



ENVOICE

A Newsletter from the Department of Environmental Science, Vivekananda College, Thakurpukur, Kolkata

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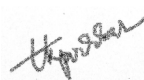
Earth Day Issue

April 2014

FROM THE DESK OF PRINCIPAL

It is great news that the fifth issue of ENVOICE is going to be published soon. On the eve of its publication, I must congratulate the students, faculty members and staff of the department of Environmental Science for maintaining continuity successfully in a fifth row.

Our city life has become hazardous day by day due to the effect of green house gasses and change in climate condition. Now it is a global problem. In all corners of the World, we see destruction, loss of life and property every day. ENVOICE within its periphery should take responsibility to aware the common people as well as the law implementing authority about the evils of the present situation and at the same time should try to find out solutions for improved sustainable life. Hoping success in the near future, I once again congratulate all for this noble Endeavour.


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How Green are our Green Cities?

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'The City of Joy is changing fast, along with other big metros throughout the India. More and more urban people are adapting to live in less defensible space, so as the case of urban biota. The vertical urban growth and subsequent urban sprawling accommodating the population influx has snatched the accommodations from urban biodiversity, what we frequently miss to acknowledge while cherishing the affluence. News articles and sectoral surveys very often blame electromagnetic radiations and urban pollution responsible for the loss, but other factors like loss of habitat causing havoc to the disappearance are seldom discussed.

The Source book of Environment of Kolkata published last year by KEIP showed quite encouraging species diversity within the urban premises, while insights of habitat conditions are hazy. In fact, the Raj Bhawan premises, at the centre of the city recorded maximum diversity, which, to some extent sets the atmospheric pollution free as the worst accused. Widening of the roads, construction of flyovers, large residential complexes and our supermarket cultures with ready to eat food habits (lacks use of raw food grains) and gardening with very specific as well as well maintained horticultural species silently stealing the habitats. *Lantana camara*, *Mikania scandens*, *Glycosmis pentaphylla*, *Heliotropium sp.* etc. have been proved to be the most favorite food plants of butterflies and some insects, but one hardly expect any of those in an urban greenery. Clumsy ventilators, open rainwater pipes, a vat with left over foods, road side raw food grains cater the comfortable habitat needs for birds like crow, sparrow etc. which are never acceptable to a clean and green city dweller.

Green city has been chosen as the theme of Earth day this year to remind us of the greens those turned pale today. But it should be kept in mind that a green city does not mean only to plant some trees of having clean roads and gardens. Indeed dirty courtyards, clumsy garrets, moist under growths with flowering weeds are also needed to restore the biodiversity habitats which actually breed the greens.

Phero-Facts

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As we know pheromones are chemicals released by an organism into its environment enabling it to communicate with other members of its own species. The word 'pheromone' was proposed by Peter Karlson and Martin Luscher in 1959, referring to a 'chemical cocktail' emitted by an animal and detected or responded by the other animal of the same species. That same year researchers reported the identification of the first pheromone (called Bombykol) in female silk moth which is designed to attract males. Many people do not know that the pheromones can trigger many other behavior in the animals of species apart from sexual behavior, including alarm, to follow food trail, sexual arousal, territory marking, to bond between mother and her baby etc.

Interestingly, when an ant is disturbed it releases a pheromone that can be detected by its friends several centimeters away. And they are attracted by low concentration of that pheromone and begin to move towards the region of increasing concentrations, and as they neared their nest mate, their response changes to one of alarm. The higher concentration causes them to run about as they work to remedy the disturbance. Unless additional amount of pheromones are released, it soon dissipates. This ensured that once the emergency is over, the ants return quietly to their former occupations. Similarly, certain ants as they return to their nest with food lay down a trail of pheromone, which in turn attract other ants to the food. It is continually renewed as long as the food holds out. When the food supply begins to dwindle the trail mark ceases.

Many mammals like dogs, cats etc. deposit chemical around their territory and when these vaporize they give signal to other members of the species about their territory. Experts say that the pheromone system of insect is much more easier to understand than that of mammals. It is believed that mammals detect pheromones through an organ in nose called Vomeronasal organ (VMO) and connects to the brain. There are many myths about existence of human pheromones though most proper well controlled scientific studies failed to so any compelling evidence. But it has been noticed that women living close together (roommates) develop synchronous menstrual cycles. This is, may be, because of pheromones release by one that triggers other menstrual cycle which seems interesting.

