishes and big crabs. That could leave the tigers hungry. But we cannot fight nature and must accept the inevitable that the islands could submerge one day due to rising sea levels.

Bappa Majumdar
Planet Ark

HEATING PROPERLY WITH ENVIRONMENTAL PROTECTION

Wood is an ozone-neutral fuel. When burned it only releases the amount of carbon dioxide that the trees had captured during growth. However, its incomplete combustion as well as the use of the wrong fuels such as varnished wood, particle board, and plastic packaging cause a mission of large amounts of hazardous air pollutants such as particulate matter or polycyclic aromatic hydrocarbons. The particulate emissions from the millions of small wood-fired systems in Germany are just as high as the combined emissions from passenger cars, trucks and motorcycles. High quality wood, stoves in good working order and economic use can help lower emissions from wood-burning stoves and boilers significantly.

To achieve above objectives, we should replace old burners by adopting modern, low-emissions technology, e.g. pellet heaters. Proper fuel should be chosen for burning and only dry untreated wood should be burned.

Source: Federal Environment Agency, Bonn, **Germany**

BIODIVERSITY FUNDAMENTAL TO ECONOMICS

Biological diversity constitutes the indispensable foundation for our lives and for global economic development. The loss of global biological diversity is advancing at an unprecedented pace. Up to 150 species are becoming extinct every day, and their uniqueness and beauty, and their specific functions within ecosystems are also irrecoverably lost. The web of life that sustains our global society is getting weaker and weaker.

The production of natural resources in agriculture, forestry and fisheries, stable natural hydrological cycles, fertile soils, a balanced climate and numerous other vital ecosystem services can only be

permanently secured through the protection and sustainable use of biological diversity. Two-thirds of these ecosystem services are already in decline, some dramatically.

We are gradually becoming aware of the fundamental importance of biological diversity for the global economy. The global value of plant-derived pharmaceutical products is more than $ 500 bn in industrialized countries. Of the medicines currently available 40-50% are derived from natural products. For oncology and anti-infective medicines, it amounts to 70-80% with every species we lose, we may be losing a remedy for global health problems.

An estimated 40% of world trade is based on biological products or processes. Biological diversity provides the world's population, particularly the poor, with food stuffs, medicines, building materials, bioenergy and protection against natural disasters. The "biodiversity treasure trove" provides the global economy with an invaluable and extensive potential for innovative products and processes that is still widely untapped. But our globalized and steadily growing economy is using up this irreplaceable natural asset at a terrific speed. The rate of loss of species and habitats is proceeding relentlessly at up to 11000 times the speed of natural processes..

Besides the crucial role of direct conservation policies such as protected area systems and sustainable production methods, mainstreaming biodiversity into all relevant sectors such as trade, development, financing and transport is essential. We are also increasingly becoming aware of the close link between biodiversity and climate. Habitats like forests, bogs and coral reefs contain massive carbon reservoirs, which significantly contribute to regulating the global climate. Equally, the climate has a direct influence on the state of biodiversity. Estimates predict the loss of up to 30% of species by 2050 if climate change continues at its current pace.

We, therefore, need integrated solutions to global environmental problems. If biofuels are produced on land obtained through deforestation, their use is ineffective for climate change mitigation and has substantiated negative effects on biodiversity.

By Sigmar Gabriel
Minister for Environment **Germany**
(BBC News)

INTERNATIONAL GROUP TACKLES GLOBAL WARMING

Global Roundtable on Climate Change comprising more than 100 corporate heads, international organizations and experts recently set out a plan to cut greenhouse gas emissions, calling on governments to act urgently against global warming as failing to act now would lead to far higher economic and environmental costs and greater risk of irreversible impacts. They urged governments to place a price on the carbon emissions released by power plants, factories and other sectors to discourage emissions. Addressing climate change involves risks and costs. But much greater is the risk of failing to act.

The atmospheric concentration of carbon dioxide is about 30 per cent higher than in 1900 and nearly half of this increase has occurred since 1980. Given fast-rising emissions from developing nations, the planet could have three times the carbon dioxide levels seen before 1900. The largest carbon-emitting sector is power generation, responsible for more than 40 per cent of global energy-related emissions. Industry accounts for more than 18 per cent of emissions, transport contributes 20 per cent, and the residential and services sector nearly 13 per cent. It is estimated that technology to head off mounting carbon dioxide concentrations would cost about one per cent of global gross domestic products. Costs would fall as technologies become more established. If we delay too long in beginning the changeover to increasingly de-carbonized energy systems, the environmental costs will only rise and the impact of climate change will only become more severe. The poorer nations would see the worst impact from climate change.

