



# ENVIRONEWS

INTERNATIONAL SOCIETY OF ENVIRONMENTAL BOTANISTS

## Newsletter

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### Environmental Pollution - Biggest cause of mortality

Up-to-date projections of socio-economic trends up to 2050, and their implications for four key areas of concern: climate change, biodiversity, water and the health impacts of environmental pollution, are presented in a recent study by the OECD. It is foreseen that despite the recent economic recession, the global economy will nearly quadruple by 2050 and rising living standards are expected to be accompanied by ever growing demands for energy, food and natural resources – as well as more pollution.

Specifically as regards air pollution, it is set to become the world's top environmental cause of premature mortality by 2050, overtaking dirty water and lack of sanitation. Air pollution concentrations in some cities, particularly in Asia, already far exceed the recommended air quality guidelines set by the World Health Organization (WHO), and air quality is projected to deteriorate further by 2050.

The number of premature deaths caused by exposure to particulate matter (PM) is projected to be more than double worldwide, from the current figure of just over one million to nearly 3.6 million per year in 2050, with most deaths occurring in China and India.

Over the same time period, premature deaths from exposure to elevated concentrations of ground-level ozone are projected to be more than double worldwide, from 385,000 to nearly 800,000. Most of these deaths are expected to occur in Asia, where ozone concentrations as well as the size of the exposed populations are likely to be highest. More than 40 per cent of the world's ozone-induced premature deaths in 2050 are expected to occur in China and India.

The costs of inaction could be colossal, both in economic and human terms. Without new policies world energy demand in 2050 will be 80 per cent higher and still 85-per-cent reliant on fossil-fuel-based energy. This in turn could lead to a 50 per cent increase in greenhouse gas (GHG) emissions globally.

*Christ Agren in Acid News, Goteborg, Sweden*

- **Members of ISEB are requested to intimate any change in their contact address including postal, Email, Fax, Telephone to ISEB office.**
- All correspondence should be addressed to: **The Secretary, International Society of Environmental Botanists**, National Botanical Research Institute Campus, Lucknow - 226 001 (India).
- **E-mail:** [isebnrllko@sify.com](mailto:isebnrllko@sify.com) **Website:** <http://isebindia.com>



## LETTERS

I have a simple request more so because of my Indian origin. For several decades I have been gathering data on the drumstick plant, *Moringa oleifera* which my Indian forefathers brought to South Africa around 1860. This community continues utilizing this plant especially the young pods as a source of food. It is also a plant which is actively being cultivated on the African continent to address malnutrition. I would like to publish on this species but do not have all the literature especially from the East. I would greatly appreciate assistance and also linkages with researchers and also organizations that work with *Moringa*. Any data would be welcome.

My association with Dr K.J. Ahmad, ISEB's Secretary, goes back a few decades when we met at the Jodrell Laboratory, in Kew Gardens, England.

**Himansu Baijnath**

Professor, Department of Botany, University of  
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I am really very happy to see your Newsletter. I am basically a microbiologist and working as Assistant Professor. My field of research is Bioremediation of different environmental pollutants using microorganisms. I am associated with this field for the last 13 years. I have attended 4th International meet at NBRI, Lucknow in 2010. It was my first experience to meet other subjects people on large scale apart from my microbiology subject.

I really appreciated your team efforts and this Newsletter also updates our information. I have seen small articles in this Newsletter. I am actually interested to send some small article for next issue of this newsletter. If it is possible then please inform me. Anticipating your positive reply.

**Dr. Shilpa Gupte**

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New V.V.Nagar, Anand, Gujarat, India  
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I am still doing things as usual. I have also been bombarded with deadlines from granting agencies and had to travel as the Principal Investigator to meet with my collaborators. Nevertheless, things are under control now. Changing the subject, I have requested Dr. Kevin Percy (Executive Director, Alberta Wood Buffalo Oil Sand Environmental Program) and his wife (PR person) to write an article for EnviroNews. Canadian Oil Sands has the third largest oil supply in the world and provides 13% to the US demand. Most scientists have very poor internal (US) funding at the moment. So, meeting attendance has been very low, in fact dismal. Nevertheless, I can find some funding for ISEB before the end of this year. I have squeezed \$3,000 for ISEB. However, will need to spend it before the elections. Please advise me regarding your wishes.

We need to discuss the funding situation, (1) Transfer the money to ISEB or (2) Provide partial or full airfare to three N. American scientists (total of \$3000) for attending any future ICPEP Conference in Lucknow. Either will work.

Please note that I will be away in Canada and Mexico during most of October.

**Prof. Sagar Krupa**

University of Minnesota, U.S.A  
<krupa001@umn.edu>

I have been invited to organize a symposium at 'The 13th Conference of International Association of Botanical Gardens' which is to be held at Guangzhou, China from 13-15 November, 2012.

I should be highly glad if you would please contribute to the symposium '**Role of Botanical Gardens in Addressing Social and Environment Challenges of 21st Century**' by presenting a talk/paper. I also request you to circulate this call for talk/papers among your staff, friends and colleagues in India and all over the Globe. I need your kind cooperation in this regard.

**Dr. Chandrakant B. Salunkhe**

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### WELCOME NEW LIFE MEMBERS OF ISEB

**Dr. H. Gokul** is Professor & Head Department of Botany,  
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**Dr. N. Mamatha** is an Associate Professor Government First  
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**Prof. (Dr.) Pramod W. Ramteke** is Professor in Sam Higginbottom Institute of Agriculture, Technology & Sciences Naini, Allahabad, India.

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**Dr. Vinod Chandra Sharma** is Assistant Professor at the PG Department of Botany, Darjeeling Government College, Darjeeling, India.

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### Welcome New Members from Lithuania

**Prof. Ms. Eugenija Kupcinskiene** is a Professor at Vytautas Magnus University, Kaunas, Lithuania.

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**Ms. Lina. Zybartaite** is a student of Master of Biology at Vytautas Magnus University., Kaunas Lithuania.