Ground water Fluoride Contamination and Its Impact on Plants

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The groundwater contamination with fluoride is generally credited to the geological causes like aquifer rock regime and petrological background of the area. The major part of groundwater in India is found in granitic aquifers. Fluoride occur in three forms, namely, Fluorospars or calcium fluoride (CaF_2), Apatite or rock phosphate $\text{Ca}_3\text{F}(\text{PO}_4)_3$ and Cryolite (Na_3AlF_6). Granites have 5 times higher fluoride concentration than Basalt rocks. Shale have higher concentration than sand stone and lime stone. Alkaline rocks contain highest percentage of fluoride (1200 to 8500 mg/kg). Geological Survey of India has brought out considerable data which reveals that fluorite, topaz, apatite, rock phosphate are widespread in India and contains high percentage of fluoride. Semiarid climate and intensive irrigation, alkaline environment of circulating water mainly facilitates leaching of fluoride from the soils, contributing to high fluoride containing groundwater. Low pH and higher hardness of groundwater is negatively correlated to fluoride concentration in ground water. The fluoride in groundwater appears to be controlled by the distribution of Ca^{2+} and to some extent SO_4^- , ionic strength and the presence of complex ions. From correlation coefficient analysis, fluoride has been found to be inversely related to Ca^{2+} and positively related to Na^+ .

Fluoride exerts its negative effect on plants from germination to crop yield, however the degree of impact varies from plant species to species. Fluoride may affect crop yield and crop quality. Moreover it enters into the food chain due to its uptake, accumulation and translocation in vegetative parts in labile form which may create serious health consequences in human and animals. Consumption of vegetable and fruit juices has become popular and has concern for the fluoride concentration in the extracted juices. Thus it is desirable to cultivate edible plants away from the fluoride source in soil and irrigation water.

The high electro-negativity of fluoride destroys the chlorophyll molecule and accelerates the disintegration of chloroplasts. Along with accumulation in chloroplasts and consequent reduction of the chlorophyll concentration, ultra structural study has shown that fluoride disrupts chloroplasts membrane. The fluoride induced inhibition of chlorophyll synthesis was found to be

directly related to the degradation of magnesium atom attached to the chlorophyll ring structure as Mg is the central component of chlorophyll and important compound of cell wall pectin. Fluoride exerts negative effects on the activities of chloroplast ATPase. After fumigation of hydrogen fluoride on orange leaves, it was found that chloroplasts represent the site of highest fluoride accumulation in cell organelles.

Blue Carbon

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It's time to shift our focus towards an ecosystem which is doing a great job in naturally combating climate change. But unfortunately we are losing 25-30% of it in the last 60-70 years. It is the Marine Ecosystem, which should be a major concern today.

We know that carbon is the basic ingredient of life on earth. Animals and plants exchange carbon in a key balancing act called Carbon cycle. Years ago, machines consuming carbon-based fuel like coal and oil, were made to release excess carbon in air. The difference is the fuel they consume comes from deep in ground, where carbon was retained from the carbon cycle. This excess carbon emission is creating changes in our atmosphere and hydrosphere.

But nature plays an important role in absorbing CO₂. From schooldays we had this conception that forests and grasslands does all the work, whereas in reality a lot of carbon is absorbed in the ocean either by the process of dissolution and deposition or by life on ocean, which is called the Blue Carbon. It's the carbon stored and sequestered in coastal ecosystems including mangroves, sea-grass meadows and salt marshes.

Mangroves perform an important mechanism for absorbing carbon, breeding habitat for marine life and natural protection against storms.

When these habitats are destroyed, most of the retained carbon is released back in the atmosphere. In a way, we are creating a new carbon source. Marine ecosystems are lost in an alarming rate than any of the other ecosystems.

In Sundarbans, an afforestation program was initiated by some NGOs, whose objectives were to plant 60 million mangrove trees in 6000ha of area both as bio-shield and for wetland restoration. Through biomass production, they have stored 700,000 tones of carbon.

