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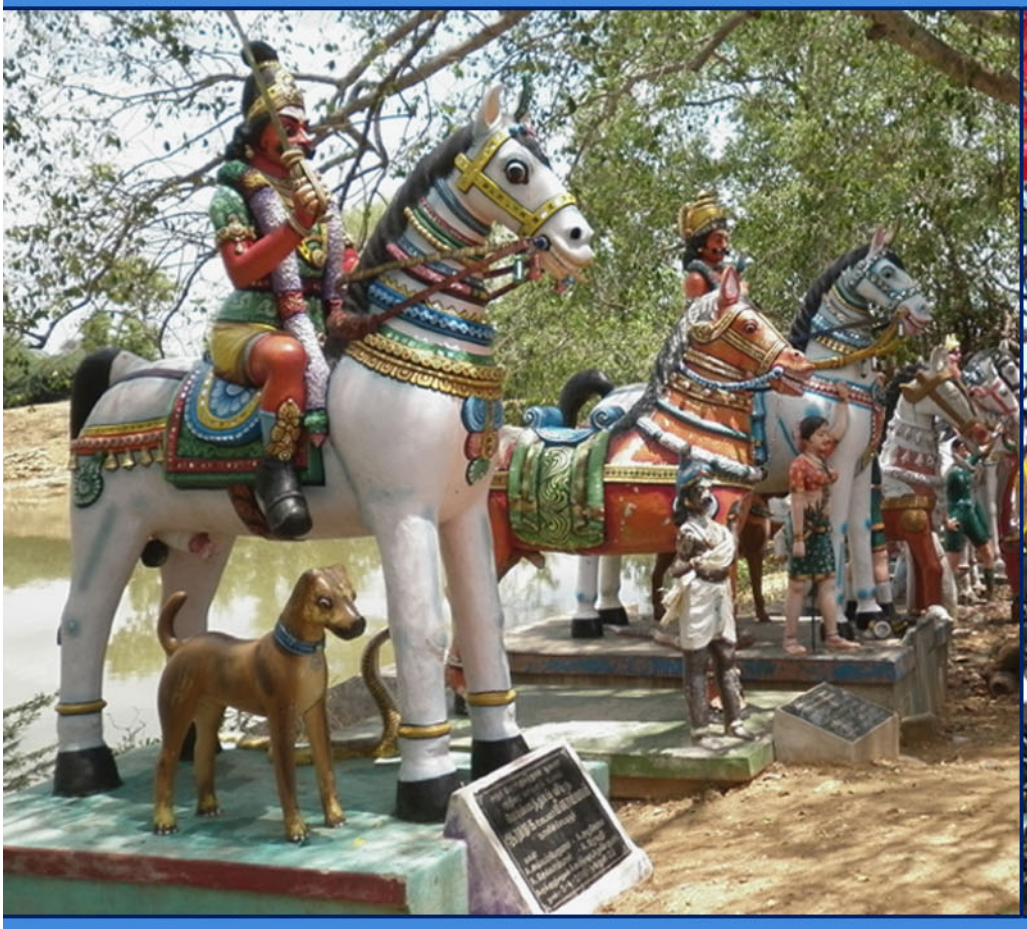

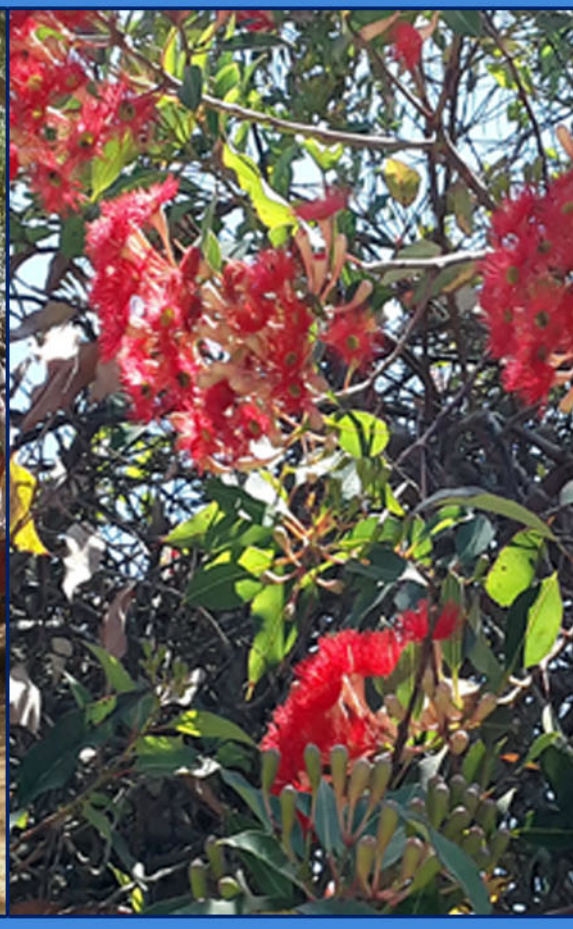

C.P.R. ENVIRONMENTAL EDUCATION CENTRE

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C.P.R. ENVIRONMENTAL EDUCATION CENTRE