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## NEWS FLASH

**Dr. Riti Thapar Kapoor**, Assistant Professor in Amity Institute of Biotechnology, Amity University, Noida and life member of ISEB was invited as a chairperson in the International Conference on Chemical Processes and Environmental Issues (ICCEEI' 2012) in Singapore during July 15-16, 2012. This international conference was hosted by Planetary Scientific Research Centre in collaboration with SRM University, King Mongkut's University of Technology Thonburi, Thailand and ISEM Society.

**Dr. Jagdish Gandhi**, founder-manager of Lucknow's well known City Montessori School and, a life member of International Society of Environmental botanists, during a recent visit to Argentina, was felicitated with honorary doctorate degree by the Universities of Etre Rios and Law Mendosa. Earlier, he was also awarded honorary doctorate by Russia's Bakshir state Pedological University ufa for his efforts towards uplift of human race.

**Dr. Kamla Kulshreshtha**, Senior Scientist NBRI, Joint Secretary ISEB and editor Environews was deputed by CSIR-National Botanical Research Institute, Lucknow to Republic of Yemen during 6-12 September 2012 at the invitation of Hayel Saeed Anam Group of Companies which plans to set up a "Touch, feel and smell garden" on the pattern one such garden developed by her at NBRI. Dr. Kulshreshtha made a presentation before the senior officials of the company wherein she gave an overview of the garden developed at NBRI. In subsequent meetings of discussions and after surveying the proposed site in the city of Taiz, she presented a

blue print for developing this garden in an area of 1800sq ft, which was approved by the company at the highest level.

**Dr. S.C. Sharma**, Vice-President, ISEB organized a "Tree Plantation Programme" at the "SAMARPAN" an Old Age Home, Lucknow on August 22, 2012. Sixty Senior Citizens adopted the saplings of trees and shrubs for plantation inside the Old Age Home and pledged to look after the saplings as their own children. Dr. Dinesh Sharma, Mayor Lucknow Corporation presided over the function. Padmashri Dr. S.C. Rai, former Mayor Lucknow Corporation planted the saplings of "Rudraksha" (*Elaeocarpus ganitrus* Roxb.) along with the officials of Gayatri Parivar.

**Dr. Mohd. Yunus**, Professor, School of Environmental Sciences Baba Saheb Bhimrao Ambedkar Central University Lucknow superannuated on 31st August 2012. One of the founders of ISEB and currently its Executive Councillor, he was the founder editor of Environews. Prof Yunus will be based in Lucknow. (<mykabdali@yahoo.co.in>)

### NBRI Director wins CSIR Award

**Dr. Chandra Shekhar Nautiyal**, Director CSIR-National Botanical Research Institute Lucknow along with Prof. H.B. Singh of the Department of Mycology and Plant Pathology, Institute of Agricultural Sciences, Banaras Hindu University and Directorate of Agriculture, U.P. have been awarded the prestigious CSIR Award for S&T Innovation for Rural Development (CAIRD) – 2011. Prime Minister Dr. Manmohan Singh presented the award on September 26, 2012 in New Delhi.

### Workshop on Plant-based Management of Ganga Water Pollution

On the occasion of the commissioning of a pilot scale sewage treatment plant developed under an ongoing research project of CSIR-NBRI entitled "Plant based management of Ganga water pollution: Plantation along the banks and development of constructed wetlands for

sewage and waste treatment: Phase –I Uttarakhand" sponsored by National River Conservation Directorate, Ministry of Environment & Forests, New Delhi, a team of NBRI scientists organized 3<sup>rd</sup> workshop on 24<sup>th</sup> August 2012 at Dev Sanskriti Vishwavidyalaya, Hardwar, Uttarakhand,

India to develop a road map for future programmes. The workshop was inaugurated by Swami Chidanand Saraswati Ji Head of Parmarth Niketan, Rishikesh. It was followed by scientific and technical sessions and panel discussions. The workshop was attended by about five hundred professionals and individuals from educational institutions, officials of local bodies, industrial associations, voluntary and spiritual organizations concerned with the augmented pollution of Ganga river. Prof. S. P. Singh, was the key note speaker, while Dr. Chinmay Pandya and Prof. B. D. Joshi were the Guests of Honour.

Dr. C. S. Nautiyal, Director, CSIR-NBRI, while welcoming the guests highlighted the importance of plants in purifying Ganga water pollution. He emphasized the need to undertake development of constructed wetlands for waste treatment and plantation drive on the river bank so as to check soil erosion and siltation. He informed that the aim of implementing this project was to rehabilitate the river ecosystem, using a green and cost effective technology. He further affirmed that there was a need to replace the current piecemeal efforts taken up in a fragmented manner in select cities with an integrated approach that sees the river as an ecological entity.

Dr. U. N. Rai, Project Leader of the team of scientists while giving the background and objective of the workshop, informed that the workshop involved local people who would be benefited by training and sensitization about the role of plants in improving the quality of Ganga water and to encourage employment generation. The aim of the project was to promote this small-scale, low capital and carbon negative technology among the rural population as a model. As of now, whatever steps have been implemented to treat the sewage released into Ganga, only one fourth of the sewage was treated before releasing into the river. Until the people living on the banks were sensitized about this, it was not possible to achieve the desired result.

Prof S.P. Singh, former Vice Chancellor, H. N. B. Garhwal University advocated the importance of plants in cleaning of sewage water in constructed wetlands before releasing into the river Ganga.

Dr. Chinmay Pandya, Pro-Vice Chancellor, Dev Sanskriti Vishwavidyalaya, Haridwar in his oration, appreciated the integrated approach of NBRI to bring spiritual leaders, academicians and common people on one platform to fight against pollution of Ganga. He appreciated the constructed wetland developed by CSIR-NBRI at Shantikunj, which was a novel attempt to control Ganga pollution.

