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C.P.R. ENVIRONMENTAL EDUCATION CENTRE

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A Centre of Excellence of the Ministry of Environment and Forests, Government of India

Contents

Urban Parks – The Ecosystem Service Providers of Chennai....3

Toxin in vaccines?....5

Electronic Waste Management in India – Concerns and Challenges 7

Wildlife - Road Kills....10

Temples Tanks in Arid Lands....12

Forest fire and its effects on Biodiversity in Similipal Biosphere Reserve, Orissa 14

Bay Islands and Plastics....16

Alternate Sources of Energy....19

Bioethanol from Algae - The Green Alternative....21

Importance of Mangrove Forests and their Management....23

Birds in Indian Culture – Art and Mythology....25

C.P.R. Environmental Education Centre is a Centre of Excellence of the Ministry of Environment & Forests, Government of India, established jointly by the Ministry and the C.P. Ramaswami Aiyar Foundation.

The Centre has been set up to increase consciousness and knowledge about the environment and the major environmental problems facing the country today. It has been conducting a variety of programmes to spread awareness and interest among the public, including, teachers, students, voluntary workers, educators, farmers, women and youth, on all aspects of the environment and ecology, with the purpose of promoting conservation of nature and natural resources.

Urban Parks – The Ecosystem Service Providers of Chennai

P. Sudhakar

Introduction

Chennai and its neighbourhood had several groves of economically important species such as tamarind, mango and jackfruit. The names of certain places in Chennai are synonymous with the word "grove", as for example Palathope (jackfruit grove) in Mylapore, Pulianthope (tamarind grove) in Perambur and Maanthope (mango grove) in Ambattur. There were a number of gardens established by rich people as well as by colonial the rulers, especially on the banks of the Coovum (Muthiah, 2008).

The British started the culture of parks in Chennai. The first park that was established in Chennai was "My Lady's Park" adjacent to the present Central Railway station. Subsequently, parks were established in T.Nagar, Mylapore and in other places.

Ecosystem services of urban parks

The urban parks, apart from providing green and open space for recreational purposes, also provide a number of ecosystem services. Ecosystem services are defined as "the benefits human populations derive, directly or indirectly, from ecosystem functions" (Costanza *et al.* 1997). According to Bolund and Hunhammar (1999), trees in urban areas offer a variety of ecosystem services like air and water purification, rain water recharge, noise filtering, health, microclimate stabilization and biodiversity conservation.

Rain Water Recharge

The trees in the urban forests or the vegetated area help in retaining the rain water up to 70- 80% by reducing the force of the rain water which falls directly onto the surface and running off into the storm water drains. In the cities without vegetation, 60% of the rain water goes through the storm water drains (Bernatzky, 1983).

Health

According to recent studies the presence of trees in human neighbourhoods helps in overcoming several psycho-social problems (Kuo, 2003). Parks or gardens with trees are used for morning and evening walks, exercise and recreation by all kinds of people. A study in 9 cities of Sweden shows that people of all

categories, professions and age consider parks, gardens and urban forests as the most effective means for stress relieving and relaxation (Grahn and Stigsdotter, 2003). A study undertaken in Guangzhou, China indicates that more than 50 % of its residents use urban forests for recreational and stress relieving purposes (Jim and Chen, 2006).

Air Pollution

Vegetation plays a major role in reducing air pollution; however the level of reduction depends on the local conditions. The major constituent of air pollutant is the Suspended Particulate Matter (SPM). Urban parks having more canopy cover can filter the particulate matter thereby, improving the quality of air (Givoni, 1991).

Micro climate

Concrete structures in urban areas absorb the sun's energy and radiate the heat into the ambient air, thus making the area hotter by several degrees. This phenomenon is termed as heat island. This heat is reduced by the evapo-transpiration process of the urban green spaces (Shashua-Bar *et. al.,* 2010).

Noise

In urban areas noise levels from traffic and other sources are high, thus creating health problems. Vegetation and open green spaces reduce the intensity of noise levels (Bolund and Hunhammar, 1999).

Biodiversity

Green space is one component of biodiversity management and the most obvious. Biodiversity is the living diversity of nature. Trees in cities and towns, parks and gardens provide a wealth of benefits relating to biodiversity. Urban parks support a great variety of wildlife and are the only refuge for birds, squirrels, insects, butterflies, bats and bees. Some of these insects and birds are important pollinators (Mendes, *et.al.*, 2008). Even trees in backyards provide the benefit of biodiversity conservation networks in urban ecosystems (Hillary, *et.al.,* 2002).

Conclusion

Parks are developed in open space revenue lands, which are under the control of the government. Whenever there is any need and urge for the improvement of infrastructural facilities, green spaces are considered "land banks", often encroached upon by private as well as government interests for creating additional built-up space (Zerah, 2007).

Parks being the lung spaces of cities, it is the responsibility of every citizen to safeguard them.

Toxin in vaccines?

U.T. Arasu

Are our children safe from Thimerosal – a mercury based preservative in vaccines?

The presence of Thimerosal (Thimersal) – a mercury based preservative in life-saving vaccines is now under a cloud. Scientists around the world are raising doubts about the toxic effects of thimerosal, which is used primarily as a preservative against microbial (bacteria and fungi) growth in vaccines.

The childhood vaccination schedule prescribed by paediatricians all over the world and during India is growing. A new born has to be given many shots of vaccines in the first nine months. The infant's small body is not only receiving life protecting vaccines against diseases but also has to receive residual mercury derivatives as a part of it. Mercury concentrates in the human body and cause many problems ranging from minor rashes to renal failure and effect on central nervous system.

Thimerosal (ethyl mercury) is an organo-mercurial compound used since 1930 in vaccines as a preservative against microbial growth and in many other pharmaceutical products such as antiseptics and contact lens solutions. At high concentrations, methyl mercury is known to cause many health problems in the human body. Ethyl mercury is less toxic when compared to methyl mercury. Mercury is harmful when it reaches certain level of concentration in the human body. The exposure level recommended by the World Health Organisation (WHO) is 0.47µg/kg body weight per day, whereas the Environmental Protection Agency (EPA) of USA recommends 0.1µg/kg body weight per day. These ranges of recommendations are based on varying safety standards adopted by the organizations on various purposes. The Government of India is still to spell out its own strategy and standards on this issue.

The world woke up to the deadly effects of methyl mercury in the late 1960s. When industrial discharge of mercury was let in to Minimata Bay, Japan, it crippled people with neurologic problems after widespread consumption of mercury-contaminated fish

Expectant mothers who were exposed to methyl mercury poisoning began to suffer from neurologic injury to the new-born including cerebral palsy. Sensory –motor-neurologic dysfunction has also been reported from *in-utero* exposure to low levels of methyl mercury. The debate over mercury poisoning and autistic conditions in children is still inconclusive.

It is heartening to note that thimerosal has gradually been reduced to trace amounts in all vaccines. Especially vaccines that are prescribed for children less than six years old, which are primarily targeted for phasing out thimerosal.