So the future of Blue carbon is bright as long as we keep on caring about our coasts!

The Lost World (Holocene Extinction)

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Earth has changed a lot by different natural activities such as volcanic eruptions, ice age, cosmic radiation sounds etc. All these activities also altered the gene pool and give rise to mass extinction.

The term Holocene extinction also known as sixth mass extinction that begins from the extinction of woolly mammoth and saber-toothed tigers. The end of the dinosaurian age was the last mass extinction. The Earth lost about 50 percent of all species by natural disasters 65 million years ago. Go back another 185 million years and there was the one that paleontologists nicknamed the Great Dying. If we are living in a period leading to another mass extinction, it will be the sixth. In this era of extinction we have already lost many species like the flightless bird Dodo, the famous Golden Toad, and the most common species which was least concern at times in American is the Passenger Pigeon. But now all of them are extinct and human interference was a major cause behind it. Human have invaded their living place and destroying them, many of these species become extinct just because of excessive hunting for fur and entertainment.

Extinctions take hundreds of thousands of years, but the current one is moving at a much faster pace. If we do not regulate our activities and approach towards them thewe may see the sixth mass extinction really soon.

DO YOU KNOW?

PAPER FACTS

***1 Ton recycled paper saves
17 trees.***

***Recycled paper needs 60%
less energy than virgin paper
during manufacturing
process.***

***5 both side printouts a day
can save at least 2 trees a
year.***

***Travelling without printout of
e-ticket Saves 3 Lakh A4
paper a day Saves 360 trees
a year.***

Remote Sensing- As a Fire Alert System

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We the people of 21st century are familiar with the term Remote Sensing. Earlier it was mainly used for deriving information about the Earth's Land and water areas from images at a distance. But now a days, new innovations in case of resolutions, sensitive sensors along with advancement in GPS & GIS technology making this technology popular. The enormous use of this has made our life easier, comfortable & safe.

The fields of application of remote sensing are Hydrology, Meteorology, Soil Science, Biology, Agriculture, Engineering and so on. In it has also become the most preferred option of pollution monitoring, such as water quality change detection, deforestation, species inventory, watershed management, coastal protection etc.



However, the most important and newly developing aspect of remote sensing is its use in Disaster mapping & management system. Disaster mapping is basically the drawing of the areas affected by the disruption through excessive natural or manmade troubles resulting in loss of life, property and national infrastructures.

The main objective of disaster management is to increase preparedness, provide early warning, monitor the hazard in real time, assess the damage and organize relief activities. In disaster management, there is a need of geo-spatial information at different scale, such as topographic, vegetation cover, road network, aerial photography, satellite imagery, and global positioning system data (GPS). From the information gathered, it is possible to map the affected areas and provide information to the relief supplying groups. In Disaster like cyclone, forest fires, earthquake etc. remote sensing has proved its efficiency from early warning to risk modeling, vulnerability analysis and damage assessment.

Let's consider the disaster management process of Forest fires as an example. Forest fires, wildfires, wild land fires – are all different names for unwanted, non-structural fires that occur in landscape settings. For centuries, people have relied on human detection of forest fires. It should not be a surprise that the 21st century is bringing some technological – and even biological – systems to bear on the problem. This article is an introduction to the concept of automated forest fire

detection and a summary of some of the work being done by scientists and engineers:

- Many efforts to automate forest and wild land fire detection have focused on image based systems. Similar to those used in many of today's video based fire and smoke detection systems. These may use visible or infrared bandwidths for image processing. Improvements are on the way to increase resolution and decrease detection time.

- Many communities that regularly experience wildfires have some form of centralized wildfire command center or network. The use of standard Geographical Information Systems (GIS) can permit real-time data sharing among different agencies. Commanders can quickly look at satellite imagery overlaid with road maps, real estate information and fire progress maps. They can switch to or overlay views showing power transmission lines, cell towers and other fixed infrastructure elements.

These are just some of the ways that technology and biology are being used to manage forest and wild land fire risks through the development and use of detection, signaling and information management systems.