## Remote Sensing and GIS for Forest Monitoring and Management

S.P.S. Kushwaha

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The problems involved in maintaining a sustained supply of forest resources for the present day needs and future demands of the mankind have made the forest managers conscious about the compelling need for rational utilization of these resources. The conventional methods of forest resources assessment and monitoring are time and cost-intensive. Many a time they do not match with the resource dynamism and hence, become obsolete by the time the results are available. The advent of remote sensing and geographic information system (GIS), and global positioning system (GPS) technologies has revolutionized the forest resources assessment, monitoring, management and has reduced the time and cost considerably. Remote sensing is the science and art of obtaining information about an object, area or phenomenon through analysis of data acquired by the device that is not in contact with the

object, area or phenomenon under investigation (Lillesand and Kiefer, 2006). It is also said to be the practice of deriving information about the earth's land and water surfaces using images acquired from an overhead perspective, using electromagnetic radiation in one or more regions of the electromagnetic spectrum, reflected or emitted from the earth's surface. Some of the highlights of the remote sensing technology are stable sensing platforms, synoptic coverage, high frequency of observations, and real-time images available in spatial form and on multiple scales. It is perhaps the only technology, which allows retrospective evaluation of forest resources.

Remote sensing, as such a multidisciplinary discipline, is utilized in the inventory and monitoring of the forest resources. All remote sensing systems including aerial cameras capture radiation (signature) in different

wavelengths reflected or emitted by the land and water surface features and record it either directly on the film as in case of air photos or on a digital medium like tape, and other digital media. As no two objects in nature are theoretically ditto, their signatures are unique. This property of the objects is exploited in remote sensing to differentiate the objects from one another. The reflectance from vegetation is controlled by leaf pigments, cell structure, and the leaf water content. The radiation absorbed in red region is primarily used for photosynthesis. In healthy vegetation, both absorption and reflectance are more pronounced. Diseased and senescent vegetation shows lesser absorption as well as reflection in red and near-infrared regions and a higher overall reflectance in blue and green regions. These spectral properties of vegetation are exploited to detect their type and

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condition through image interpretation. Forests are one of the most conspicuous terrestrial features on the planet earth. Identification and mapping of forests using remote sensing techniques is thus, relatively easy. Satellite remote sensing is extremely popular in forest surveys.

### **Satellite Remote Sensing**

During the World War-II, the use of electromagnetic spectrum was extended from visible and infrared to microwave regions and this is considered as a major milestone in the history of remote sensing. The beginning of space-based remote sensing dates back to 1891, when Germans developed rocket-propelled camera systems. But it was in 1957, when Sputnik-1 took the first photograph of the earth from satellite. Systematic earth observation from space started with the launch of Explorer-1 in 1959 and meteorological satellite, TIROS-1 in 1960. The launch of Earth Resources Technology Satellite (ERTS) in 1972 dawned a new era in remote sensing. This was the first satellite available for systematic and repetitive observations of earth's land resources. Landsat-1, 2 and 3 carried multispectral sensors operating in 0.5-1.1 $\mu$  wavelength range and had 79m x 57m spatial resolution. The satellite data provided by these satellites facilitated the identification and mapping of broad forest types and canopy densities. Landsat-4 and 5 carried both MSS and Thematic Mapper (TM) sensors and provided low as well as medium resolution (30m x 30m pixel) imagery. The Landsat TM imagery changed the foresters' outlook about the forests. The availability of 20m and 10m resolution imagery from French satellite, SPOT later significantly advanced remote sensing applications and brought image interpretation close to virtual reality.

The Indian Space Research Organization (ISRO) launched a number of Indian Remote Sensing Satellites (IRS) with capabilities similar to contemporary earth observation satellites. The launch of Indian Remote Sensing Satellite (IRS-1A) in March 1988 marked a new era in the history of satellite remote sensing programme in

India. Subsequently, the IRS-1B, IRS-P2, IRS-P3, IRS-P4, IRS-1C, IRS-1D, TES and IRS P6/Resourcesat-1, and Resourcesat-2 were launched. Both IRS-1A and 1B carried 72.5m and 36.25m spatial resolution sensors on-board and provided not only the continuity of satellite data from Landsat Programme (of U.S.) to indigenous one but also an opportunity for Indian scientific community to test their data for forest resources inventory and monitoring. While the earlier two sensors are meant to facilitate in locale-specific intensive resource inventories, the WiFS (Wide-Field Sensor) and AWiFS (Advanced Wide-Field Sensor) data facilitated the assessment of the land and water features and phenomena encompassing large areas. The Indian Remote Sensing Programme has come a long way and is all set to grow further through more advanced sensors with improved capabilities of information generation.

The availability of satellite data in digital form provides a whole lot of flexibility with respect to its use. Single band black and white as well as false colour composite (FCC) images can be used for interpretation. Since single imagery covers large area, the broad forest features encompassing larger areas could be studied. The use of multi-date imagery provides information on phenological conditions of the forests i.e., evergreen or deciduous as well as on the extent and the distribution of forests with the passage of time. Over time, the visual interpretation has given way to digital interpretation. It has been found that a combination of supervised and unsupervised techniques i.e. hybrid methods yield better results. In India the first attempt to categorize forest cover types by digital classification of satellite data was made in 1978 for Nagaland delineating temperate evergreen, tropical evergreen, tropical semi-evergreen, tropical deciduous, bamboo, degraded forests, shifting cultivation and permanent cultivation. Many studies on forest cover mapping have been done in India so far using satellite imagery. NRSA carried out the first-ever forest cover monitoring using 1972-75 and 1980-82 timeframe satellite

imagery, showing very high rate of deforestation (NRSA, 1983). In general, forest cover mapping has been attempted more frequently than type mapping. Selecting a time of the year when maximum differences occur due to phenological changes such as leaf fall, flowering etc. improves the capability of satellite data in forest type delineation.

