ENVIRONEWS

INTERNATIONAL SOCIETY OF ENVIRONMENTAL BOTANISTS

Newsletter

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IN THIS ISSUE

Sixth International Conference on Plants & Environmental Pollution (ICPEP-6)
Jointly organized by International Society of Environmental Botanists (ISEB) & CSIR-National Botanical Research Institute (CSIR-NBRI), Lucknow, INDIA 27-30 November, 2018

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All individuals interested in attending the Conference are required to Pre-register themselves by submitting duly prescribed Pre-registration forms on line/by mail/e-mail/fax latest by **31 October 2017**. **There is no pre-registration fee**. Future Conference announcements/ information and Conference Registration forms etc. will be sent only to such individuals who pre-register themselves. Delegates are required to mark the area/areas of their interest in the form.

Website of the Conference: http://isebindia.com

Mailing address: Organizing Secretaries, ICPEP-6, CSIR-National Botanical Research Institute, Rana Pratap Marg, Lucknow-226001, India, **Phone:** +91-522-2297821/2297825/2297929/2297931; Fax: 91-522-2205836/2205839 **E-mail ID/online submission: icpep6@gmail.com**

LETTERS

It is with humble gratitude that I respond to your kind invitation regarding membership on the ICPEP-6 International Advisory Committee. I have often felt that I have not contributed enough to the goals and operations of ISEB, but with all due consideration, I would look forward to any meaningful contribution of which I may be capable. As you may know, a number of health issues have made it difficult for me to travel or make strenuous efforts in my daily activities. Yet, I am active in writing textbook materials on plant structure and carry a strong active interest in global climate change. If I can provide meaningful contributions to the position, I would be honored to participate, even it is remotely. I look back at the first ICPEP Conference and see both how much has been accomplished since that great privilege to have participated and aspired to the goals of the Society, and one that I would like to continue to support. With many thanks for your confidence in me.

Prof. Richard F.E. Crang
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Silvopastoral system (SPS) is an important and integral part of the indigenous farming system of many countries across Central America and is intimately associated with the rural life of the region. It involves integrating forestry practices with livestock management in a sustainable, environment friendly fashion without any major capital investment. The non-sustainable and non-environment friendly livestock management practices; encouraged by short-sighted, easy profit making policies and being operational for decades have been hugely responsible for the decimation and detrimental situation of indigenous local forests and natural vegetation across the planet. Hence, it is important to encourage reduction of complex and negative anthropogenic impacts on the local forests and natural vegetation from an ethnobotanical perspective by adapting to sustainable agricultural practices like SPS. The various socio-economic factors responsible for this negative anthropogenic impacts on the local forests need to be investigated and monitored in depth; and can certainly help in providing directions how SPS approach could be effectively utilized in building the bridge between local natural ecosystems, indigenous communities and livestock managers. SPS if successfully applied can serve as an important model for the protection of the local forests while securing livestock management and local employment integrating forest protection through an eco-friendly, ethnobotanical approach in better understanding local community issues. Hence there is a need for developing comprehensive ethnobotanical forest resource information system for the vulnerable natural ecosystems clearly identifying detailed traditional anthropogenic use of the local forest trees by indigenous communities. Comprehensive and well managed ethnobotanical surveys for a particular region can not only provide taxonomic and biogeographic information on indigenous tree species; but can also provide valuable data on the traditional uses of local tree species for better understanding indigenous cultures, encourage environmental protection and for developing an environment friendly, livestock management practices for local livestock operators and managers. Such invaluable ethnobotanical data collection can serve as a model for accumulating information on traditional use of local flora and their role in the traditional lifestyles of indigenous communities.

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NEWS FLASH

Prof. Kusum Arunachalam, a Life Member of ISEB has been appointed Vice-Chancellor of Doon University, Dehradun, Uttarakhand, India.

WELCOME NEW LIFE MEMBERS

Dr. Monika Koul, Assistant Professor, Department of Botany, Hans Raj College, University of Delhi, Delhi.
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Dairy waste and a lush green campus – A journey

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The Indian agricultural system is predominantly a mixed crop-livestock farming system, with the livestock segment supplementing farm incomes by providing employment, draught animals and manure (FYM). According to the Economic Survey (2015-16), India ranks first in the milk production, accounting for 18.5 % of world production, achieving an annual output of 146.3 million tons during 2014-15 as compared to 137.69 million tons during 2013-14 recording a growth of 6.26 %. Besides milk, livestock farming system provides cow dung and urine which need to be managed by economically viable, socially safe and environmentally sustainable methods. The Graphic Era University (GEU) has developed a model, adopting green technologies (Figure 1) for converting dairy waste (wastewater and cow dung) into (a) vermicompost, (b) clean and odorless water for irrigation, and utilizing both for the maintenance of huge lush green campus (Figure 2 D & E).

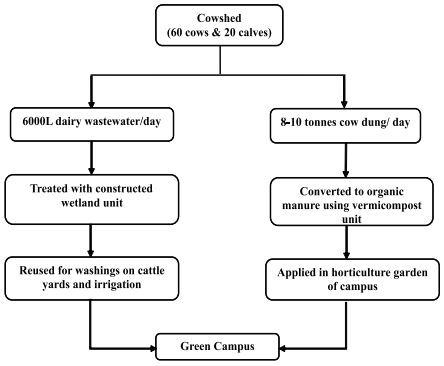

Figure 1: Two-pronged strategy used for dairy waste management at Graphic Era University

Two cowsheds are maintained in the university premises of GEU (Fig 2 A), with more than adult 60 cows including both Indian and foreign breeds. One shed generates approximately 3000 L wastewater and 5-10 tonnes cow dung per day. Liquid waste and solid waste are treated independently through constructed wetland and vermicomposting, respectively.