From: Green@work
TodayEnvironmental News Portal

ARTIFICIAL TREES: A GREEN SOLUTION?

In 2006, more than 29 billion tonnes of carbon dioxide was pumped into the atmosphere. A New York based geo-physicist Prof. Klaus Lackner has designed a synthetic tree, a construction that mimics the function of natural trees whereby leaves pull carbon dioxide (CO_2) from the air as it flows over them. The CO_2 removed from the atmosphere in this way, could be stored deep underground both safely and permanently.

Just like a real tree, an artificial tree would have a structure to hold it up the equivalent of a trunk, probably a pillar. It will also have "branches" which hold up the leaves. Unlike a real tree, where the leaves are spread out because they have to see sunshine for the purpose of photosynthesis, the leaves on an artificial tree could be packed much more tightly. Thus an artificial tree can collect much more CO_2 than a natural tree.

When CO_2 comes into contact with sodium hydroxide, it is absorbed, producing a liquid solution of sodium carbonate. It is that liquid solution which could be piped away and the time at which the CO_2 could be recovered as a concentrated gas in preparation for its final storage.

Once trees and other plants have absorbed CO_2, the carbon is retained in their tissues. Prof. Lackner aims to produce thousands of artificial trees and estimates that every single one would remove 90,000 tonnes of CO_2 a year the equivalent emissions of 20,000 cars. Using existing oil drilling technology,

channels thousands of metres deep would be bored into the sea bed. The carbon dioxide gas would be injected into it, permeating the surrounding porous rock. At this depth and low temperature, the CO_2 is denser than water, locking it in place. It cannot rise from there to the ocean floor. So it puts it away literally for millions of years.

BBC News

BEWARE OF THE INDOOR CLIMATE IN YOUR HOME

Many of the products in our homes emit a number of substances which together can affect our health as we spend greatest part of our lives indoors according to a report recently published by Danish Environmental Protection Agency. All the computers, irons, shoe sprays and other products in our home give off a number of toxic chemicals. The children's play room has the highest concentration of harmful substances.

The Danish study has calculated the combined concentration of a number of chemicals from products typically found in kitchen, children's room or utility room for example TV, hair-dryers, stain removers, glue and printers. Concentrations were calculated for formaldehyde, acetaldehyde, phenol, benzene, toluene, xylene, styrene and limonen. The calculations show that furniture, electrical andf electronic appliances and toys together can emit substances which can cause allgergic reactions, respiratory irritation, headaches and dizziness.

The children's room, in particular, can have high concentrations as this is often a small and typically contains many products that can emit undesirable shubstances. Some of the precautions include: air out the home regularly, especially when we smell something; all types of sprays should be used outside, as far as possible.

Danish Environment Newsletter

GROUND-LEVEL OZONE IN THE 21ST CENTURY

Despite improvements in air quality across Europe over the last two decades, background level ozone has continued to increase, primarily because of the trans-boundary nature of the problem. The effects of climate change on ground-level ozone are potentially important but uncertain. Ground level ozone is a serious pollutant that affects human health, reduces crop yields and damages natural ecosystems and in Europe is considered to be most important air pollutant because of these effects. Several factors may be important for the increase. For example; growth in anthropogenic precursor emissions (such as methane, carbon monoxide and nitrogen oxides) in other parts of the world; reduction in the ground removal fluxes due to land use changes(eg deforestation) and drought.

There are important interactions between ozone and climate that are only now beginning to be understood. Ozone has a direct effect on climate through radiative forcing, and its impact as a green house gas is third only to carbon dioxide and methane. climate affects ozone production and distribution. For example, natural emissions of Ozone precursors are temperature and humidity dependent.

The Royal Society, London is launching a study to assess and synthesise existing information on ground- level ozone and its impacts, and their coupling to climate change. The study will assess the potential impact of ground level ozone on human health and the environment over the next century

Source; The Royal Society London

MERCURY IN FOOD CHAIN

Mercury has shot up in public awareness in recent years in many countries. The naturally occurring metal is also released into the air by burning coal and through other manufacturing processes. It then falls back to earth in rain, and once in waterways, it accumulates in fish tissue.

Mercury can cause neurological problems in humans, and scientists warn that children and women of chid-bearing age in particular should be careful about which-and how much-fish they eat. Mercury persists in the food chain, building up in higher level in larger fish, and can cause develop-mental problems for birds and other mammals that eat fish

In U.S.A, tests carried out in Virginia showed that 11 of the13 rivers and lakes, east of Richmond are mercury tainted. The swampy, slow-moving rivers of eastern Virginia contain bacteria that more readily convert mercury to a compound called methyl mercury, which travels more quickly and with more damage through the food chain and the human nervous system.