### **Microwave Remote Sensing**

The use of microwave imagery in forestry/vegetation sciences is mainly driven by the fact that microwave remote sensing is capable of providing data at any time of the day/night and more than that is the capability of microwaves to penetrate the atmosphere under virtually all conditions. Depending on the wavelengths involved, microwave energy can see through haze, light rain, fog, snow, clouds and smoke. Hence, microwave remote sensing has some edge over optical remote sensing. Moist vegetation returns more signal than dry vegetation. Also like-polarized (HH or VV) sensing penetrates vegetation more than cross-polarized (HV or VH) microwave remote sensing. Likewise more energy is returned from crops having their rows aligned in the azimuth direction than from those aligned in the range direction of radar. Radar imagery has been widely used in qualitative and quantitative forest stratification. The backscattering from forested areas has been found to be dominated by tree crowns consisting of foliage and branches. The K- and C-band have been found to be sensitive to low biomass level while P-band is sensitive to high biomass forests. The backscattering from broadleaved forest stands is normally more than that from coniferous forests. Many studies have related various forest stand parameters like tree height, density, age, timber volume, biomass etc., with radar backscatter with varied degrees of success.

### **LiDAR Remote Sensing**

LiDAR (Light Detection And Ranging) remote sensing is a breakthrough technology for forest resources

inventory. It offers a great potential for forest conservation and management. The advantage of using LiDAR is that it provides three-dimensional data. If cautiously planned, LiDAR can form one of the most scientific and accurate means of forest management. The various advantages of LiDAR technology are higher accuracy, weather independence, capability of canopy penetration, lesser time needed for data acquisition and processing, minimum user interference. Besides, laser-derived images help in terrain visualization. As vertical component (z-axis) measurement is the backbone of LiDAR technology, this characteristic is exploited in a very straight forward way for tree height estimation. Tree canopy height is obtained by subtracting the elevations of the first and last returns. Vegetation height when coupled with species composition and site quality information, serves as an estimate of stand age or successional stage. Like simple height estimate, the vertical distribution of laser returns provides basis to classify vegetation, and to estimate other important canopy characteristics such as canopy cover, crown volume (foliage, trunk, twigs, branches etc.). LiDAR data provides input for estimation of aboveground biomass with high accuracy. The combination of LiDAR and satellite remote sensing data could be very useful for describing biodiversity and monitoring changes in biodiversity.

#### **Forest Type and Canopy Density Mapping**

The utility of the remote sensing data for forest canopy density mapping and monitoring on various scales is well established by now. The nationwide forest studies carried out by NRSA and FSI have amply demonstrated the scope of satellite remote sensing in forest mapping and monitoring. Multispectral data such as that from IRS LISS-4 with 5.8m, IKONOS with 1m, and QuickBird with 0.61m spatial resolutions provide an unprecedented opportunity to monitor the forests. Barring single species dominated forests and forest plantations, majority of the Indian forests are highly heterogeneous. This

makes their differentiation, delineation and mapping a difficult task. Problem gets further compounded in case of forests that are located in hilly and mountainous regions on account of topographic effects. Forest type mapping from satellite imagery has been attempted in past with varied degree of success. Local level studies backed by intensive ground truth have generally resulted in more number of forest type categories. Except for the small scale map prepared by Champion and Seth in 1968, showing sixteen major forest groups, India did not have a forest type map until recently. This year, the Forest Survey of India, for the first time, has come out with a satellite image-based forest map with 180 types.

#### **Wildlife Habitat Evaluation**

Remote sensing can be applied to wildlife habitat inventory, evaluation and wildlife census. Remote sensing not only provides spatial data but also allows us to compare temporal variations in the spatial data, essential for wildlife management. While ground survey methods such as counting animals, trapping, collection of droppings, investigations of feeding sites as well as ground mapping of habitats will always be useful, remote sensing can supplement or considerably replace tedious ground surveys. Ground methods have limitations as whole area can not be accessed in one go in many of the cases and the information collected may not be as accurate as is possible through remote sensing. The GIS-based modeling of species-habitat relationships is one of the popular forms of habitat suitability analysis (Singh and Kushwaha, 2011). The GIS output is a map depicting habitat suitability for any wild animal. The map can guide decisions regarding habitat preservation priorities, forest/land management practices, or sites for reintroduction of endangered species. As more and more data and information is being collected day by day by wildlife managers, world over, a need is being felt to develop a Wildlife Information System (WILIS), integrating wildlife species databases in spatial/non-spatial formats, habitat suitability models and rules/guidelines

for habitat evaluations. A WILIS could be operational at national level with linkages to regional and local databases. One particular study done in Chilla Sanctuary showed US\$ 100 as the cost of per square kilometer habitat evaluation.

#### **Timber Volume/Growing Stock Inventory**

Timber volume and the total growing stock are the key information required for the forest planning and management. Remote sensing data facilitates in the stratification of forests, which in-turn reduces the sampling error and allows the growing stock assessment with fewer samples. Most of the territorial forest divisions have working/management plans and these are revised every ten years. Conventional methods have limitations and hence, space technology should be adopted to achieve objectives envisaged in the National Forest Policy. The satellite image-based forest stratification can be correlated to the actual on-ground timber volume/growing stock or biomass using two-stage inventory design (Köhl and Kushwaha, 1994). For large areas, it is advisable to go for multi-phase sampling techniques. In a multi-phase design, visually or digitally classified imagery makes the first stage followed by large-scale image interpretation and ground measurements. The multi-phase sampling design reduces the cost considerably. Overtime, high resolution satellite imagery has significantly replaced aerial photos in forest in growing stock and biomass inventory.