Figure 2: A) Cow Shed, B) Constructed wetland unit for treatment of dairy waste water, C) Vermicompost unit, D &E) University Green campus

Dairy wastewater (cow urine, washings and bathings; twice in a day) is directed to a constructed wetland (CW) unit for treatment. CWs simulate natural wetlands in which processes such as filtration, microbial degradation, nitrification and denitrification, etc. are allowed to proceed to remove pollutants from wastewater. Constructed wetland technology has been used for treatment of wastewater of varied origin (dairy, municipal sewage and domestic) and composition. Such a unit located in the campus (Fig 2 B) treats dairy wastewater in terms of organic matter,

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nitrogen, phosphate, suspended solids and pH, through P-adsorption, organic matter degradation and nitrification (by microbial film developed around gravel). All nitrogen forms are biochemically interconvertible and are removed by ammonification, nitrification and denitrification. Macrophytes such as *Phragmites* also contribute to waste water purification via the plant-uptake mechanism. In an ongoing constructed wetland treatment facility, treated wastewater showed marked positive effect on different parameters (DO, BOD, COD, TN, NH_4-N, NO_3-N, TSS & TP) in comparison to untreated wastewater (Table 1). Details of constructed wetland technology can be seen in a recent article by Sharma et al. (ENVIS Bulletin for Himalayan Ecology, Vol 23, 79-84, 2015)

Further cow dung along with other degradable solid waste, i.e waste paper, horticultural (twigs, prunings) and kitchen waste (from hostels), etc. is taken to a vermicompost unit (Fig 2 C). Available bio-waste is heaped in the open and chopped, if necessary. In the vermicompost bed, biodegradable waste is kept in layers in the following order: (From top to bottom)-plant leaves/prunings, cow dung, plant leaves/prunings, kitchen waste, plant leaves/prunings. The depth, length and width of vermicompost beds are 1.5 feet and 2 feet, respectively. Water is sprinkled intermittently to maintain 60-70 % moisture content and the heap is turned upside down after every 15-30 days. Vermicompost is usually ready after 90 days. Currently, approximately 250 tonnes of vermicompost are produced annually through the composting unit which is then used in the university gardens across campus. This ensures recycling of the hostel, garden and dairy waste by converting it to useful biofertilizer.

In addition to waste management, vermicompost helps build up soil fertility and restore its vitality. Several studies have indicated the agronomic impacts of vermicompost such as improved seed germination, enhanced seedling growth and development, and increased plant productivity much more than what is possible by mere conversion of mineral nutrients into plant-available forms. The growth responses of plants from vermicompost appear more like hormone-induced activity associated with the high levels of nutrients, humic acid and humates in vermicompost rather than boosted by high levels of plant-available nutrients. Nutrient composition of vermicompost has been found (% values) to be: Organic carbon (9.8-13.4), nitrogen (0.51-1.61), phosphorus (0.19 - 1.02), potassium (0.15 - 0.73), calcium (1.18 - 7.61), magnesium (0.093 - 0.568), sodium (0.058 - 0.158), copper (0.0026 - 0.0048), iron (0.2050 - 1.3313) and manganese (0.0105 - 0.2038)

Table 1: Various parameters of dairy wastewater before and after treatment

S. No.	Parameters	Influent concentration mg/L^{-1}	Effluent concentration mg/L^{-1}
1	Dissolved Oxygen (DO)	1.65	6.79
2	Biochemical Oxygen Demand (BOD)	619	6.5
3	Chemical Oxygen Demand (COD)	1019	24
4	Total Nitrogen (TN)	124	43
5	Ammonium Nitrogen (NH_4-N)	74	36.6
6	Nitrate(NO_3-N)	1.2	3.7
7	Total Suspended Solids (TSS)	450	6
8	Total Phosphorus (TP)	49.5	2.5

Shift in plant species distribution and regeneration potential due to global warming and climate change in Himalayan region

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The geographic ranges of most plant and animal species are limited by climatic factors, including temperature, precipitation, soil moisture, humidity, and wind. Any shift in the magnitude or variability of these factors in a given location will impact the organisms living there. Species sensitive to temperature may respond to a warmer climate by moving to cooler locations at higher latitudes or elevations. Himalayan forests having unique climatic conditions support unique vegetation types. The plants are strongly adapted to the narrow range of altitude for the specific habitats as a marginal shift in altitude may change the climatic condition significantly. Himalaya generates different conditions, to support unique and isolated ecosystems along the altitudinal rise. The Himalayan forests are considered as a biodiversity hub which provides an excellent opportunity to investigate the climatic effects on plant distribution. Though the response of global warming has

been widely studied on the Himalayan vegetation shift, it is difficult to predict how concurrent changes in climatic factors affect the species distribution. Despite the uncertainties, ecological models predict that the distribution of world biomes will shift as a result of the climate changes associated with increased greenhouse gases in multiple ways. The distribution and size of the populations of plants and animals within those biomes will also change, with potential consequences for the functioning of ecosystems and for humans who are dependent on many ecosystem goods and services.