It is important to reduce mercury at its source because the metal persisists in nature for long periods

Source :Patrick Lynch in Daily Press

CONFERENCES

9th International in situ and on-site Bioremediation Symposium
7-10 May 2007; Baltimore, Maryland, **U.S.A.**
Contact: biosymp@battelle.org
Website: www.battelle.org/biosymp

International Conference on Climate Change
29-31 May 2007; Hong Kong, **China**
Contactg: http://www.hkie.org.hk/iccc2007/

2nd World Congress on Work-related and Environmental allergy
13-16 June, 2007; Weimer, **Germany**
Contact: http://www.conventus.de.woreal/
E-mail: woreal@conventus.de

6th Kustem Annual Seminar 2007 on Sustainability and Management
Ecosystem Sustainability and Health of Threatened Marine Environments (ESHTME)
2-4 May 2007, Awana Kijal Terengganu, Malaysia
Organized by Institute of Oceanography, Kolej Universiti Sans dan Teknologi **Malaysia** (KUSTEM)
Contact: kas2007@kustem.edu.my

2nd EPOBIO Workshop: Products from Plants - from crops and forests to zero-waste biorefineries
15-17 May 2007, Athens, **Greece**
Contact: web@epobio.net; web@epobio.net
The EPOBIO Administrator, CNAP, Department of Biology (Area 15), University of York, PO Box 373, York YO10 5YW, UK.; Fax: +44 (0) 1904 328801

13th International Interdisciplinary Conference on the Environment
June 30 - July 3, 2007; Portland, Maine, U.S.A.
Contact: Dr. Kimberly Reiter, Conference Chair
Department of History, Stetson University
DeLand, FL 32720, **USA**
E-mail:kreiter@stetson.edu
Website: http://www.ieaonline.org/conference.htm

3rd International Symposium on Nanotechnology, Occupational and Environmental Health
August 29 September 1, 2007; Taipei, **Taiwan**
Contact: emily@elitepco.com.tw

Interdisciplinary Opportunity for Recent PhD Graduates: Dissertations Initiative for the Advancement of Climate Change Research Symposium
10-17 September, Kilauea, Hawaii, **United States**
Contact: http://www.solas-int.org/

Research Integrity
Fostering Responsible Research
16-19 September 2007; Lisbon, **Portugal**
Contact: www.esf.org/conferences/researchintegrity

2nd Global Summit on HIV/AIDS, Degenerative Diseases, Traditional Medicine and Indigenous Knowledge
10-14 March 2008, Accara, **Ghana**
Contact: J.William Danquah, President/CEO
Africa First, LLC
517 Asbury Street #11, Saint Paul, MN 55104
E-mail: info@africa-first.com
Website: http://www.africa-first.com

BOOKS

+Climate Change and Biodiversity
Edited by Thomas E Lovejoy and Lee Hannah
Yale University Press 2005
ISBN: 10 0300 104251
Price: £45.00

Conservation Directory 2005-2006
The Guide to Worldwide Environmental Organizations
Edited by National Wildlife Foundation
Island Press 2005
ISBN: 55963-513-4
Price: US $ 80.00

Environmental and Pollution Science
By Ian Pepper, Charles Gerba & Mark Brusseau
Burlington MA Elsevier 2006
ISBN: 0-12-551503-6
Price: US $ 89.95

Environmental Archaeology: Theoretical and Practical Approaches
By Nick Branch, Mathew Canti, Peter Clark and Chris Turney
Hodder Arnold 2005
ISBN: 0-340-808713
Price: GB £ 22.99

Esau's Plant Anatomy
Third Edition
By Ray F. Evert
Publisher Wiley 2006
ISBN: 0-471-73843-3
Price: US $ 150.00

Plan B 2.0: Rescuing a Planet under Stress and a Civilization in Trouble
By Lester R. Brown
W W Norton & Co. 2006
ISBN: 0-393-328317
Price: GB £ 10.99

Plant Conservation: A Natural History Approach
Edited by Gary A. Krupnick & W. John Kress
The University of Chicago 2006
ISBN: 0-226-455130
Price: GB £ 21.00

Executive Editor :
Dr. H.M. Behl
Editors:
Dr. R.D. Tripathi
Dr. Mrs. Kamla Kulshreshtha
Dr. Amit Pal
Mr. Deepak Wahal

Printed and Published by`
Dr. K.J. Ahmad
for International Society of Environmental Botanists, National Botanical Research Institute, Rana Pratap Marg, Lucknow-226 001, India
Tel. 2205831-35 Extn. 223
Fax : 2205836
E-mail : isebnbrilko@satyam.net.in
Website : http://isebindia.com