Established in 1989

- ✯ **1980** - The C.P. Ramaswami Aiyar Foundation starts nature education for teachers and students.
- ✯ **1989** - C.P.R. Environmental Education Centre (CPREEC) established jointly by the Ministry of Environment and Forests and the C.P. Ramaswami Aiyar Foundation as a Centre of Excellence of the Ministry of Environment and Forests. Government of India.

Our Mission

- ✯ To increase knowledge, awareness and interest among the public about the environment in all its aspects
- ✯ To develop resource materials for environmental education and awareness raising
- ✯ To conduct training programmes for a wide cross-section of people
- ✯ To take up environmental projects for demonstration and research

Our Activities

- ✯ Training and awareness raising
- ✯ Awareness to and through action
- ✯ Awareness programmes in ecologically fragile areas
- ✯ Conservation of the ecological heritage
- ✯ Research and surveys
- ✯ Generation of resource materials
- ✯ Exhibitions
- ✯ Courses, seminars and symposia

Facilities

- ✯ Environmental Laboratory
- ✯ Library
- ✯ Computer Division
- ✯ Publications Division

Geographical Spread

CPREEC's activities extend to

- ✯ Andaman & Nicobar Islands
- ✯ Andhra Pradesh
- ✯ Goa
- ✯ Karnataka
- ✯ Kerala
- ✯ Maharashtra
- ✯ Orissa
- ✯ Tamilnadu
- ✯ Puducherry

NGO Network

CPREEC has an extensive network of about 600 NGOs. All educational programmes are carried out in partnership with select NGOs, Universities, Colleges and Schools.

Publications

- ✯ Activity and information books and pamphlets for children
- ✯ Environmental training guides and kits for teachers
- ✯ Researched Publications
- ✯ Colourful and informative posters
- ✯ *ECONEWS* - A quarterly magazine
- ✯ *Indian Journal of Environmental Education*, a peer-reviewed journal

Exhibitions

CPREEC designs three new exhibitions every year and has a bank of mobile exhibitions that travel all over India.

Environmental Education

- ✯ Green Schools of India (GSI)
- ✯ Training programmes for Teachers
- ✯ Training programmes for School and College Students
- ✯ Environmental Law Education

Special Projects

- ✯ National Green Corps (NGC)
- ✯ Biomedical Waste
- ✯ Biodiversity Conservation

Research and Surveys

- ✯ Sustainable Technologies
- ✯ Surveys of Natural Resources
- ✯ Socio-Economic Surveys
- ✯ Lab to Field Technology Transfer

Contents

Food waste and its impact on the environment

Dr. P. Sudhakar

The farm product which comes to the retail stores looks good in colour and shape. The ones which are odd shaped ugly and with fewer colours are rejected, but the amount of water used is the same which is used for both "good looking and ugly" food & fruity vegetables. Most of the developed countries produce three to four times more than the nutritional needs of their citizens, and throw away the excess. The food produce is either spoiled while transporting or wasted by the consumers in wealthier countries. The availability of food is more in the developed countries and they are not aware of the food that is being wasted and the impact it has on world hunger, environment and climate change.

There is a difference between food loss and food waste. Food loss happens mostly in developing countries during production, transportation and storage. Food waste happens at the retail and consumer level.

In the developed countries, the food waste occurs at two levels, namely, the consumer and the producer. "The consumer buys more and throws the rest; farmers leave up to 40 percent of harvests rotting in the fields because their produce does not conform to the perfect size or shape of the big supermarkets' demand," (Tristram Stuart, 2009). In India, the farmers leave their crops to rot if the procuring rates are low. According to the FAO, industrialized nations waste 1.5 trillion pounds of food a year, an amount almost equal to the entire net food production of sub-Saharan Africa. Food waste indirectly leads to deforestation, biodiversity loss and depletion of aquifers.

It is estimated that nearly 8.5 crore people go to bed hungry every night, but the irony is that more than 75% of the food that is produced which is nearly 130 crore metric tons never reaches the plate. The total loss of money is about fifty thousand crore rupees in the developed countries alone. Apart from the loss of money, more than 3.3 billion metric tons of carbon dioxide is generated in the process of producing, harvesting packaging and transportation.

Food waste is the largest emitter of greenhouse gases in the world, behind the United States and China. The water used for producing food crops ends up being thrown away. This could meet the domestic water needs of nine billion people (Tristram Stuart, 2009).