Though these processes are doing fine, still there is remains a question of its sustainability. And the answer says that in remote sensing, Infrared wavelength sensors have a disadvantage in that smoke, dust and fog as all of these absorb some of the infrared emissions from a fire. The use of detectors sensitive to longer wavelengths has been investigated and shown to be promising. Not only that the use of fiber optic cables, gas sensors and other optoelectronic sensor networks have also been tested in actual forest settings. While promising, these systems might have scale limitations due to power requirements and sensor installation and distribution requirements.

However, the remote sensing technology too is not fool-proof. In spite of very high operating cost, the measurement uncertainty may also remain quite large at times, the data interpretation can be difficult and may need to understand theoretically how the instrument is making the measurements but most important is the reading of the instrument is dependable upon the weather change.

However, the wide array of advantages frequently subdues these disadvantages and its use in forest fire disaster management is expected to increase in coming years.

Students Research Communication

Urban Habitat Loss:

An experiment with house sparrow

Arka Karmakar

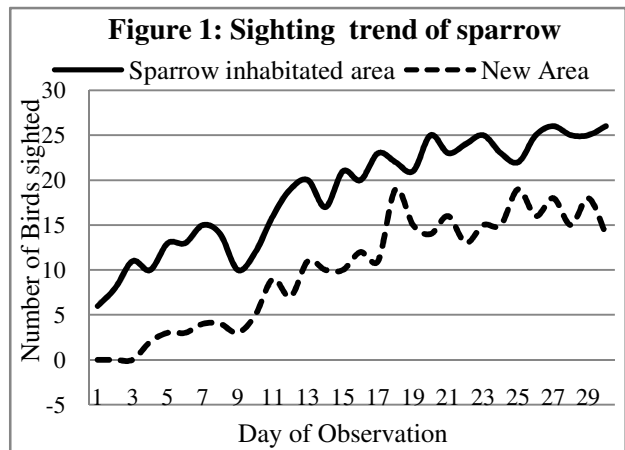
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The urban biodiversity has been a major concern for last few years with increasing pollution loads and demand for space. One of the major indicators of such change is rapidly reducing population of sparrow in our neighborhood. While even a few years back most of the urban houses used to host sparrow families either in their ventilators or garrets, now a days it is hardly found. Their absence may be attributed to several causes like habitat loss due to vertical urban growth, loss of food grains, indiscriminate exposure to communication waves etc. However, the mobile communication has been the most discussed among the other causes, although any specific scientific study behind it hardly available. A recent study by Bombay Natural History Society (BNHS) at Delhi and Assam although reported the trend of population reduction, but could not confirm any link of it to EMR. Keeping all these observations in mind a small pilot scale experiment was designed to ascertain the chances of habitat restoration for sparrow in urban set up, i.e. with other factors on.

The present experiment was run for one month in two different sites one with some prevailing sparrow population and one where no sparrow was seen for long. The two sites were situated within a stretch of two kilometres and in an area of south Kolkata where strong cell phone communication system is available and mobile towers are also present. With the idea of habitat restoration some cereal grains were spread as food for the sparrow at each of the sites. Every day during morning hours (7:30 to 9:30 a.m.), numbers of sparrows sighted at the observation sites were recorded. Once significant numbers of sparrow sighting was found, on the 14th and 15th day the sparrow flock was marked by some colour to identify their reappearance to the sites, and also to notice whether new individuals are gathering there or not. Besides the sparrow sighting a simple household survey was also done to get an idea about the willingness of the resident habitat restoration for sparrows.

The results of the experiment were quite interesting and encouraging too. While at the site where no sparrow was seen for long recoded reappearance of sparrow within one week of the

experiment started. On the other hand a steep increase in the number of sparrow at the other site was also been recorded. But at the new site till day 18 the number of individual kept increasing and then showed fluctuation within a range at higher side (Fig. 1). This peculiarities were absent in case of the other site. However, it was also been noticed newer individuals joined the flock almost every day indicating that there are scattered population of the bird, which may reappears if foods and other supports are available.



However, the survey results were not encouraging, as most of the households are now prefer to keep all the potential nesting places clean. Moreover, the altered food habits have reduced the food reserve for the sparrow which feed mostly on leftover grains.