#### **Plant Richness Assessment**

India, with a geographical area of 2.4 per cent of the world, has about 8 per cent the world's total biodiversity. The country is very rich in biodiversity with 45,000 plant and 75,000 animal species. Hence, it is called as a mega-diversity region. The threat to biodiversity in India is due to the over-exploitation of plant and animal resources as well as their habitats resulting in the fragmentation of habitat and creation of considerable landscape heterogeneity (Singh and Kushwaha, 2008). Remote sensing and GIS can

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contribute immensely in biodiversity assessment at regional to global scales. Remote sensing can play a very useful role in assessment of bio-rich areas, which could then be related to actual values of biodiversity, got through ground methods. This can be done through landscape characterization wherein a digitally or visually classified image is taken as direct input (Behera et al., 2005). Many landscape parameters viz., porosity, patch size and shape, interspersions and juxtaposition etc. have been said to have a direct relationship with a variety of vegetation features like biodiversity, physiognomy, composition and other stand parameters. Geospatial analysis of a forest landscape can take care of many factors that persist within each ecosystem. Vegetation type maps are prime inputs for biodiversity assessment at landscape level. The impact of scale on biodiversity assessment is significant; higher scale results in better assessments (Kushwaha et al, 2005).

#### **Forest Fire Risk Assessment**

More than ninety five percent of the forest fires in India are man-made. Forest understorey is burnt year after year by local people for deriving benefits like cattle grazing, fodder, accessibility for timber/firewood extraction etc. Recurrent burning hampers forest regeneration and arrests plant succession. About 65 percent of the India's 64 million ha forests are broadleaved deciduous and ca. 5 percent are coniferous; thus, about 70 percent deciduous forests happen to be fire-prone. The estimated average annual tangible loss due to forest fires in the country is of the order of approx. US\$ 100 million. The Himalayan coniferous forest comprising of fir, spruce, cedar, chirpine and blue pine etc. are highly prone to fire. The factors governing fire occurrence and spread are: fuel loading (type and moisture), temperature, humidity, wind (both speed and direction), slope, aspect and the accessibility. A rapid assessment of the forests for their proneness to fire could be worked out using a combination of information generated from remote sensing and other means.

The information on wind is generally seldom available because of the poor network of meteorological stations in India. A dynamic fire spread model using a combination of biophysical parameters including wind direction, speed and live fire events could be worked out to predict the fire spread.

#### **Forest Litigation**

Remote sensing and GIS applications have assisted the judiciary for quite some time now to decide on the disputed cases of land ownership in the country. In one such case between Sanjay Gandhi National Park authority, Mumbai and the encroachers, wherein considerable area along the park periphery had been encroached by local people over past several decades, the High Court at Mumbai, based on the evidence produced by remote sensing gave the verdict in favour of the Sanjay Gandhi National Park and directed Government of Maharashtra to evict the encroachers. In another similar case in Maharashtra involving farmers of Dhule district and the forest department, wherein farmers had encroached during past three decades sizeable reserved forest area and were practicing agriculture, the remote sensing and GIS-based evidence showed that the disputed area actually was well within the reserved forest boundary and hence, the High Court in this case too decided in favour of the Forest department. In yet another similar case, where fisher folks had encroached a part of the Jambu island in Sunderban Biosphere Reserve for fish drying, the Supreme Court of India gave the verdict in favour of the Biosphere authorities after untiring efforts of the Director, Sunderbans Biosphere Reserve by producing concrete evidence through time-series analysis of satellite images.

#### **National Forest Information System (NAFIS)**

Responsibility for 64 million ha of dense, open forests and forest plantations across the country falls under a great many jurisdictions and management agencies including government organizations and the individuals. Forestry information is gathered in different ways, for different uses and is stored in different formats and locations. As a result, accessing and

integrating this information is extremely complex. There is need for a national forest information system (NAFIS) for effective information and communication management. NAFIS is envisaged as an internet information gateway to forest information resources from across the country. The NAFIS should address these significant and wide-ranging differences by adopting international standards and by building a distributed network of servers and applications which allow access to forestry information held by independent agencies. The NAFIS should provide web tools ranging from simple portrayal to sophisticated analyses, to users from anywhere in India or abroad, which means that users can discover, interact, integrate and display the authentic and accurate information on India's forests and forestry. NAFIS should promote standards for enhancing the interoperability of multiple information resources.

#### **Future Prospects**

The need for higher spatial, spectral and radiometric resolutions for forest types and species (associations) has been emphasized over time. Gradually, the mapping and monitoring scenario is expected to be a lot better than ever before. The spatial, spectral, and the radiometric resolutions have already improved considerably. Currently many of the sensors provide spectral resolutions of the order of about 10 nanometers per band. Sensing using continuous spectra is expected to help not only in better species identification, association/formation and forest/vegetation type level mapping but also result in higher accuracy in timber volume and biomass estimations by highlighting the subtle differences in the physiognomy of the vegetation. The hyperspectral imagery is providing insight into the state of biodiversity and the vegetation continuum across ecosystems and the landscapes in an unprecedented manner. Ground penetration radars are already helping the scientific community in belowground biomass Assessment.

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## Planning Ecocities for maintaining the quality of urban ecosystems

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Ecocity is a sustainable city that links the human beings with natural environments. Ecocity provides good housing and good environment using modern technologies such as eco engineering, system engineering and information technology. Ecocity reduces harmful pollution and unnecessary waste and contributes quality of life. A sustainable city is that where the people are able to fulfill their needs without endangering the living conditions and survival of other people, at present or in the future. Good housing, good air quality, good water quality and healthy environment are needed for a good living condition. The sustainable cities and the eco-city planning approaches may provide solution to environmental problems. Ecological cities enhance the status of society through integration of urban planning. Ecocities provide solar, wind and recycling technologies, in green buildings and green businesses, and in urban environmental restoration projects. An ecocity is an ecologically healthy and eco friendly city. Ecocity fulfill the basic characteristic of healthy ecosystems and requirements of living organism. An ecocity is "An ecologically healthy human settlement modeled on the self-sustaining resilient structure and function of natural ecosystems and living organisms". There are "well-managed entities in which economic growth and social developments are in balance with the carrying capacity of the natural systems on which they depend for their existence, sustainable development, wealth creation, poverty alleviation and equity".