Parents visiting their paediatrician should ask and insist on Thimerosal-free vaccines before getting a shot for their child. However, the availability of thimerosal-free influenza vaccine is limited worldwide.

Age	Vaccines	Note
Birth	BCG	
	OPV zero	
	Hepatitis B -1	
6 weeks	OPV-1 + IPV-1 / OPV -1	OPV alone if IPV cannot be given
	DTPw-1 / DTPa -1	
	Hepatitis B -2	
	Hib -1	
10 weeks	OPV-2 + IPV-2 / OPV-2	OPV alone if IPV cannot be given
	DTPw-2 / DTPa -2	
	Hib -2	
14 weeks	OPV-3 + IPV-3 / OPV -3	OPV alone if IPV cannot be given
	DTPw-3 / DTPa -3	
	Hepatitis B -3	Third dose of Hepatitis B can be given at 6 months of age
	Hib -3	
9 months	Measles	

Source: Indian Academy of Paediatrics - *www.iapindia.org/immunisation/immunisation-schedule*

Electronic Waste Management in India – Concerns and Challenges

R. Sabesh

E-waste comprises of wastes generated from used electronic devices and household appliances which have been rendered unfit for their original intended use and are destined for recovery, recycling or disposal. Such wastes encompass a wide range of electrical and electronic devices such as computers, cellular phones, personal stereos, including large household appliances such as refrigerators, air conditioners etc. E-wastes are generated due to the advancement of technology changes in fashion, style, status or the gadgets nearing the end of its useful life. At present, electronic and electrical equipment have become part of our everyday life and their use has increased manifold during the last two decades. The industrial and economic growth in the city has fuelled a greater consumption and, subsequently, generation of huge volumes of e-waste. E-wastes contain over 1000 different substances, many of which are toxic and potentially hazardous for the environment and human health if these are not handled and disposed of in an environmentally sound manner. At present, there is a growing recognition of the e-waste problem in India at the national level and hence the Ministry of Environment and Forests (Govt. of India) has notified E-Waste (Handling and Management) Rules, 2011, effective from 1st May 2012.

E-Waste Management – the Indian scenario

A majority of electronic waste items are stored as such due to the lack of awareness and clarity with regard to the safe disposal and management of e-waste. This electronic junk lies unattended in houses, offices, warehouses etc., sometimes mixed with household waste, and are finally disposed along with municipal solid waste, thus causing serious health and environmental problems. As per the report of the Ministry of Environment and Forests, India generated 1,46,800 tonnes of E-waste during 2005 and the quantity is expected to reach several times by 2020(Please refer the graph-1). The top E-waste generating states in India are Maharashtra, Tamil Nadu, Andhra Pradesh, Uttar Pradesh, Gujarat, West Bengal, Delhi, Karnataka, MP and Punjab.

The draft notification of e-waste (Management and Handling) Rules was published by the Ministry of Environment and Forests (Govt of India) in May 2010 with the purpose of scientific management and safe disposal of e waste .The complete details of e-waste (Handling and Management) rules 2011 are available in MOEF's website *http://moef.nic.in/downloads/rules-and-regulations/1035e_eng.pdf*. The concept of Extended Producer Responsibility (EPR)is introduced in the rules as this strategy makes the producer (of electronic/electric equipment) responsible for the entire life cycle of the product, including its recycling and final disposal. Even in developed countries recycling and disposal of e-waste involves significant risk to workers and communities and great care must be

taken to avoid unsafe exposure in recycling operations and leaching of material such as heavy metals from landfills into ground water. Various components of electronic waste cause severe health effects which are mentioned below in the table-1.

Table 1 shows the effects of e-waste components on our health

Source of e-wastes	Constituent	Health effects
Solder in printed circuit boards, glass panels and gaskets in computer monitors	Lead (PB)	• Damage to central and peripheral nervous systems, blood systems and kidney damage. • Affects brain development of children.
Chip resistors and semiconductors	Cadmium (CD)	• Toxic irreversible effects on human health. • Accumulates in kidney and liver. • Causes neural damage. • Teratogenic.
Relays and switches, printed circuit boards	Mercury (Hg)	• Chronic damage to the brain. • Respiratory and skin disorders due to bioaccumulation in fish.
Corrosion protection of untreatedand galvanized steel plates, decorator or hardner for steel housings	Hexavalent chromium (Cr) VI	• Asthmatic bronchitis. • DNA damage.
Cabling and computer housing	Plastics including PVC	Burning produces dioxin. It causes • Reproductive and developmental problems; • Immune system damage; • Interfere with regulatory hormones
Plastic housing of electronic equipment and circuit boards.	Brominated flame retardants (BFR)	• Disrupts endocrine system functions
Front panel of CRTs	Barium (Ba)	Short term exposure causes: • Muscle weakness; • Damage to heart, liver and spleen.
Motherboard	Beryllium (Be)	• Carcinogenic (lung cancer) • Inhalation of fumes and dust. Causes chronic beryllium disease or beryllicosis. • Skin diseases such as warts.

Conclusion

Today it is illegal to dump old televisions, mobile phones or laptops into the garbage bin or sell any of these items to the local scrap dealer. Under the Electronic Waste (Management and Handling) Rules 2011, effective from 1st May 2012, such waste must be routed to one of 73 authorized recyclers in India. "The rules allow a consumer to dispose of their old electronic items only through three means, authorized collection centers, authorized recycler or through the manufacturer," The law seeks to put the onus largely on manufacturers, who are expected to pick up/take back the e waste. Non-compliance can entail imprisonment or a fine. Consumers while buying electronic products make sure that the products are made up of less toxic energy efficient and designed for easy up gradation. Also the products must be approved and certified by the regulatory authorities. Customers should opt for upgrading their computers or other electronic items to the latest versions rather than buying new equipment. A holistic approach is needed to address the challenges faced by India in e-waste management.

References

1. Jain, A and R. Sareen, 2006. E-waste assessment methodology and validation in India, *Journal of Material Cycles and Waste Management*, Vol. 8, No.1.
2. E-waste, Vol.I Inventory Assessment Manual, 2006. Compendium on National WEEE Legislation, *United Nations Environment Program*, United Nations University.
3. Information Technology (IT) and Telecommunication (Telecom) Waste in Canada – 2003. Final Draft, Updated, Environment Canada, 2003.
4. Management, handling and practices of E-waste recycling in Delhi, 2004. *IRGSSA*, India.
5. Report on the Survey of the import and Environmentally Sound Management of Electronic Wastes in the Asia-Pacific Region, *Asia-Pacific Regional Centre for Hazardous Waste Management Training and Technology Transfer,* Basel Convention Regional Centre in China, December 2005.
6. Scrapping the high-tech myth: computer waste in India 2003. *Toxics Link*, p 13, India.
7. Report on Assessment of Electronic Wastes in Mumbai-Pune Area, MPCB (2007), *http: //mpcb.mah.nic.in*
8. *http://moef.nic.in/downloads/rules-and regulations/1035e_eng.pdf*
9. *http://www.greenearth.com/blog*

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Wildlife - Road Kills

M. Kumaravelu

It is needless to mention the richness of bio-diversity in the Western Ghats, of which the Nilgiris are a core zone which is also the first bio-sphere reserve in the country, and within which exists quite a few micro level hot spots wherein the endemism of the flora and fauna unique to the Western Ghats is quite high.