Shift in plant species distribution in relation to global warming

A change in the agro-climatic conditions of an area can affect the population dynamics of plants, animals and microbes which are living there and as a consequence,.the structure and function of the entire ecosystem can also get modified. It is evident that the high altitudinal vegetation is directly influenced by global warming; these habitats are considered very sensitive and vulnerable to the climatic change phenomena emerging as a key factor to regulate the future ecological relations in the different ecosystems and biomes. The climate-induced species range shifts have been reported along altitudinal and latitudinal gradients. The spread of tree species involves several factors, including dispersal, regeneration on a suitable site, maturation, and seed production. If climate changes faster than trees can disperse to new and more suitable areas, the composition of the forest may change and the survival of some species could be at risk. Global-scale models are also inadequate to evaluate the indirect effects of climate, such as disturbances from pests, disease, fire, flooding, and wind damage. It is expected that changing climate may shift the vegetation towards the upside or lower elevation, which may change the composition of the forests in near future.

Species capability to shift along the altitudinal range depends on species tolerance efficiency of warming effects, their seed dispersal capability and their competitive ability. Only the species which have ability to compete effectively with species occurring at higher altitudes would be able to shift upward. There are three types of upward shifting that occurs in Himalayan ranges: (1) upward shift in entire altitudinal range with little or no change in range width, (2) upward altitudinal shift on higher side of the range but no change on the lower side of the range and, (3) altitudinal range squeezed at lower ends but no upward shift (Figure 1) (Singh & Singh, 2013). In general, altitudinal range in several species is squeezed because they are intolerant to warmer temperatures, and are unable to expand their range towards the upper side.

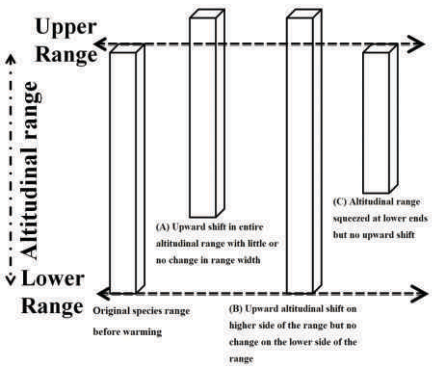

Figure 1. Types of species shift due to global warming in response to climate change (Singh & Singh, 2013)

The recent climate change is mainly comprehended as a result of modification of natural climatic conditions and the chief factors which favour it are natural as well as anthropogenic. For meeting the ever increasing energy demands, human activities such as burning of fossil fuels and deforestation have resulted in the increased concentration of green house gases in the natural environment. Among the various green house gases, carbon dioxide is considered as the most important and its level has increased from 270 parts per million (ppm) prior to industrialization to the value of 410 ppm in year 2017 (Kahn 2017). The impacts of climate change are seen to be more pronounced in the sensitive high altitude regions especially in the mountainous environments.

The retreat of Himalayan glaciers during the last two decades and the formation of several glacial lakes evidenced the role of global warming. During the past century, the average global air temperature near the earth's surface has been estimated to increase at the rate of 0.74 $\pm$ 0.18ºC (1.33 $\pm$0.32ºf). The global mean land surface has warmed by 0.27º C per decade since 1979 (Guisan et al. 2005). The last decade of the 20th Century and the beginning of the 21st have been the warmest periods in the entire global instrumental temperature records. Certain naturally occurring gases, such as carbon dioxide (CO2) and water vapour (H2O), trap heat in the atmosphere causing a greenhouse effect. Burning of fossil fuels, like oil, coal, and natural gas is adding CO2 to the atmosphere. The current level did not reach this level during the past few million years.

Although plants have moved across the landscape in response to changing climate for millennia, projections of contemporary climate change suggest that forest tree species and their populations will need to migrate faster than their natural ability in search of more suitable environment. Therefore, climate change and adaptation strategies, such as assisted migration, have gained attention since 20th Century (Williams, 2013). During the past 30 years, a few climate changes and adaptation strategies have been proposed. One strategy is assisted migration (Peters and Darling 1985), defined as the movement of species and populations to facilitate natural range expansion in direct management response to climate change. Climate has played a major role in shaping vegetative growth, composition, and genetic variation across the landscapes. Long-lived species, such as trees, will lag behind short-lived species in their ability to adapt and track suitable climatic conditions. It may take several

generations (centuries to millennia) for a tree population to become adapted through evolution to a new climate. Evidence from the fossil record and from recently observed trends proved that changing climate has a profound influence on species range expansion both upward and downward. Ecological 'fingerprints' of climate change appear across a wide range of taxonomic groups and geographic regions and are being identified with increasing frequency.

Chen et al. (2011) have reported that terrestrial organisms are currently shifting their distribution range along the latitude or elevation in response to changing climate. Using a meta-analysis, they estimated that the distribution of species has recently shifted to higher elevations at a median rate of 11.0 meters per decade, and to higher latitudes at a median rate of 16.9 kilometers per decade. These rates are approximately two and three times faster than previously reported migration rates. Parmesan and Yohe (2003) compiled studies on many species including alpine herbs, birds, and butterflies, and found an average poleward shift of 6.1 km per decade. The timber lines in European mountains have been recorded to have moved upward by nearly 200 m since the early twentieth century (Grabherr, 2010). Furthermore, because initiation and cessation of growth are influenced by temperature, precipitation and light, the forest ecosystems are likely to experience phenological imbalances with longer growing seasons such as the bud break may occur earlier in the spring, making those individual trees susceptible to weather events (e.g., freezing temperatures and snowfall). In the assisted migration of plants, forest tree species are highlighted most often because of their economic value and focus on climate change research; however, assisted migration conducted for economic rather than conservation reasons is also cited as a major barrier to implementation.