Although it is tough from such a short study to reach any conclusive comment, but the result is indicative of the fact that Sparrows had not disappeared from the scene rather the word that should be used is 'Dispersed' or 'Scattered'. The reason they disappeared can easily be given on the 'Supermarket Culture'. Sparrows are so adaptable and eat food which is available. They mainly prefer seeds, grains and weeds. They could be seen in the grain storage places, super markets, in hotel walls feeding on the foods that are available there. Lack of nesting sites are also a very big problem for the sparrows as they prefers to nest in manmade structures such as eaves or walls of buildings, street lights, and nest boxes instead of in natural nest sites such as holes in trees.

However, the study is having several limitations too, in respect to site selection, data collection and experimental set up. And hence, it will be too early to negate or even comment on the effect of communication wave (EMR) based on these findings, although it has opened a way to look into the concern from a specific angle.

Students Research Communication

Study of Macrophyte distribution of freshwater bodies with special reference to water quality

(Synopsis of Students Research Project, 2012-13)

Shuvendu Das, Saikat Manna, Kasturi Saha

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Aquatic macrophytes characteristically grow in water or in wet areas and are quite a diverse group. Physico-chemical characteristics of the wetland have direct influence on the type and distribution of aquatic biota. Conversely, they are also influenced by the activity of aquatic biota. As a result wetland such as rivers, lakes, *beels*, estuaries etc. are continuously subjected to a dynamic state of changes. This dynamic balance in aquatic ecosystem is frequently disturbed by human activities leading to pollution which is manifested as fish killing, bad taste, bad odour etc.

Limnological studies over past few decades were done all over the world with particular reference to the impact of human activities on different kind of water bodies (Angelidis et al., 1995). Aquatic plants like *Lemna*, *Eichhornia*, *Utricularia*, *Myriophyllum*, *Nuphar* and *Potamogeton* *Potamogeton pectintus*, *P. crispus*, etc. has been reported to act as pollution indicator in different literatures. Therefore, it is imperative that the study of macrophytes at any water body may be used as a cost effective and rapid way of having an idea on the water quality. It however is very useful in pollution assessment qualitatively for surveillance purpose.

In accordance with the aforesaid claims, a study was designed to identify some of the indicator aquatic species, which can be used for qualitative assessment of the water quality. Water quality assessment and simultaneous checklisting of the plants were carried out in water bodies of different use profiles. There were a total of four water bodies chosen as sampling point at the Thakurpukur – Joka area, which includes a canal, two natural water bodies and one pond having regular human interactions. Water quality was measured in three seasons and simultaneously the checklist of plants was made.

The result did not crop any finding which can correlate any of the water parameter with occurrence of any particular species. But, the species distribution in wetlands of different use

profiles seemed indicative. Species like *Sagittaria montevidensis*, *Cyperus iria*, *Echinochloa colonum* and *Polygonum sp.* were only found in the polluted water of canal, while some of the sensitive species like *Ceratophyllum sp.*, *Ceratopteris sp.*, *Azolla sp.* remained absent from water bodies with low oxygen levels. However, the quantitative analysis using biodiversity index like Sørensen index also indicated a lower value and skewed distribution of species for water bodies with higher pollution loads or human interference.



Ongoing Students Research under RGC Effects of Roadside Trees on Local climate parameters

Kasturi Saha, Sristi Jha, Vaskar Ghosh, Dripta Ghosh
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The cooling effects of tree canopy are well known phenomena. The present research project under the Students research Project scheme of the college has been designed to quantify the cooling effects of the road side trees and urban greeneries. Till date a few sites have been visited and the temperature and relative humidity data has been collected.

It is found that a tree canopy may lower the ambient temperature by 2°C to 5.5°C and retain 3 to 15% more relative humidity compared to the adjacent open areas. However, the effects most probably depend on the type of the tree and the landscape of the sampling sites.

It is expected that collection of more data will lead to further narrowing down of the trend with proper scientific explanation.

Departmental Faculty Research Publications

Hajra R, Mitra R., Ghosh, T., [2014] Assessing the Indicator Based Sustainability: A Pragmatic Approach. *The Int. J. of Humanities and Soc. Studies*. 2(1), 39 – 43.

Mitra R. [2013] Need of a paradigm shift in disaster management approach: A case study from coastal Sundarbans. *Proc. of 7th Biennial Conf. of INSEE, Tezpur Assam*. Dec '13.