However, each micro-level hotspot within the Western Ghats is facing threats and, in fact, vegetation has been lost in quite a few micro level hot spots.

Change in climate, urbanization, encroachments and unplanned tourism activities are some of the reasons to which may be attributed the loss of habitat and vegetation in the hotpots of the Western Ghats which, in turn, poses a threat to herbivores, while invasive species of plants are curbing the regeneration of native species.

Coupled with this, major hydro electric projects and construction of roads escalate the man-animal conflict. Flagship species such as the tiger (*Panther tigris*) and elephant (*Elephas maximus*) are facing high pressure due to the shrinkage of migratory paths and disturbance and destruction of the natural habitat.

While these are the major eco-destruction factors affecting the biodiversity-rich Western Ghats, quite a few other damages often go unnoticed which have disastrous effects on wildlife. One such factor is the roads which pass through reserve forests, sanctuaries and National Parks. As per the data furnished by the Indian National Economic Survey of 2007-2008, India is a country with second largest road network, having more than 3.34 million kilometers and this has been expected to increase around 7-8 percent every year. Roads traversing through forests and sanctuaries and National Parks are of great concern from the conservation point of view. A few studies documented in recent times have showcased the road-kills, wherein the killing ranges from small insects to large mammals, carnivores, reptiles, amphibians etc,. The most affected are deer, small cats and slow moving animals like lizards and snakes, whereas avian species normally escape the threat from traffic in the jungles.

Causes for road kills

In the Western Ghat region, particularly the Nilgiri Biosphere Reserve, there is a continuous stretch of forest patch. However, the Wayanad wildlife sanctuary has become fragmented and Silent Valley and Mukkurthi National Park separated from other National Parks (i.e. Mudumalai, Bandiupr and Naharhole national Parks). Only a patch of green cover from Sathyamangalam Reserve forest to Nagarhole National Park including Mudumalai and Bandipur National park exists in a continuous forest patch. It is pertinent to note that these roads that traverse through these jungles causing considerable damage to wildlife.

In search of food and water and safe habitation, mammals need a vast stretch of forest land that provides sufficient food and water. In the Nilgiri Biosphere Reserve, mammals and carnivores find it difficult to get food and water except in protected zones. Migration is a herculean task because roads pass through the fragile jungle zones. Quite a few animals get killed when they are hit by speeding vehicles as they attempt to cross roads in the midst of the jungles.

In the Nilgiri Biosphere Reserve alone hundreds of snakes and amphibians are among the worst hit in road kills. Recently, the Sathy-Mysore National Highways within Erode forest division witnessed a sloth bear and two deer killed in a single day by speeding vehicles (*New Indian Express*, 22.04.2012). Roads passing through Mudumalai and Bandipur Tiger Reserve often witness road-kills that include butterflies, dragonflies, snakes and small cats like leopard cats. The number of kills goes up during the summer season, as there is rise in the volume of traffic during summer.

Due to the traffic restriction on the road from Thorappalli (entry point to Mudumalai Tiger Reserve) to Melkamnahalli (entry point to Bandipur National Park) between 10.00 pm and 6.00 am, the number of kills on the road is expected to come down. According to Boominathan's study and report, between December 1998 and March 1999, there were 180 road kills of 40 species of amphibians, reptiles and mammals. It was noted that the highly endangered carnivores (both big & small) and Palm civet were most affected. Among these big mammals primates were most seriously affected.

When the animals tend to cross borders across the roads in search of food and shelter, they fall prey to speeding vehicles.

Conclusion

When roads become wider and busier, the number of animals crossing and the number of road kills drastically increase. The roads become a great barrier and fragment the habitat. The roads also cause vegetative damage by spreading alien plant species like, for example, Parthenium seeds spread by vehicle tyres. In turn, animals tend to move to safe habitations by crossing the roads.

More studies should be done to manage the roads passing through the forests for better wildlife movement. One should explore the possibilities of the creation of speed breakers, under passes and over passes to aid animal crossings across the roads. In addition to this sign, boards carrying messages of the significance of hot spots should be put up. This is to enable motorists to minimize their speed and allow wildlife to cross This can be done at established points.

Landscape management is to be ensured while constructing roads, so that free movement of wildlife will be ensured. Tree canopy and native vegetation must be maintained instead of spreading alien species. Most important of all, motorists using jungle roads must be cautioned and educated on the importance of wildlife and their role in taking care of their interests while they are driving along the forest roads.

References

1. Shankar Raman, T.R. Death on the highways, Survey of the Environment 2009.

2. Boominathan, D. Road kills, A case study from Mudumalai Wildlife Sanctuary, 1998-1999.

Temples Tanks in Arid Lands

M. Amirthalingam

It is well known that human civilization has been linked to the availability of freshwater resources, with many a great civilization and empire having risen and fallen due to the power of water — the great equalizer.

Hundreds of years ago, when the spectacular array of temples, amongst the greatest expression of religious creativity, were being built in the vast, dry plains of Tamil Nadu, the creators of those magnificent temple complexes had, at the same time, also excavated sizeable water-tanks around the temples. Not only had these people understood the significance of water, but, more importantly, had elevated it to great sanctity. Water was treated as the foremost of the five elements (*pancha tattva*) and perhaps the primary reason in constructing these tanks must have been functional and entirely logical.
Going back in history across other parts of India too, one can trace the existence of water storage facilities at Mohenjo Daro and Harappa, and nearly every reign and kingdom has helped advance this concept of water storage, for domestic use and for agriculture. In *Arthashastra*, there is description of a well-organised system of specially created water tanks while the *Padma Purana* mentions in detail about the conservation of water tanks. Manu takes water tanks very seriously and recommends the imposition of the death penalty on anyone found damaging or destroying a water-tank.

Much of the plains of Tamil Nadu are characterized by an average rainfall of

under 1000 mm and a near absence of perennial rivers. Not surprisingly, this region was described as *vaanam paartha bhoomi* (land that looks at the skies – for rain!). In this context, creation of several kinds of water tanks made practical sense. The best known water-holding structures were the specially excavated water tanks around the many temple sites.

The two entities, the temple and the water-tank complemented each other, both serving an essential part of rural and urban life, of rituals and domestic use. The temple and the tank are linked in the term *kovil kulam*, meaning temple tank. Sacred place, deity and sacred water, the temple and the tank fulfilled all the requirements of pilgrimage.