Shift in plant species distribution in Indian Himalaya

In different district of central Indian Himalayas, Panigrahy et al. (2010) reported upward shifting of alpine tree line and reported 360-430 m upward shift in Uttarkashi (360 m), Tehri Garhwal (400 m), Rudraprayag(390 m), Bageshwar (430 m), Chamoli (360 m) and Pithoragarh (390 m). A study conducted by Telwala, (2011), in the north-east India (Sikkim Himalaya) suggests that many of the 124 endemic plant species investigated, demonstrated a prolonged upward shift over the past 150 years (from 1850 - 2010) with a mean species shift in altitudinal range of 237.9 ± 219.8 masl. The upward shift in species' range was between 100m to 400m in 70% of the species but, in extreme cases, the range shift was 600-800m. About half of the endemic species, showed an upward shift on upper side of their range, leading to an altitudinal expansion on the range. In Kashmir Himalaya the rate of upward shifting of the regional plants depends upon the extent of changes in the local climatic conditions and by other factors including anthropogenic pressures that operate differently in each mountain systems of the world (Agnihotri et al., 2017). As per Kumar et al., 2010, flowering in *Rhododendron arboretum,* and its other associate like banj oak has shifted by 25 to 30 days whereas time of leafing by around 2 weeks. Himalayan blue pines *(Pinus wallichiana),* Bhojpatra *(Betula utelis)* and *Abies* spp. are on the move too in western Himalaya. From past few decades, nuisance weed *Parthenium hysterophorus* and the water fern *Azolla cristata* have shifted in the formerly temperate climate of the Kashmir Himalayas. Historical range shift of plant species like *Rhodiola bupleuroide, Rheum nobile, Saussurea stella, S. uniflora* and *Ponerorchis chusua* has been recorded in Northeast Himalaya (Telwala et al. 2013). Migration of tropical species, including some pines (e.g. *Pinus merkusii*), from lowland areas of South Asia to the Himalaya is indicated to have occurred in the geological past during warmer climate phase whereas *Bombax ceiba,* and *Butea frondosa* have penetrated into the Himalayan ranges through migration along rivers that have cut deeply into mountains.

Changes in regeneration behaviour of plants in Indian Himalayas

It is important to understand how evolution and ecological potential of different life forms helps them to adapt climate change (Woodward and Kelly 2008), because Himalayan forests are greatly affected by climate change, water availability and temperature. The regeneration potential of any forest directly depends on biotic and abiotic characteristics and its geographic distribution (Gairola et al. 2012). Regeneration patterns of species population can address climate change by adaptive evolution or by migrating association to survive in their favourable climate. Forest ecosystems depend on adequate regeneration potential of tree species to be healthy and sustainable. Himalayan forest composition and ecosystem services depend on forest structure and regeneration potential which are considered to be changing in the alignment of tree population over time. Economically important plant species have repeatedly been reduced from Himalayan forests due to climate change, species shift and other natural or anthropogenic disturbances. These phenomena have ultimately affected forest regeneration (Sharma 2016). Emergence and establishment of seedlings in the oak dominated forests under their natural habitat conditions in Garhwal Himalaya is reported to be unsatisfactory (Bisht & Kuniyal 2013). In Indian lower Himalayan parts, the regeneration in Sal *(Shorea robusta)* is known to be a problem, because its seeds are ready to germinate by mid-June when the commencement of monsoon is uncertain. Availability of seeds, which are often limited for Himalayan temperate species and competition among species for space, light and water, may be the reasons for non-regeneration of certain tree species.

Global warming and its implications for coral reefs

Coral reefs are marine structures of limestone built from the skeletons of coral animals, and it has taken millions of years to build the reefs we see today. Coral reefs occur in at least two types. Barrier reefs extend along coasts. The best-known example is the Great Barrier Reef off the east coast of Australia, which is the world's largest coral reef. Coastal reefs form an addition to an island or a coast. Corals prefer such shallow areas where they eventually reach the water surface and create a kind of platform.

Coral reefs are also divided into two groups according to the water temperature and depth of occurrence. The most well-known and studied ones are the shallow-water coral reefs in tropical and subtropical waters, while the other type occurs in northern temperate areas in much colder water and at great depth. Most of this overview is focused on the tropical reefs, because they are already heavily impacted by global warming.

The projected water temperature increase will greatly affect the most biodiverse ecosystems of the oceans – the tropical coral reefs – which harbour some 25 per cent of all marine species over an area covering less than 0.1 per cent of the total ocean surface. Another side effect of global warming is the increased content of carbon dioxide in the atmosphere. The liming processes in the corals are disturbed by increasing carbon dioxide.

Tropical coral reefs are found in more than 100 countries. This figure refers to the warm-water coral reefs, which are by far the most well known, because they occur in very shallow water and even at the present sea water level.