### Need of Ecocity planning

In India the urban areas have several challenges to face. There is over crowding of the land due to rapidly growing population. The major challenges are related to land use,

environmental quality and pollution problems. Pressure on natural resources, sanitation, health and socioeconomic issues, slums settlement and livelihoods, issues related to water and energy are now burning challenges for developing countries. At present the urban services are very poor in India. The sewage do not have a proper way to drainage, it goes own way leaking with water lines. Landfills are becoming a source of infection and diseases. The concept of ecocity planning is now very useful and fruitful for developing world. The resource management and proper plan for designing cost effective measures are needed for maintaining the city clean and green. Rules and regulations and initiatives from local public are needed for implementation of these concepts.

### Urbanization and Environment

Population is increasing rapidly and urbanization is pushing the cities to unprecedented sizes and destroying the natural features of ecosystem. The transformation of land to urban area harms the agricultural land and habitats such as wetland and forests present in and around the city. The land is used for roads, housing and industries. Many environmental scientists have stated that the basic capacity of the natural system (biophysical component) which supports the human existence on this earth, has reached the threshold limit just because of the urbanization. It is expected that by the year 2025 the global population will reach about 8 billion, out of which 5 billion will be the urban population. About 476,000 hectares of arable land in the developing countries is being transformed for urban uses annually (WRI).As the results show, the urban areas are facing many environmental problems like soil erosion, air pollution, depletion of ground water, climate change, flooding etc.

### Some Initiatives for Ecocity planning

Today urban areas in developing countries are facing many environmental and socio economic problems. World Bank has initiated urban and local government strategy for attaining ecological and economic sustainable cities. Many Asia Urbs projects based on ecocodevelopment of cities are addressing problems as such as slums, poverty and pollution. The purpose of these projects is to enhance the capacity of Ecocities in India as well as Europe and fulfill the challenges of sustainable urban development. These projects particularly focused on environmental issues like sewage treatment, solid waste management, infrastructure like water, roads, electricity and green belts. The main objectives of these projects are to seek cooperation for sustainable development and to develop methods and design for sustainable development of urban cities. Indo-European web portal is an effective and efficient networking discussion exchange programme, on these issues. Projects for ecocity planning initiated by CPCB (Central Pollution Control Board) are based on environmental improvement through implementation of different methods related to sewage drainage, solid waste management and disposal system, protection of water bodies, improvement of traffic and transportation and plantation and landscaping. Funding for the project is on 50:50 cost-sharing basis wherein 50% of the total budget comes from the municipality of the participating town and 50% (limited up to Rs 25 million) from CPCB.

### Techniques Used in Ecocity Development

In recent years, due to urbanization and modernization, demand of two wheelers and four wheelers increasing day by day that leads to air pollution,



water pollution and noise pollution. Migration from rural to urban areas in search of jobs has increased informal settlement which disturbs the sustainability of cities. Global report on human settlement 2009 assesses the effectiveness of urban planning as tools for sustainable development of urban areas. Clean air, fresh water, lovable sound and productive land are the basic needs of the peoples. Many past practices are being implemented for sustainable city planning which is based on good housing, sanitation, electricity, quality living environment and socioeconomic profile. Many techniques like, eco-engineering design and development, eco-scope planning and legislation and ecosystem monitoring and management are used for sustainable development of urban areas. Remote sensing, GIS (Geographical Information System) and other modern database techniques are used now-a-days for making city green. GIS is a vital tool to identify the city green through data merging. In this method the information is in the digitized form (such as soil map, climatic maps, topographic maps, land use maps, land cover maps, road maps etc). Through this technique we can identify the potential area to improve the green systems and provide a set of plant list for those particular areas. Some of GIS tools which are involved to develop city green are-

**Topological data structures-** These help in handling the spatial relationships among lines and polygon features.

**Spatial analysis capabilities-** These would help in manipulation and display of map and locations related attribute data.

**Automated Mapping technology-** It helps in handling different spatial map information system easily.

**Data base management-** It helps in handling variety of data.

**Remote Sensing -** Remote sensing is an essential tool for analytical and descriptive subjects. These modern techniques are being used in environmental planning, disaster management, environmental impact assessment and monitoring. For city green plan we need many basic information at regional scale regarding land use maps, climatic maps etc. For the collection of all these information we require huge manpower and it would be a time consuming process. The remote sensing provides us all these biological and physical information at the regional level through aerial photographs, satellite pictures directly and frequently.

**Through querying –** With this method we set questions related to environmental factors and functional factors and find out the appropriate plants for a location. If we want to prepare a tree list for a plot then the following questions may be asked

How much area is available?

What type of building is to be built? Is it Public or Private?

What are the possible plant lists available for the region?

What are the physical characteristics of the plants?

#### **Guidelines for Ecocity Development**

Ecocity development requires ecological security, clean air, good water supply, food, healthy housing, good municipal services and protection against different natural calamities.

Ecocity development is a whole systems approach integrating administration, ecologically efficient industry, people's needs and aspirations, harmonious culture, and landscapes where nature, agriculture and the built environment are functionally integrated. Many religious places like Tirupati, Ujjain, Puri are considerably polluted and during spiritual walk, pilgrims suffer from many problems. We will have to initiate projects at local and regional level to mitigate the problems and it could be possible only through ecocity projects initiatives. Some guidelines are given below-

i. Ecological sanitation: Efficient, cost-effective eco-engineering for treating and recycling human waste, gray water, and all wastes. ii. Ecological industrial metabolism: Resource conservation and environmental protection through industrial transition, emphasizing materials re-use renewable energy, efficient transportation, and meeting human needs. iii. Ecological infrastructure integrity: Arranging built structures, open spaces such as parks and plazas, connectors such as streets and bridges, and natural features such as waterways and ridgelines, to maximize accessibility of the city for all citizens while conserving energy and resources and alleviating such problems as automobile accidents, air pollution, hydrological deterioration, heat island effects and global warming. iv. Ecological awareness: It would help people understand their place in nature, cultural identity, responsibility for the environment, and help them change their consumption behavior and enhance their ability to contribute to maintaining high quality urban ecosystems.