Several temples had two tanks, one of which served to cleanse the pilgrim while the other was used for the deity's ritual bath or *abhishekham* and the site of the float festival; also, these helped nurture the gardens which provided flowers for the many rituals. These tanks served

more than just the ritual needs; they played an important role in the prosperity of the area by recharging the groundwater level and proved to be a boon for local ecology as well. There are more than a hundred water-tanks in the Chennai region alone, though most of these have fallen into a state of utter neglect in recent times."

Made of brick or plain earth, most temple tanks are rectilinear in shape. The original structure was a beautifully planned affair, with appropriately situated inlets to gather rainwater from surrounding areas and outlets for excess water. Even surrounding architecture was made in sync with the objective of enhancing the rain-harvesting potential of these tanks. For instance, many of the older homes had sloping roofs that facilitated the flow of rain-water into the tanks, some of which were even connected with one another through channels to enable optimum harvesting and use of water.

While religious and practical functions may have been instrumental in the evolution of this concept, the sacred tanks even became a social necessity, offering a meeting place for village people, an ideal location to spend long hours on hot evenings and an open-air theater for dance and music programmes. In the hot weather of this part of south India, water loss due to evaporation can be high and so, by introducing proper aquatic flora such as the lotus and water lily, steps were taken to reduce water-loss from evaporation.

Interestingly, the original names of many of the tanks too were sacred, a few of them even named after a sacred tree. Thiruvallikeni, the original name of the Parthasarathy temple tank at Triplicane, means 'tank of the sacred white lily'.

Alas, unplanned development and growth of the urban areas around the temple complexes has ruined many of the sacred tanks and while steps have been taken for the restoration of this beautiful concept, there is obviously a very long way to go because every day, fresh detergents, plastics and so much other refuse continues to flow into and corrupt our traditional wisdom, turning these sacred tanks into sewage tanks and adding to water woes.

An urgent programme to revive Chennai's temple tanks is essential to stave off the ever-increasing water shortages and droughts. Maintenance and regular cleaning of the inlet and outlet channels should be strictly followed. Recreation spaces around tanks must be developed to inspire and force people to keep them clean, and concrete flooring in the tanks must be avoided.

ECONEWS welcomes articles and news items from its readers. Please send them to

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Forest Fire and its effects on Biodiversity in Similipal Biosphere Reserve, Orissa

Pradeepta Nayak

Introduction

Similipal is very rich biodiversity area of Orissa where 96 species of orchids and about 3000 species of other plants grow, these includes 2 species of orchids are endemic, 8 plants species which are endangered, 8 species which are vulnerable and 34 other rare species of plant. There are 55 species of animals, 304 species of birds, 20 species of amphibians, 62 species of reptiles and 37 species of fish which collectively heighten the Biodiversity richness of Similipal. The Similipal Biosphere Reserve (SBR) located in Mayurbhanj district of Orissa (21º28'- 22º 08' N latitude and 86º04' - 86º37' E longitude) and comprising of 845.70 square kilometers. The climate of the reserve is influenced by a monsoon pattern of rainfall. The maximum rainfall occurs from mid June to October accounting for 75-80% of annual rainfall. In spite of high annual rainfall summer and winter are relatively dry, generally with <10cm monthly rainfall.

The amount of average annual rainfall is not correlated with elevation and generally ranges between 28.11 to 344.96 cm. Summer is not unbearable, as the maximum temperature rarely goes above 40 ^{0}C. Winter is severe and the temperature comes down to 4^{0}C in parts with frosts in valleys. Spring is very pleasant because of luxuriant vegetation cover and a network of perennial streams Similipal is relatively moist throughout the year. The humidity of Similipal at 0600 hrs is around 40% and at 1800 hrs is around 81% to 93%. The whole forest cover is divided into two parts both disturbed and undisturbed. The biodiversity of SBR has been lost day by day due both anthropogenic and natural activities. The two type of forests differ considerably in soil characters, canopy cover, light intensity on forest floor as well as tree density. Conflict arises on disturbed site due to resource access and in many instances over the character of particular resources.

The forest area is dominated by a number of tribes such as Kol, Santal, Bhumij, Mankidias and Khadias who depends on the forest for their food and medicine. The indigenous tribes those were lived in the forest for many hundreds of years, collect a number of non-timber forest products (NTFP) from the forest and it is their main source of income. From the commercial view point, the two most important NTFPs are the mahua (*Madhuca indica)* flowers and kendu (*Diospyros melanoxylon)*.The flowers of mahua are rich in carbohydrates and form the substrate for locally brewed liquor. The new, regenerated leaves of kendu are used in the *bidi* industry. It is well known that fire is used in the forest areas to initiate the coppicing of kendu plants and to facilitate the collection of mahua flowers. Unfortunately – and incorrectly – these activities are among the reasons commonly given for forest fires, pointing to the forest -dependent people as the

root causes of such fires. What escapes attention, however, is the poverty that these people live in.

Case study

Some cases were studied in the following places Lulung, Pithabata, Sitakunda, Baniabasa, Podadiha and other places of Similipal in Mayurbhanj (2012).

90% of new germinated seed and existing seedling were lost due to ground forest fire. For this reason, the forest cover decreases which is challenging for the forest and environment dept. These activities are also happening in the districts of Bolangir, Deogarh and Sambalpur in the state of Orissa. These districts have one of the highest forest covers in the state, and hence a significant proportion of their rural population is dependent on the forest for their subsistence, as well as for much-needed income. In order to generate a full picture of the dynamics involved, elaborate discussions will be held frequently with the forest dwellers, grassroots-level workers in a local non-governmental organization (NGO) working in the area and Forest Department officials at his sites.

At village-level meetings, it was ensured that there was maximum representation of women and village elders. The environment education among students, villagers and the local people of the nearby forest area should be conducted regularly. During the course of the study, it was found that most forest protection initiatives emerged only after the dependent community had started to feel the scarcity of resources. The frequency of occurrence and the management of forest fires seem to be closely correlated to the level of dependency that a community living in close proximity to the forest has over the forest. The reason of the poor management of the forest is that the state Forest Department lacks infrastructure and has poor budgetary allocations. It would be useful to encourage community-based initiatives as the most feasible mode of managing forest fires.

Effects on biodiversity

1. Loss of valuable timber resources,
2. Degradation of catchment areas,
3. Loss of biodiversity and the extinction of plants and animals,
4. Loss of wildlife habitat and depletion of wildlife,
5. Loss of natural regeneration and reduction in forest cover,
6. Global warming,
7. Loss of carbon sink resource and increase in percentage of CO2 in atmosphere,
8. Change in the microclimate of the area with unhealthy living conditions,
9. Soil erosion affecting productivity of soils and production,
10. Ozone layer depletion,
11. Health problems leading to diseases,
12. Loss of livelihood of the tribal people

Now a day every newspaper and article focus on elephant & human conflict. The most negative impact is put on the elephant habitat because of forest fires. Due to loss of natural habitat of the elephant basically the food of elephant i.e. the seedling and seed of *Diospyros melanoxyglon* (Kendu), *Peterrocarpus marsupium* (Piasal), brack of *Buchanania lanzan* (Chanhar or char), *Bambusa bambos* (Bamboo),*Careya arborea* (Kumbhi)and somehow *Sorea robosta* (Sal) has been lost . These trees are dominate the Similipal area and due to loss of the species the elephant could not get its nutrious food. Hence their population is reducing and they migrate towards the villages.