Much less known are the stone corals of temperate waters, which may occur at depths from 40 to 3,000 metres and at temperatures ranging from 4 to 13 degrees. These reefs have so far been found in 41 countries and their total area is estimated to be as great or even greater than the tropical coral reefs. In the North Atlantic these cold-water reefs are mainly built up of eyes corals (Lophelia pertusa), which occur off the Swedish West Coast. The largest yet discovered cold-water coral reef made up of eyes corals is found off the Lofoten archipelago in Norway, and appears to cover an area of close to 100 km^2. The high density of reefs shown in the North Atlantic most probably reflects the intensity of research in this region and further discoveries are expected mainly in the deeper waters of tropical and subtropical regions.

The global oceans regulate our climate and weather conditions, like rainfall and floods. The oceans also absorb roughly one third of all carbon dioxide emitted through human activities, and have also absorbed some 90 per cent of the extra heat trapped by the rising concentrations of greenhouse gases. The temperature rises so far experienced mean that three-quarters of the world's coral reefs are currently under threat.

As mentioned above, tropical coral reefs are probably among the least resilient marine ecosystems, as well as the first victims of global warming. These reefs occur in shallow water, where the temperature is rarely less than 20 degrees and salinity is around 3.5 per cent. The number of fish species has declined significantly, but the most destructive effect on the well-being of a coral reef ecosystem is the effect on the reef itself. This process is termed coral bleaching. Corals are adapted to live within a narrow temperature regime. A temperature increase above the corals' threshold level by as little as 1–2 degrees (C) for 5–10 weeks can lead to coral bleaching.

Coral bleaching means that the corals lose their colouration and the underlying white calcium skeleton becomes visible. What happens is that the corals' endosymbionts, called zooxanthels, lose their photosynthesising pigments. When coral bleaching occurs, some 60–90 per cent of the zooxanthels are lost and in addition individual zooxanthels can lose as much as 50–80 per cent of their photosynthesizing pigments. Some corals, however, may also have additional fluorescent pigments that are not associated with the zooxanthels and these corals may not lose all their colour. Bleached corals grow much more slowly than healthy ones, but under extreme conditions such as prolonged temperature rise above what is normally tolerated by the corals, mass mortality can occur, which may require decades to recover. Thus, mass coral bleaching events are projected to increase in frequency and intensity, and even preserving more than 10 per cent of present coral reefs would require warming to be limited to below 1.5 C.

In the period 1997–98 warm-water coral reefs all over the world suffered from massive bleaching. The major

impact was noted in the coral reefs of the Central Indian Ocean, where some 90 per cent of all corals in an area covering several thousand km^2 died, including most corals in the Maldives, the Chagos Archipelago and the Seychelles. Other coral reefs, e.g. off the coasts of Thailand and Vietnam, were also badly damaged but they included more robust coral species that allowed the reefs to recover. Even parts of the Great Barrier Reef, Indonesia, the Philippines and the Caribbean area were also damaged but with a lower mortality of some 20–50 per cent. These events were attributed to a combination of two weather scenarios, ENSO (El Nino-Southern Oscillation) and La Nina. The combination of those two weather phenomena probably caused the warmest water temperatures that "modern" corals have been subjected to, and it seems likely that some of the most severely damaged reefs may require years or even decades to recover. Even if most coral reefs will slowly recover there is a chance that local extinction of coral species may occur, which will lead to reduced biodiversity and, at worst, to less resilience to future accidents. This worst-case scenario may in future occur annually as a consequence of continued temperature increase, i.e. cause local or even regional destruction of entire coral reef ecosystems. At current projected levels of temperature increase it has been suggested that tropical coral reefs could be lost altogether as early as 2050 and, in fact, fluctuating and rising ocean temperatures caused by global warming present the largest primary threat to coral reefs.

Source: Lennart Nyman (Acid News, Sweden)

One tonne of CO_2 melts 3 m^2 of Arctic ice

Noting that Arctic ice cover for summer has already shrunk by more than half in the past 40 years, the climate scientists predicted that the remaining ice will disappear by the middle of the century. Published in 'Science', the study evaluates the future of the Arctic summer sea ice on the basis of observational data obtained between 1953 and 2015. Making a linear connection between carbon dioxide emissions and Arctic summer sea ice, the study led by lead author Dirk Notz from Hamburg, Germany, commented that the observed numbers are very simple. "For each ton of carbon dioxide that a person emits anywhere on this planet, 3 m^2 ($\pm$ 0.1m^2) of Arctic summer sea ice disappears," he noted.

The study argues that Arctic summer sea ice can survive only if global warming is kept below 1.5°C. by reducing greenhouse gas emissions including carbon dioxide. The internationally agreed 2°C global warming target is not sufficient to allow Arctic summer sea ice to survive.

The study traces a robust linear relationship between monthly mean September sea ice area and total CO_2 emissions based on the observational record. The methodology addresses the disparity problem that long plagued climate-model simulations regarding the sea-ice loss. According to the study, the linear relationship makes it clear that a loss of 3 $\pm$ 0.3 m^2 of September sea ice area per metric ton of CO_2 emission is really happening. The damage wrought by carbon dioxide as a greenhouse gas is that it keeps the heat retained in the Earth's atmosphere and escalates the global temperature more and more.