## **Seaweeds: A Staple Food for 21<sup>st</sup> Century**

**Babita Kumari & Vinay Sharma**

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India has a diverse coastline of 8085 Km<sup>2</sup> covering 27 states and 4 union territories, which offers many advantages for utilization of marine biological resources. Marine algae

commonly known as Seaweeds are found attached to the bottom in relatively shallow coastal water. They are found in rocky seashore areas, lagoons and reed areas of Indian Sub-

continent. They are considered as the food supplement for 21<sup>st</sup> century as source for proteins, lipids, polysaccharides, minerals, vitamins and enzymes. In nature, there are about 900

species of green seaweeds including 4000 red species and 1500 brown species. Some 221 species of seaweed are utilized commercially. Of these, about 145 species are used for food and 110 species for phycocolloid production (agar, algin, carrageenan etc.). Seaweeds are rich source of valuable compounds including food additives and biomedicines. Seaweeds have a high nutritional value; therefore an increase in their consumption would elevate the food to offer population. In India, seaweeds exploited from natural seaweed beds are used as raw materials for the production of agar, alginates and seaweed liquid fertilizer. Besides, they are one of the major groups of biological organisms contributing to the productivity of coastal regions. They are consumed in Asia as sea vegetables but in western countries they have been used as a source of gelling or thickening agents. The use of seaweeds in Asian food is well known. In Western societies, it is mainly associated with localized coastal use or historical anecdotes, but seaweeds are now attracting increasing attention as a valuable food source. Seaweeds generally contain high amount of minerals (10-20 times that of land plants) and many other vitamins needed for metabolic processes. The content of vitamin C in red and brown algae ranges from 500-3000 ppm. Some seaweeds (e.g. nori) have protein concentrations as high as 50 percent.

Vitamin A, B, C and E can also be found in certain seaweeds. Hijiki and wakame contain ten times the calcium of milk. Besides, seaweeds also play an important role in the biomonitoring and biosorption of heavy metals (Kumari et al. 2012). The minerals like calcium, iron, potassium, magnesium, sodium, iodine etc. are also present in seaweeds.

Seaweeds provide few calories because of their high water and low fat content, making them ideal for low-calorie diets. They have a great value in providing low cost nutrition and therapeutic protection. Seaweeds are rich source of valuable compounds including food additives and biomedicines. They have a high nutritional value; therefore, an increase in their consumption would alleviate the food scarcity to some extent. In contrast, the Journal of Medicinal Food 2009 report points out that a few studies have been performed to analyze the effects of seaweed consumption on overweight and obese people. The main benefits of seaweed consumption appear to be associated with cardiovascular and intestinal health. Its effects on bone health and body weight regulation need further investigation. Additionally, the presence of fiber molecule algin allows seaweed to attract various metals (e.g. mercury and lead) in the gastrointestinal track and draw them out of the body. Besides, seaweeds constitute a source of dietary fibers that differ chemically and physico-chemically from those of land

plants. *Undaria pinnatifida* contains antiviral compounds, which inhibit the *Herpes simplex* virus. Extract of *Undaria pinnatifida* has been used to treat breast cancer and HIV AIDS. In India, several research organizations like CSMCRI, CMFRI, and University of Madras are involved in finding out the utility of seaweeds along the coastal belts of south India.

According to FAO, between 1981 and 2000, world production of aquatic plants increased from 3.2 million tons to nearly 10.1 million tons (wet weight), increasing the world trade to US \$ 6 billion in 2000, compared to US \$ 250 million trade in 1990. The contribution of cultured seaweeds was 15 % of the total global aquaculture volume (45,715,559 tons) or nearly 5 % of total volume of world fisheries production (141,798,778 tons) for 2000. The seaweeds that are most exploited for culture are the brown algae with 4,906,280 tons (71 % of total production) followed by the red algae (1,927,917 tons) and a small amount of green algae (33,700 tons). East and South-East Asian countries contribute almost 99 % cultured production, with half of the production (3 million tons) supplied by China. Most output is used domestically for food, but there is a growing international trade. Several training programmes have been organized for the Fisher Women to culture the different varieties of seaweed in India.

## NEWS & VIEWS

### Ethanol from Seaweed

The common intestinal bacteria *Escherichia coli* has been genetically modified to break down brown Kombu seaweed to produce ethanol. The problem was that most bacteria were unable to digest one of the most common sugars in algae, algin. But this problem has been overcome. After two days at a temperature of 25–30°C the microbe was able to turn 80 per cent of the sugars into ethanol. The potential yield for this technology is double that

of sugarcane ethanol and five times that of corn ethanol. It is estimated that if the algae were grown along three per cent of the world's coasts it could produce 227 billion litres of ethanol using this technique.

**Source: Scientific American, Acid News**

### An Ingredient in Popcorn Connected to Alzheimer

An ingredient found in artificial butter flavoring used in microwave popcorn,

margarine, candy, some chardonnays, and baked goods has been shown to worsen the abnormal brain activity linked to Alzheimer's disease, according to CBS Local. A study at the University of Minnesota has found that diacetyl (DA) used to produce artificial buttery flavor seems to be the cause. Too much DA leads to an increase in levels of beta-amyloid, which clumps together and has a toxic impact on nerve cells. The clumping together forms plaque, which is a telltale sign of Alzheimer's disease.

**Source: Science daily**

## Earthworms soak up heavy metals

With rapid increases in urban populations particularly in the developing world, there is a growing problem of how to manage organic waste and to find alternatives to landfill disposal particularly for domestic food waste and that from vegetable markets. Much of this waste is currently dumped on the outskirts of many towns and cities and is causing serious pollution, disease risk and general ecological harm.