Preparedness and Mitigation Measures

- To keep the source of fire or source of ignition separated from combustible and inflammable material.

- To keep the source of fire under watch and control.
- Not allow combustible or inflammable material to pile up unnecessarily and to stock the same as per procedure recommended for safe storage of such combustible or inflammable material.
- To adopt safe practices in areas near forests viz. factories, coalmines, oil stores, chemical plants and even in household kitchens.
- In case of forest fires, the volunteer teams are essential not only for fire fighting but also to keep watch on the start of fire and sound an alert
- To arrange fire fighting drills frequently
- To create awareness among students and villagers or those who are staying near the forest area.

Conclusion

The population of India is growing very rapidly due to industrialization and improvement in medical facility. To fulfill of the basic requirements of human beings the natural resources are depleted day by day alarmingly. So many natural resources are there and forests are one of them which provide food, medicine, fodder and shelter to many animals. Basically, it is to regulate the temp i.e. CO_2 which is a hot topic for global warming and climate change. Due to forest fires the forest cover depleted and it is not a good sign for animals including man also. It very necessary and needed to control forest fires for sustainable development and the survival of future generations.

Bay Islands and Plastics

A. Gopal

The Andaman and Nicobar group of Islands (ANI) consists of 572 islands including islets and rocks which are lying along the arc in a long and narrow broken chain. The total geographical area of these Islands is 8249 sq.km. These islands have a population 3,79,944 (as per 2011 census). ANI represents fragile, ecologically sensitive and biogeographically significant ecosystem which is a mini hotspot of a large quantum of biodiversity. The Islands have protected bays, cays and mangroves which provide goods and services to its communities (bio-shields as natural defense to the vagaries of sea, fish as a food source, natural-harbour for navigation and reefs as well as mangrove sites for recreation).

Industrialized human society generates vast quantities of materials which lack proper recycling and end up as hazardous waste. The nature of these wastes has changed dramatically over the last few decades due to introduction of synthetic materials such as plastics. ANI faces solid waste management as a big challenge. The Islands are less polluted areas in comparison to other places but are vulnerable to environmental degradation ascompared to other parts of the world.

The modern world produces a lot of plastic waste as they are a cheap wrapping material and are good for air tight packaging etc. Though plastics are a major cause of concern in any part of

the world, it is a major problem for these islands too. The islands have asmall populated area but do have a large tourist inflow, which, on total, contributes huge plastic deposits as waste.

This waste is generated from different domestic and commercial activities which pollute these islands, in which a few domestic practices are elaborated here-under:

Household activities

Carry bags, oil bottles, cool drink bottles, cosmetic items and other grocery items and wrappers etc, are derived from household wastes. These wastes are dumped in the drains, roadsides and nallahs etc., which eventually stops the natural flow of water thus creating a lot of health hazards. The non composting character of plastic is very dangerous as it destroys the soils fertility and vegetative strengths. The day to day disposal of plastic waste from every dwelling unit is so huge that all of it contributes to a potentially very hazardous quantity of plastic waste.

Official programs and meetings

During various meetings and programmes conducted in the different parts of the islands, it was found that plastic contributes to a large extent for various purposes like serving eatables, tea and water in plastic glasses and cups which eventually lead to a major accumulation and contribute towards major part of plastic wastes in islands. The shameful part of the matter is that the island's major population is from the services sectors which comprises of educated people. Despite such a major part of the total population being educated mass, the awareness towards the pollution and hazards towards environment is neglected now a days.

Marriage and other ceremonies

The Andaman and Nicobar islands are called a mini India because of its varied culture and peoples from North to South and East to West (From every part of India) along with the primitive human beings i.e., tribals, and hence has a mixed culture. All the communities do have different types of culture and ceremonies. However, in any sort of ceremony plastic contributes a major part from serving eatables to sweets, and almost everything. Water and sweets are served in plastic cups and glasses. Each ceremony generates nearly 3000 to 4000 glasses and cups as wastage. It generates a heap of plastic in the islands, which contribute a huge deposit of plastic waste.

Tourism

Tourism contributes towards the major part of the GDP fof the Islands. The tourism sector has mainly flourished during the last few year. Tourists arrive from various parts of India and abroad. As the facilities extended for tourists are not up to the mark, the tourists are forced to use more and more of plastics in the form of pet jars and bottles as they are highly hygiene conscious mass. The table 1 shows the tourist flow for last few years:

Table 1: Arrival of tourist from 2008 - 2011

Year	Foreign	Domestic	Total
2008-09	12512	123914	136426
2009-10	13684	142042	155726
2010-11	14615	180781	195396

Source: Directorate of Economics and statistics

The plastic wastes contributed by tourists include litter left by beach goers, such as food and beverage packaging, cigarettes and plastic beach toys.

Festivals

'Bhoo-mithithal' (running on fire) is the famous festival celebrated in most of the temples around these islands. During the festival devotees are served with water, cool drinks, butter-milk on the entire stretch of their walk. All these are served in plastic glasses on the use and throw basis, which cause drainage gridlock from the plastic wastes which are dumped on the roadsides..

Hotels and tea stalls

Tea stalls and hotels selling tea in plastic cups and bottled water, also generate a lot of plastic wastes.

These islands are undulating in topography, and all the drainage systems and nallahs are connected to the sea, All its run-off from highland reaches coastal areas or near to small water bodies. Plastic bottles and plastic cups are among the most prevalent source of pollution and absorb pre-existing organic pollutants. The extremely slow decomposition rate of plastic bottles leaves them to drift from land to sea and remain as such for many years. When plastics break down, they don't become degradable and remains as such forever.

Plastics absorb toxins which contaminate soil, water ways, and animals which feed on these waste.

Issues with plastics

1. The plastics from bottles don't biodegrade – it is now a permanent part of our landfills.
2. Marine animals and sea birds become entangled in marine debris or ingest it. This can cause them serious harm and often results in their death.
3. Lightweight plastics also reach the sea from inland urban areas via storm and drain systems leading to nallahs and the sea.
4. Once it reaches the ocean, about half of plastic debris floats and can therefore travel on oceanic currents and reach thousands of miles. Consequently plastic has become widely dispersed over the oceans.
5. Plastic can damage the fragile ecosystem.
6. Plastic can cause many human diseases.

How tourists can help?

1. Individual tourists can do their bit by carrying their own reusable bottles and filling up with fresh clean water whenever they can.