Source: http://www.techtimes.com/articles/184807/20161105/here-s-how-much-arctic

How to get people to eat less meat

Livestock farming contributes to emissions of air pollutants and greenhouse gases, including more than 90 per cent of the EU's ammonia emissions and about half of the EU's methane emissions. Decreased meat consumption has been a recurring recommendation to bring these emissions down.

In a study, researchers from Greifswald University have studied barriers and opportunities for reducing meat consumption in developed and transition countries. They found 155 studies that covered the topic in different ways. Barriers and opportunities were categorised into three main types: personal factors, socio-cultural factors and external factors.

Some of the factors are similar to those that predict other types of behaviour that have an environmental impact. Awareness of the negative consequences is needed in order to bring about change. Awareness of the environmental impact of animal products has grown, but is still quite low. In one study, only 30 per cent of people identified meat and livestock as a significant contributor to climate change. Many people also believe that meat is necessary for a meal to be nutritious. People also need skills to change their behaviour, such as a knowledge of vegetarian cooking.

Values have a strong impact on people's behaviour. Studies have

shown that moral values, particularly concerning animal welfare, are one of the key factors that influence someone to become vegetarian.

Adequate knowledge and values are not always enough, however. Cognitive dissonance is a negative feeling that occurs when you have multiple contradictory ideas simultaneously. Common strategies to reduce such dissonance include denial and delegation. The latter can be to blame politicians or food corporations instead of taking responsibility oneself.

Day-to-day routines are an often-identified barrier to reduced meat consumption. "Convenience" is important in an age when many people feel that they have little time, lack of knowledge or interest in cooking. That they like the taste of meat is often mentioned as a reason when people are asked to justify a high level of meat consumption. Taste preferences are not however independent from other factors such as identity and moral beliefs.

Gender is found to be one of the strongest factors predicting level of meat consumption. Men tend to eat more meat than women and are also less willing to reduce their consumption. There are also signs of a generational shift where young people have the highest proportion of vegetarians and are more open to "flexitarian" eating, meaning to actively omit meat from some meals without excluding meat completely from the diet.

Fatty meats are nowadays associated with low-income groups and poor education in many western countries. The proportion of vegetarians increases slightly with level of income. However, in emerging economies, such as China, meat consumption is still seen as an indicator of wealth.

Personality traits also play a role. Not too surprisingly, conscientious people are better at reducing their meat consumption than people who are not. Openness and agreeableness are also traits linked to environmentally conscious behaviour.

The perceived ability to control behaviour is also important in changing one's behaviour. People who lack the feeling of self-efficacy tend to regard barriers such as high prices and poor supply as greater than people who do not.

Many people see meat-eating more as a cultural norm than active choice. There are also several cultures and religions where meat-eating is surrounded by various restrictions and taboos, e.g. Lent in Christian tradition and the importance of not hurting other living creatures in Buddhism and Hinduism.

Peer pressure should not be underestimated. One study shows that for men, the number of vegetarian and non-vegetarian friends is the greatest predictor for their level of meat consumption. The behaviours of others in social occasions can work both as a barrier and an opportunity.

What you eat is also a social marker of identity. The concept of flexitarianism that has emerged in the past few years offers an opportunity for people to identify with a diet low in meat without going vegan or vegetarian.

Among the external factors, economy is one of the more obvious ones. Livestock products are directly and indirectly subsidised in many countries and price has a strong influence on people's food choices.

The food infrastructure also plays a part. Supermarkets and restaurants must offer meat-free alternatives in order for people to choose them. There has been a massive growth in vegetarian alternatives in recent years, but availability can vary, even between neighbourhoods in the same city.

Though there is growing institutional awareness about the negative environmental impact of meat and livestock production this has not yet translated into policy. Nevertheless, steps have been taken. Germany has included reduced meat consumption in its national climate goals and China is running a campaign to halve meat consumption. Private companies such as IKEA are promoting vegan alternatives in their restaurants.

The researchers argue for a mixed approach to encourage synergies between the different factors they identified. Different groups need to be targeted with different arguments. For older people and men, health arguments and flexitarianism (reduced meat consumption) are believed to be more effective.

They also stress the importance of prominent role models – actors, musicians, politicians and sport heroes – taking a lead, such as Paul McCartney, Bill Clinton, Mike Tyson and Kate Winslet. They can help and encourage people to do the right sustainable thing even if they are surrounded by sceptics.

Finally, they call for more political and economic measures, "these include removing harmful subsidies from livestock production, imposing taxes and more generally internalising social and environmental externalities in food production costs".

Source: Kajsa Pira
(Acid News, Sweden)

Air pollution linked to fifth of pre-term births

Close to a fifth of premature births worldwide could be associated with mothers' exposure to outdoor air pollution, according to a study by the Stockholm Environment Institute (SEI). It showed that up to 2.7 million of the 14.9 million births worldwide considered as pre-term, i.e. taking place before 37 weeks of gestation, can be linked to mothers' exposure to particulate matter $PM_{2.5}$ levels above 10 micrograms per cubic metre of air ($\mu g/m^3$).

"Pre-term births associated with this exposure not only contribute to infant mortality, but can have life-long health effects in survivors," said Chris Malley, the study's lead researcher.