Earthworms could be used to extract toxic heavy metals, including cadmium and lead, from solid waste from domestic refuse collection and waste from vegetable and flower markets, according to researches carried out by Swati Pattnaik and M. Vikram Reddy of Pondicherry University, in India. Three species of earthworm can be used to assist in composting of urban waste and to extract heavy metals, cadmium, copper, lead, manganese, zinc, prior to subsequent processing.

The process of vermicomposting in this way allows such waste materials to be remediated and the compost used. Subsequently for use in growing human food without the risk of accumulating heavy metals in crops. Upto about three-quarters of the various heavy metals can be removed by the worms from solid waste. The *Eudrilus eugeniae* species was the most effective worm at remediating solid waste and producing rich compost.

The worms' digestive system is apparently capable of detaching heavy metal ions from the complex aggregates between these ions and humic substances in the waste as it rots. Various enzyme-driven process then seem to lead to assimilation of the metal ions by the worms so that they are locked up in the organism's tissues rather than being released back into the compost as worm casts. The separation of dead worms from compost is a relatively straightforward process allowing the heavy metal to be removed

from the organic waste.

## The Role of Trees in Climate Change

**Source: Earth & Climate**

The climate change is now a reality and has contributed to rising temperatures on a global scale. And as the temperature increases, even by a fraction of a degree, these small but significant variances can influence natural evaporation events to such an extent that the timings and underlying nature of plant growth itself is being changed forever. But climate change does not only alter the basis of plant life, it also changes the fundamental dynamics between pests and disease as well as the very foundations of the animals that can live and thrive in different areas of the globe. Such changes have had huge implications for those working within the agriculture industry that have found their farms and ranches much less profitable and viable than ever before and the species and varieties of animal they are able to farm much different to those they have experienced in the past. As the problem of climate change has predominantly been caused by burning fossil fuels and deforestation, by carefully reintroducing more trees into the areas that have been most greatly impacted, we can in fact start to re-absorb some of the CO<sub>2</sub> that has been emitted and slow down the process of climate change that we have experienced over recent years.

However, the benefit of introducing trees into the environment is not exclusive to the CO<sub>2</sub> absorption they provide. In addition, planting sustainable woodland on agricultural land has become a way for many to seek an alternative income source that is much less influenced by changes in the environment and can provide a stable way of living into the future. This combination of trees and agriculture, commonly known as Agroforestry may well be the solution both in terms of environmental issues and also economic challenges that many

landowners now face. By identifying the correct types of trees that thrive in the local area and focusing on planting them in sufficient numbers, land owners not only establish protection for the environment but also take back control their personal livelihood. Furthermore, the shade of forest trees can provide habitats to a number of diverse forms of wildlife which can bring back a natural equilibrium to the land and the roots of the trees are able to trap sediments and nutrients into the soil, enabling further plant life to thrive within the canopy provided. While the trees are growing, the natural barriers that they provide can also ensure that the wild stock on the land are preserved and have a greater opportunity to thrive than ever before.

Though clearing agricultural land for forestation would be economically enviable for the farmer if they are planting for carbon absorption alone, by planting the right types of timber that provide a high sell on value to the land owner, this combination of agriculture and forestry could mean that trees themselves could be both a short-term and long-term solution to the challenges we now face.

**Source: Ian R Harlock**  
<http://EzineArticles.com>

## Nano-tech can poison man, environment

Nanotechnology, which is fast emerging as the future science promising thousand things including cures for complicated diseases, could prove to be toxic for human beings, animals and environment. Nanoparticles are extremely miniscule and this makes them potential agents of toxicity in humans during drug delivery. Their infinite smallness enables them to cross the cellular barriers in humans, animals and plants, and create trouble for the host rather than solving the problem.

**Source: Nano Technology, Diseases, Health Effects, Environment, Pollution, Pollution Control, Hazardous Waste**



## CONFERENCES

### National Conference on Environment and Biodiversity of India

November 3-4, 2012, New Delhi

Contact details:

Email: ebi2012@neceer.org.in Website: <http://www.ebiconference.com>

### International Conference on Environment and Human Health

28-29 November, 2012; New Delhi, India

Jointly organized by

National Environmental Science Academy, New Delhi, India

Department of Botany, Jamia Hamdard, New Delhi, India

Contact : Prof. Javed Ahmad, General Secretary, National Environmental Science Academy, New Delhi.

Email: nesasilverjubilee@yahoo.com

### 2nd International Conference on Clean and Green Energy (ICCGE 2013)

19-20th January 2013 Dubai, United Arab Emirates

Contact person: Miss. Feng

Website: <http://www.iccge.org/>

### 4th International Conference on Environmental Science and Development (ICESD 2013)

19-20th January 2013, Dubai, United Arab Emirates

Contact person: Mr. Lee

Website: <http://www.icesd.org>

### 2nd Biotechnology World Congress

18-21 February, 2013, Dubai, UAE

SAIF Zone, Sharjah, U.A.E.

Email: [info@biotechworldcongress.com](mailto:info@biotechworldcongress.com),

[mahmood@biotechworldcongress.com](mailto:mahmood@biotechworldcongress.com)

[www.biotechworldcongress.com](http://www.biotechworldcongress.com)

### 10th International Conference on Modeling and Measurement in Medicine and Biology

24-26 April, 2013 Budapest, Hungary

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### 6th International Conference on Sustainable Development and Planning

27-29 May, 2013, Kos Greece

Conference Secretariat

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### 19th International Conference on Urban Transport and the Environment

29-31 May, 2013, Kos, Greece

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### 21st International Conference on Modelling, Monitoring and Management of Air Pollution

3-5 June, 2013; Siena, Italy

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## BOOKS

### The Anatomy of Palms

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