2. Eco-conscious hotels should provide potable water and should keep water-filling stations. At least all tourist accommodations should give ample drinking water (boiled or UV processed)

Solutions

1. Avoid plastic bottles and cups
2. Restrict to bottled water and permit only reusable ones.

3. Reduce the amount of plastic bottled cool drinks
4. Avoid dumping the waste in the drains.
5. Do not throw in water bodies
6. Avoid plastic bottles entering to National Parks and wildlife sanctuary.

Conclusion

Plastic waste is the environmental threat of these islands. The foremost policy decision with respect to the islands will be to initiate a complete or partial ban on plastics. It is being implemented and a lot of awareness should go into this. Plastic creates landfills, entangles with mangrove roots, corals and sea beaches. Save the islands from the plastics and save tourism from plastic. It is imperative for the policy makers to enact schemes for salvaging the plastics already spread to in environment and proactively implement a total plastic ban for preventing further plastics going into the pristine seas of the emerald islands.

Alternate Sources of Energy

K. Sowmya

Energy forms the basis of human life and the backbone of technological and economic development. Coal, oil and natural gas are the commonly used sources of energy. They were formed around many millions of years ago when plants and other debris were buried and compacted in due course of time resulting in their lithification. Abundant amounts of energy is stored in these fuels, which upon burning gets relaeased. The biggest disadvantage of these non-renewable resources is that they cannot be replenished once they are used and they emit a lot of gases which pollute the environment, thereby causing global warming. Rapid increase in the use of energy has created problems in demand and supply. The crisis is due to the over exploitation of non-renewable energy resources.

Alternate sources

Alternate sources of energy viz solar energy, wind energy and geothermal biogas are perennial sources of energy. They are available all throughout the year and do not contribute to any gaseous emissions(except biogas in which case a small amount of methane is emitted) thereby proving environment friendly.

Solar energy

The sun is the ultimate source of all energy. India receives around 6000 billion megawatt of solar energy per year. In one hour the sun pours as much energy onto the earth as we use in a whole year. Electricity is produced from solar energy using devices called solar cells or photovoltaic cells which contain silicon. When solar rays fall on the cells, the electrons absorb the rays (photons) which are excited, thereby conducting electricity. Photovoltaic cells are small, square shaped semiconductors manufactured in thin film layers from silicon and other conductive materials. When sunlight strikes the PV cell, chemical reactions release electrons thus generating electric current. The small current from individual PV cells which

State	Gross Potential	Total capacity
Andhra Pradesh	8968	200.2
Gujarat	10,645	2175.6
Karnataka	11,531	1730.1
Kerala	1171	32.8
Madhya Pradesh	1019	275.5
Maharashtra	4584	2310.7
Orissa	255	-
Rajasthan	4858	1524.7
Tamil Nadu	5530	5904.4
Others	-	4
Total	**48,561**	**14,158**

(Source:http://www.eai.in/ref/ae/win/win.html)

are installed in modules can be used to power household units or stored in bulk.

Solar-thermal technologies use traditional electricity generating methods which involve using the sun's energy to produce steam, which in turn is used to drive an electric generator. Sometimes parabolic trough systems use reflectors to concentrate sunlight to heat oil, which in turn creates steam to drive a standard turbine. Parabolic dish systems concentrate sunlight to heat gaseous hydrogen or helium or liquid sodium to create pressurized gas or steam to drive a turbine to generate electricity. In States like Haryana it has become mandatory for every house to have a solar water heater installed. India plans to add 67,000 MW of electricity through solar energy by 2022. This helps in cutting coal imports by 30% and saving 5.5 billion dollars.

Wind energy

Energy of air in motion is called wind. Wind turbines rotate at a speed when winds blow over it. Wind turbine converts kinetic energy into mechanical energy which produces electricity. The working of wind turbines can be considered as a reversal of the working mechanism of a fan. India has enormous potential for generating electricity from wind.

Around 2.5 billion pounds of Co_2 emission is reduced per year due to the use of wind energy. The drawbacks include requirement of a huge area for setting up many heavy wind turbines. Also eagles, bats and other birds are killed accidentally when they get stuck in the rotating blades.

Geothermal energy

Geothermal energy is the energy in the form of heat stored in rocks and fluids inside the crust of the earth. The earth's crust is very hot and is called mantle. In order to obtain electricity, the earth's surface is drilled very deep and pipes containing water are made to pass through the earth's hot interior. The water gets heated to a very high temperature inside and is returned back to the earth's surface in the form of steam or hot water which is used to produce electricity. The heated water escapes to the surface through fissures in the form of hot water or steam. In the Philippines 25% of the energy requirements are met by geothermal energy.

Tidal Energy

Tides occur as a result of the gravity of the earth as it rotates on its axis. This kinetic energy of water can be harnessed to generate electricity. The energy from tides is harnessed. The technique is similar to that used in hydroelectric projects.

Bio mass

The organic wastes are collected and allowed to decay under anaerobic conditions. The microbes decompose the organic matter. This results in the production of gases like methane which can be used as fuel for cooking and the residue can be used as manure. It is estimated that 3 KW of energy can be produced using dung produced by a single cow during its entire life span. A plant that converts cow dung into energy has begun operation in the Netherlands and 1100 homes are expected to be benefited by this. Hence measures like this can go a long way in preventing the cutting of forests for firewood and minimize deforestation.

References

1. *Handbook on environment education for teachers*. (1998) 158-163.
2. The select Committee for energy Independence and Global warming. *http://global warming.house.gov.*
3. *http://www. Clean energy ideas.com/solar panels.htm.*
4. *Planet Earth*. August 2010, Vol 2, Issue 7.

Bioethanol from Algae - The Green Alternative

N. Yasaswini

Introduction

Global warming, urban pollution, oil reserve depletion and the high cost of fossil fuels, have been the driving forces for current research on the use of alternative energy particularly those derived from biomass (Arrendondo *et al.,* 2010). In the past decade, the development of biofuel production is regarded as the national strategy to solve energy and environment issues in many countries (Balat and Balat; Yan and Lin, 2009). Biofuels production from algae using the lipids in their cell wall has received special attention and is considered the best alternative to petroleum.

Microalgae as a Feedstock

Micro algae comprise a vast group of photosynthetic, auto/heterotrophic organisms, which have an extraordinary potential for cultivation of energy crops. Algal biomass is one of the emerging sources of sustainable energy. Depending on species, microalgae produce many kinds of lipids, hydrocarbons and other complex oils (Metzger and Largeau, 2005). The micro algal lipids are highly useful for the biodiesel or biofuel production. Thus, an alga serve as the best source and is gaining importance for its ability to replace fossil fuels and its capacity to inexpensively produce biodiesel and ethanol which is of strategic significance to an environmentally sustainable society. The micro algal biomass is known for its complex carbohydrates that are trapped in the cell wall which have to be released and converted to simple sugars for the microorganisms to utilize these simple forms for bioethanol production.