According to the European Environment Agency, around 85–90 per cent of Europe's urban population is exposed to $PM_{2.5}$ levels above the WHO annual average threshold of 10 $\mu g/m^3$.

http://www.sciencedirec.com/science/article/pii/S0160412016305992
Source: Ends Europe Daily

We produced 7bn tonnes of plastic waste since '50

Industry in U.S.A. has made more than 9.1billion tonnes of plastic since 1950. Plastics don't break down like other man-made materials, so three-quarters of the stuff ends up as waste in landfills, littered on land and floating in oceans, lakes and rivers.

At the current rate, we are really heading towards a plastic planet. It is something we need to pay attention to. The plastics boom started after World War II, and now plastics are everywhere. They are used in packaging like plastic bottles and consumer goods like cell phones and refrigerators. They are in pipes and other construction material. They are in cars and clothing, usually as polyester.

The world first needs to know how much plastic waste there is worldwide, before it can tackle the problem. Of the 9.1 billion tonnes made, nearly 7 billion tonnes are no longer used. Only 9% got recycled and another 12% was incinerated, leaving 5.5 billion tonnes of plastic waste on land and in water. Using the plastic industry's own data, it was found that the amount of plastics made and thrown out is accelerating. In 2015, the world created 448 million tonnes of plastic, more than twice as much as made in 1998.

China makes the most plastic, followed by Europe and North America. The growth is astonishing and it doesn't look like it's slowing down soon. About 35% of the plastic made is for packaging, like water bottles. In some estimates figures are higher than other calculations because plastic material woven into fibres like polyester clothing, including microfibre material are also included.

An official of a US trade group said the plastic industry recognized the problem and was working to increase recycling and reduce waste. "The fact that it plastic becomes waste so quickly and that it's persistent is why it's piling up in the environment.

Source: Times of India

GREEN IDEA - How to save trees? Pay people not to cut them

Tropical forests in western Uganda, home to endangered chimpanzees, are disappearing fast as locals chop down trees for charcoal and to clear space for subsistence farming.

Now, researchers have found a surprisingly cheap way to slow the pace of deforestation: Just pay landowners small sums not to fell their trees. In fact, the UN has set up a program to channel $10 billion to poorer nations to slow deforestation trends. Yet many experts have been skeptical of such payment programs. Unless we set up a randomized trial, where we are carefully comparing people who take part in the program with people who aren't, it's hard to know the effect.

A team of scientists from North Western University randomly selected 60 villages in Hoima and northern Ki baale districts of Uganda and offered owners of forested land $11.20 an acre a year if they did not cut their trees. Over the next two years, they saw forest cover drop 9.1% in control villages that were not offered payments. But in villages where voluntary payments were offered, forest cover declined just 4.2%.

The researchers calculated that the benefits of delaying the release of so much carbon dioxide came to $1.11 a ton, using the Environmental Protection Agency's climate damage estimates. That far exceeded the program cost of 46 cents a ton of carbon dioxide.

They also found that landowners who signed up started patrolling their forests to protect their trees. About 70% of Uganda's forests are on private lands, serving as crucial corridors for chimpanzees to migrate between reserves, said Lilly Ajarova, who directs the Chimpanzee Conservation Trust in the country .As trees are felled, chimpanzees have been wandering onto farms and stealing crops, leading desperate farmers to kill them.

Source: Times of India

Compostable Plastics

While Plastics offer multi faceted benefits to modern world and the society at large due to its versatile properties, some applications of the material also create environmental issues when its waste is not handled properly. While plastics are 100% recyclable, a critical waste management challenge crops up when the waste is not collected for its recycling and is left unattended. With this background, polymer scientists developed, what was termed in those days of 1970's, biodegradable plastics, later it was commonly known as 'compostable plastics'.

However, the new development did not meet the general expectations of masses who expected that biodegradable (compostable) plastics would vanish in the back yard or in the landfill of its own and would get mixed up with the soil system and thus avoiding the ill effects of the unattended plastics waste. The fact is that biodegradable plastics require a specific environment, process and specific time frame for degradation into the soil. When these criteria are not fulfilled, biodegradable plastics do not serve the intended purpose. This aspect is required to be understood before arriving at any policy decision on the matter of biodegradable (compostable) plastics. Emphasis is to be given on the use of biodegradable (compostable) plastics for right types of applications.

Despite the fact that the development of biodegradable plastics took place in the 70's, its world production remained in the vicinity of one million tons per annum compared to about 300 million tons for conventional plastic materials in 2015. The major reason for the lower production and thus the low application base for biodegradable plastics is that the material does not serve the purpose as efficiently as the conventional plastic does. Waste management, the prime mover of the development of this product, could not be achieved by using this material. Marine litter cannot be avoided by the use of biodegradable plastics, as it is not degradable in water medium.

Source: Envis Eco-Echoes

Circles in the sand reveal boating damage to marine biodiversity

The findings of a study by Swansea and Cardiff University scientists highlights the need for boating activities along the UKs beautiful coastlines to be conducted in a more environmentally friendly manner.

Seagrass meadows are an important marine habitat in support of our fisheries and commonly reside in shallow sheltered embayments typical of the locations that provide an attractive option for mooring boats. Research led by U.K. scientists at Swansea University provides evidence for how swinging boat moorings have damaged seagrass meadows throughout the UK (and globally) and create lifeless halos within the seagrass. The creation of these halos devoid of seagrass fragments the meadow and reduces its support for important marine biodiversity.