Importance of Bio fuels

Sustainable energy production has become a critical national economic and security issue. With the exhausting and more increasing consumption demands of fossil fuel resources, renewable energy has been considered as a means of controlling the atmospheric carbon dioxide and thus paves the way for the production of biofuels through algae. Currently, bioethanol has emerged as one of the most viable options in the area of non-conventional sources of energy (Zafar *et al.*, 2005). Thus bioethanol and biodiesel from algae *B.braunii* have been identified as an appropriate alternative for petroleum and also a non-polluting source of energy.

B. braunii - An Overview

B. braunii is a green, pyramid shaped planktonic microalga of the order Chlorococcales. It is widespread in freshwater of tropical and temperate areas, occasionally in brackish water (Volova *et al.*, 2003). This alga is characterized by a conspicuous ability to synthesize and accumulate a variety of lipids. The species is notable for its ability to produce high amounts of hydrocarbon, especially oils in the form of triterpenes. There are three races of B.*braunii* of which the B race is characterized by pyriform shaped cells that contains a hydrocarbon matrix in which these cells are held together.

Bioethanol

Ethanol from renewable resources has been of interest in recent decades as an alternative fuel to the current shortage of fossil fuels. Fruit peels, agricultural crops residue straw and sugar beet pulp are potential raw materials that are generally used in the production of ethanol and biodiesel. Bioethanol is alcohol which is produced through a process called fermentation from the raw materials that contain starch or sugars. Algae have emerged as one of the most promising feedstock for bioethanol production. Fermentation is a crucial step in bioethanol production. Ethanol is fermented from sugars, starches and cellulosic materials. The fermentation process is carried out by fermenting yeast Saccharomyces *cerevisiae* that helps in the production of ethanol. Enzymatic hydrolysis together with fermentation is called Simultaneous Saccharification and Fermentation (SSF).

Conclusion

With the inevitable depletion of the world's energy supply, there has been an increasing worldwide interest in alternative energy sources. Continuous use of petroleum sourced fuels is now widely recognized as unsustainable because of depleting supplies and the contribution of these fuels to the accumulation of carbon di oxide in the environment. In recent years, increasing research and development efforts have been directed towards the commercial production of ethanol as the most promising biofuel from renewable resources. These renewable raw materials look promising because they replace the environmentally unfriendly fossil hydrocarbon raw material and hence create "green" products.

References

1. Arredondo, V.I.H., Colorado, R.A.A. and Junior, O.D.S. (2010), Ethanol production process from banana fruit and its lignocellulosic residues, *Energy Analysis*, 35: 3081 - 3087.

2. Balat, M. and Balat, H. (2009), Recent trends in global production and utilization of bioethanol fuel, *Applied Energy*, 86: 2273 - 82.

3. Huang, G., Chen, F., Wei, D., Zhang, X. and Chen, G. (2010a), Biodiesel production by microalgal biotechnology, *Applied Energy*, 87: 38 - 46.

4. Metzger, P. and Largeau, C. (2005), Botryococcus braunii : A rich source for hydrocarbon, and related ether lipid, *Applied Microbiology and Biotechnology*, 25: 486 - 496.
5. Volova, T.G., Kalacheva, G.S. and Zhila., N. (2003a), Specificity of the lipid composition in two *Botryococcus* strains, the producers of liquid hydrocarbons. *Russ J. Plant Phys*., 50: 627–633.
6. Yan, J. and Lin, T. (2009), Biofuels in Asia, *Applied Energy*, 86: S1 – S10.
7. Zafar, S., Owais, M., Saleemuddin, M. and Husain, S. (2005), Batch kinetics and modeling of ethanolic fermentation of whey, *Int. J. Food Science Technol.,* 40: 579-604.

Importance of Mangrove Forests and their Management

J. Fowmitha Banu

Mangrove forests are unique in their structure and behavior. In India they are located along the east coastal region, particularly in the deltas of the Ganges, Brahmaputra, Krishna, Godavari, Mahanadhi, Cauvery, Andaman and Nicobar islands and the Gulf of Mannar. In Tamil Nadu they are found in Nagapattinum, Thiruvarur, Cuddalore, Ramanathapuram and Thanjavur districts. Among them, Sunderban in West Bengal and Muthupet and Pichavaram in Tamil Nadu are important places that may be mentioned. Mangroves are very vital coastal resources playing an important role in human life and socio economic development. A large section of the population depends on mangrove forests for their livelihood since mangrove forests supply forestry products like medicinal herbs, honey, wax, firewood, charcoal, timber, fishery products like fish, prawn, crab etc., For instance, the Sunderban mangroves provide employment to 2000 people engaged in extracting 111 tones of honey annually and it accounts for about 90% of honey production among the mangroves in India (Krishanmurthy, 1990).

Besides these, technically speaking the existence of mangroves protects the entire ecology and biodiversity of the region and supports ecotourism also. When we speak about ecology, mangroves are crucial in protecting the coastal region from solar UV-B radiation, greenhouse house effect, and the fury of cyclone flood, sea level rise, wave action and coastal erosion. Further, they help in providing a conducive environment for numerable varieties of fishes and other aquatic species. In short, they safeguard the entire flora and fauna of the ecosystem.

Mangroves have a mechanism to deal with intense sunlight rays and solar UV-B radiation. Mangrove foliage produces a substance of flavonoids that act as a UV screen compounds. Hence, mangroves make the environment free from the adverse effects of UV-B radiation. We can say that mangroves are carbon factories. Through photosynthesis mangroves are able to remove CO_2 from the atmosphere. They are capable of accumulating and storing carbon in the soil in large quantities unlike other vegetation. This may reduce the greenhouse effect and global warming and avoid adverse climate change.

Mangroves protect all types of communities from the fury of cyclones, storms and tsunamis. India in the past on several occasions has witnessed tragic flood and storm condition and in 2004 tsunami. During all such conditions, mangroves forest either minimized or protected the loss of life and properties. Mangroves have the ability of controlling floods as it has a strong root system. It has wide spread out roots deterring or acting as a shock absorber of flood and promotes sedimentation. Moreover, in addition to flood control, mangroves prevent the intursion of sea water inland and thus protect the underground water from salinity. The role of mangroves in the above activities is scientifically proved.

A mangrove system minimizes the action of waves and prevents the coast from erosion. Reduction of waves increases with the density of vegetation and the depth of water. Another important function of mangroves is trapping of sediments. Sediments have the ability to retain nutrients for habitats like fish and other wildlife species etc. Sediments have a high capacity for absorbing and holding heavy metals thereby preventing the spread of water pollution. Finally, mangrove litter decomposition causes nutrient enrichment of the surface soil in the mangrove forests.

In order to sustain these benefits to mankind and other species, an ideal mangrove management is very much necessary. In the wake of global warming, climate change and sea level rise unseasonal unprecedented storms and cyclones, we have to take several steps to protect the existing mangroves and expand the areas of cultivation by restoring activities for its prolific growth as a reasonable level of sea water intursion has to be maintained. In the mangrove areas, over exploitation i.e human stress on mangroves should be reduced considerably. People of the coastal regions, and other stake holders need to be given special training to protect mangroves. Identifying fast growing varieties of mangroves, producing saplings and distributing them to new areas to be cultivated should be followed .A special fund needs to be given by the Government for mangrove development. This will yield good and desirable results in mangrove growth and development, thus reducing the impact of climate change.

References

1. IUCN, Mc Leod, Elizebeth and Salm, Rodney.V, 2006. *Managing Mangroves for Resilience to Climate Change*. Gland Switzerland. 64pp.

2. Kathiresan, K. In *3.5 Importance of Mangrove Ecosystem*. Retrieved June 18, 2011 from *http://ocw.unu.edu/international-network-on-water environment-and-health/unu-inweh-course-1-mangroves/Importance-of-mangroves.pdf.*

3. Krishnamurthy, K. (1990). The apiary of mangroves. In: *'Wetland Ecology and Management: Case Studies'* (D.F. Whigham, D. Dykyjoya & S.Hejnyeds), pp. 135-140. Kluwer Academic press, Netherlands.

Birds in Indian Culture – Art and Mythology

T. Sundaramoorthy

Indian culture is deeply associated with many birds. Religious belief, mythology and folklore also play an important role in the conservation and protection of Indian birds.

Birds in Indian Art

Birds in Indian Art are used to express the kindness of human nature or tender human emotions. The Ajanta paintings of the 5th century CE give much importance to the swan, which appears in numerous sculptures and paintings and represents the highest principles of life. The goose is a good illustration of what is probably a tribal totem. The goose is referred to as a swan in the *Bhagavatha purana*, *Vishnu purana* and *Linga purana*. The goose is also a favourite Buddhist emblem. A flock of goose is depicted upon the Lion Pillar at Bettiah in Tirhut. Vishnu and Lakshmi riding on Garuda (*Haliastur Indus*) are depicted in paintings from Rajasthan.

The illustrated manuscript of Babur's memoir, the *Babur Nama*, has rare pictures of birds. The 18th century Kangra school of painting has used the crow, the parrot and peacock motifs profusely. The crow is a favourite subject in Rajasthani miniatures and Pahari paintings.

Birds in Indian Mythology

In the story of Nala and Damayanti, a flock of geese arranges the meeting between the lovers. Among the animals associated with megalithic burials (300 BCE – 100 CE) is the fowl. Vishnu soars above the earth on Garuda, the golden eagle hawk, who is faster than the wind. Brahma's mount is hamsa the swan. Muruga, the god of the Tamils has a peacock as his vahana. The peacock is called Paravani. In Buddhist mythology, the peacock is a symbol of compassion and watchfulness. Buddhist and Jain legends and folklore contain numerous references to this bird. In Hindu mythology, Jatayu, the vulture king (*Gyps.sp.*), fought bravely with King Ravana to save Sita. The vulture is also referred to as the vahana of Ketu. Hawks and eagles appear in the folklore and mythology of various cultures.

The welcoming caw of a crow indicated to a lonely women her lover's speedy return. The Kheshgi Pathans of Qasur will not kill doves or pigeons. The Muslims rank doves and pigeons as the Sayyid of birds.

In many mythologies, hawks and falcons are associated with the sun god. Eagles are associated with the sky gods and represent spiritual power, majesty, victory and ascension. The Parsis believe that the earth, water and fire are sacred and should not be polluted by dead bodies. Hence burial and cremation of dead bodies are prohibited. They lay their dead bodies in special funeral sites (The Towers of Silence) where the bodies are eaten by Griffon vultures.

The crow is the vahana of Shani (Saturn). There are a few myths about the crow. Once the crow was a white bird but was punished for some wrong-doing and its feathers became black, often through burning.

Thirukkalukundram is named after the eagle (kalugu in Tamil). However earlier

studies show that the place is associated with the vulture (*Neophron percnopterus*). The Brahminy kite is referred to as Garuda and is associated with both Hindu and Buddhist mythology. Garuda is the Hindu name for the constellation Aquila and the Brahminy kite is considered to be the contemporary representation of Garuda. In the Hindu religion, Garuda is a lesser Hindu divinity, usually the mount (vahana) of the God Vishnu. The bird Garuda is depicted as having the golden body of a strong man with a white face, red wings, and an eagle's beak and with a crown on his head. This ancient deity was said to be massive and large enough to block out the sun.

Garuda is also known as the enemy of the Naga serpent race and known for feeding exclusively on snakes. Such behaviour may have referred to the actual short-toed eagle of India. The image of Garuda is often used as a charm or amulet to protect the bearer from attack by snakes. The king of birds is an implacable enemy and "devourer of serpent". Garudi vidya is the mantra against snake poison to remove all kinds of evil. The *Garuda Upanishad* and the *Garuda Purana* are fully devoted to this bird. The other names of Garuda referred to in literature are Chirada, Gaganeshvara, Kamayusha, Kashyapi, Khageshvara, Nagantaka, Sitanana, Sudhahara, Suparna, Tarkshya, Vainateya and Vishnuratha. The worship of Garuda is believed to remove the ill-effects of poison from one's body. In Tamil Vaishnavism, the Garuda is known as "Periya Thiruvadi".

In the *Bhagavad Gita*, Lord Krishna says, "I am in the form of Garuda, the king of the bird community". This indicates the importance of Garuda. Garuda plays an important role in the Krishna *avatara* in which Krishna and Satyabhama ride on Garuda to kill Narakasura. Lord Hari rides on Garuda to save his devotee, elephant Gajendra.

In Buddhist mythology Garuda is known as Suparna, meaning "well-winged, having good wings". The black-necked crane, with its all-white body and black serpentine head and neck, especially symbolizes the union of wisdom and compassion. The rose-ringed Parakeet (*Psittacula krameri*) is associated with the Goddess Meenakshi, who is depicted holding a parakeet in her right hand. The bird is also associated with Sri Andal, the renowned saint of Vaishnavism. The cock (*Gallus gallus*) is the emblem on Lord Murugan's battle flag. It is also associated with the goddess Kamakhya in Assam. Goddess Saraswati is associated with the swan. A white swan is often located next to her feet. Due to her association with the swan, Goddess Saraswati is also referred to as Hamsa-vahini.

Garuda is also used as a symbol. The Garud Commando Force is a special force unit of the Indian Air Force, specializing in operations deep behind enemy lines. The Brigade of Guards of the Indian Army uses Garud as their symbol. The elite bodyguards of the medieval Hoysala kings were called Garudas, because they served the king in the way that Garuda served Vishnu. Garuda rock is a rocky cliff in the Tirumala hills in Andhra Pradesh. The 13th century Aragalur chief Magadesan's insignia were Rishabha, the sacred Bull, and Garuda. The national emblem of Indonesia is Garuda.

Conclusion

It is evident that Indian literature is replete with references to Indian birds. There is a need to do further research on the subject, especially the aspects relating to the Hindu religion and Indian paintings.

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