The seagrass *Zostera marina* (known as eelgrass) is extensive across the northern hemisphere, forming critical fisheries habitat and creating efficient long-term stores of carbon in sediments. This is the first research to have quantified this impact on eelgrass.

In the study *"Rocking the Boat: Damage to Eelgrass by Swinging Boat Moorings"*, the scientists examined swinging chain boat moorings in seagrass meadows across a range of sites in the United Kingdom to determine whether such moorings have a negative impact on the seagrass *Zostera marina* at the local and meadow scale. Conclusive evidence was found throughout the UK that *Z. marina* is damaged by swinging chain moorings leading to a direct loss of at least 6 ha of United Kingdom seagrass. Each swinging chain mooring was found to result in the loss of 122 m^2 of seagrass. Importantly loss was found to be restricted to the area surrounding the mooring and the impact did not appear to translate to a meadow scale. This loss of seagrass from boat moorings is small but significant at a local scale. This is because it fragments existing meadows and ultimately reduces their resilience to other stressors (e.g. storms, anchor damage and poor water quality). Boat moorings are prevalent in seagrass globally and it is likely this impairs their ecosystem functioning and resilience. Given the extensive ecosystem service value of seagrasses in terms of factors such as carbon storage and fish habitat such loss is cause for concern. The research highlights the need for boating activities in and around sensitive marine habitats such as seagrass to be conducted in a sustainable fashion using appropriate environmentally friendly mooring systems.

Source: Janis Pickwick,
Swansea University

CONFERENCES

ICFCMRA 2018: 20th International Conference on Food Contact Materials and Risk Assessment
12-13 March, 2018; Miami, U.S.A
Website: https://waset.org/conference/2018/03/miami/ICFCMRA

World Conference on Ecology
19-20 March, 2018; Berlin, Germany
E-mail: ecology@annualconferences.org
Website: Ecology.conferenceseries.com

7th International Conference on Biodiversity Conservation and Ecosystem Management
19-20 March, 2018; Bali, Indonesia
Website: https://www.clocate.com/conference/7th-International-Conference-on-Biodiversity-Conservation-and-Ecosystem-Management-2018/41698/

20th International Conference on Biological, Ecological and Environmental Sciences and Engineering (ICBEESE 2018)
29 - 30, March, 2018; Osaka, Japan
https://waset.org/events/2018/03/osaka/ICBEESE

20th International Conference on Natural Disasters, Assessing Hazards and Risk (ICNDAHR 2018)
14 - 15, May, 2018; London, United Kingdom
Website:
https://www.waset.org/conference/2018/05/london/ICNDAHR23, 2018

2nd Annual Congress on Environmental Pollution and Sustainable Energy
24-25 May, 2018; Osaka, Japan
E-mail:
environpollution@earthscienceconferences.com
Website: https://www.conferize.com/2nd-annual-congress-on-environmental-pollution-and-sustainable-energy

World Congress on Environmental Toxicology and Health
11-12, July, 2018; Sydney, Australia
E-mail:
environmentcongress@conferencesworld.org
Website:
https://environment.conferenceseries.com/conference-brochure.php

6th Annual International Conference on Ecology, Ecosystems and Climate Change
16-19 July 2018, Athens, Greece
Contact Person: Dr. Gregory T. Papanikos
E-mail: atiner@atiner.gr
Website: https://www.atiner.gr/ecology

7th World Convention on Waste Recycling and Reuse
16-17, May, 2018 Tokyo, Japan
E-mail:
recyclingsummit@earthscienceconferences.com
Website:
https://recyclingsummit.conferenceseries.com

BOOKS

Human Exploitation and Biodiversity Conservation
Eds. David L. Hawksworth & Alan T. Bull
Springer 2008
ISBN: 978-1-4020-5282-8
Price: €319

Air Pollution and Plant Biotechnology: Prospects for Phytomonitoring and Phytoremediation
(Eds.) Kenji Omasa, H. Saji, S. Youssefian and N. Kondo
Springer 2012
ISBN: 9784431683902
Price: US$117.75

The Hidden Life of Trees: What They Feel, How They Communicate-Discoveries from a Secret World
By Peter Wohlleben
Grey stone Books Vancouver,
Berkley 2015
ISBN: 9781771642484
Price: £13.49

Urban Forests: A Natural History of Trees and People in the American Cityscape
By Jill Jonnes
Pejnguin 2016
ISBN-13: 978-0670015665
Price: $ 19.39

Plant Responses to Air Pollution
(Eds.) : Kulshrestha, Umesh, Saxena, Pallavi
Springer 2016
ISBN 978-981-10-1199-3
Price: $129.00

Environmental Management (1st Edition) Science and Engineering for Industry
Elsevier 2017
By I.V Murali Krishna and Valli Manickam
ISBN: 9780128119891
Price: US $105.00

Climate Change and Rocky Mountain Ecosystems
(Eds:) Jessica E. Halofsky & David L. Peterson
Springer 2017
ISBN: 978-3-319-56927-7
Price: $ 129.00

Adaptive Soil Management: From Theory to Practices
(Eds.): Rakshit, A., Abhilash, P.C., Singh, H.B., Ghosh, S.
Springer 2017
ISBN: 978-981-10-3637-8
Price: € 207,99

A Treatise of Indian and Tropical Soils
By D. Pal
Springer 2017
ISBN: 978-3-319-49438-8
Price: € 86,99

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