In India, nearly 80% of our fresh water is being used for agriculture to grow more water intensive crops like rice, wheat and sugarcane. The present drought situation that is prevailing in most parts of central and western India can be attributed to the excess usage of ground water, which in turn as dried up the aquifers.

The crops raised are sent to warehouses for storage where they are left to rot. The impact on the amount of water used

to raise the crop and the amount of fossil fuel used in transporting the grains is never assessed.

It is estimated that India loses an estimated 35 to 40 percent of its fruits and vegetables due to poor packing, cooling and transportation. As individuals, let us buy only what we require and restrain from unrestricted buying and wasting of food products.

It is high time that the policy makers, producers and consumers come together and develop a mechanism/system which prevents food waste and in turn protects the environment.

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Awareness on Biodiversity Conservation

Dr. T. Sundaramoorthy

The International Day for Biological Diversity is observed every year on May 22nd since the year 2002. Every year, the Convention on Biological Diversity (CBD) Secretariat announces a theme for celebrating biodiversity day. This year, the theme is **Mainstreaming Biodiversity: Sustaining People and their Livelihoods**. The thirteenth meeting of the CBD will take place at Cancun, Mexico from December 4 to 17, 2016 and will focus on mainstreaming of biodiversity within and across sectors.

The themes so far .....

Year	Theme
2002	Dedicated to Forest biodiversity
2003	Biodiversity and poverty alleviation – challenges for sustainable development
2004	Biodiversity: Food, Water and Health for All
2005	Biodiversity: Life Insurance for our Changing World
2006	Protect Biodiversity in Drylands
2007	Biodiversity and Climate Change
2008	Biodiversity and Agriculture
2009	Invasive Alien Species
2010	Biodiversity, Development and Poverty Alleviation
2011	Forest Biodiversity

Year	Theme
2012	Marine Biodiversity
2013	Water and Biodiversity
2014	Island Biodiversity
2015	Biodiversity for Sustainable Development

The Conference of Parties (CoP) under the Convention of Biological Diversity (CBD) meet at regular intervals. The 10th CoP was held at Aichi District, Nagoya, Japan and the CoP arrived at the Nagoya Protocol on Genetic Resources and Aichi Targets for Biodiversity Conservation.

There are twenty (20) Aichi Biodiversity targets, of which the first target is very important for conserving biodiversity. The target is, "*By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably*". To achieve the goal of the above target, the countries of the CBD framed their own strategies. The International Day for Biological Diversity (IBD) is a common celebration in all the countries of the world. India is one among the mega biodiversity countries of the world.

In this article, I am summing up the various steps taken by the Indian Government through the Ministry of Environment, Forests & Climate Change (MoEF&CC) to achieve the Aichi target –

1. The main objective is to recall the commitments and ensure biodiversity conservation in our country.

To achieve the twenty Aichi Biodiversity targets, the MoEF&CC has prepared the National Biodiversity Action Plan (NBAP) in 2008. The NBAP was developed and updated in consultation with various ministries of the Government of India during 2014. In order to fulfill the twenty Aichi targets, twelve national biodiversity targets have been set by MoEF&CC.

Indian target

"*By 2020, a significant proportion of the country's population, especially the youth, is to be made aware of the values of biodiversity and the steps they can take to conserve and use it sustainably*".

INDICATORS TO ACHIEVE THE TARGETS IN INDIA

Description of indicator	**Responsible agencies**
Number of students opting for higher – level elective subject and specialization in environmental education (EE)	ISC/ICSE and CBSE Boards
Suggestions	
A comprehensive book on Biodiversity Conservation may be prescribed for the students throughout the country to increase their awareness level.	
Number of schools enrolled in the National Environmental Awareness Campaign, National Green Corps – Eco Clubs Programme, Paryavaran Mitra	MoEF&CC, Youth for Coastal Marine Conservation, South Asia Youth Environment Network (SAYEN), Ministry of Human Resource Development

Description of indicator	Responsible agencies
(Friends of the Environment) Programme, Global Learning and Observation, Gyan Vigyan Vidyalaya, bird watching clubs, DNA Clubs (DBT's Natural Resource Awareness Clubs), etc.	(MoHRD), Department of Education Centre for Environment Education (CEE), C.P.R. Environmental Education Centre (CPREEC), Centre for Media Studies (CMS), Department of Biotechnology (DBT)
Suggestions	
The number of schools covered under NGC may be increased and provided additional funds to improve the activities. The MoHRD carries its activities through SCERTs. The NGOs and CBOs have been left and the reach will be much higher through these sectors. The number of participating agencies under NEAC may be increased to reach more stakeholders and the theme on Biodiversity Conservation should be retained for a minimum period of three years to increase the awareness level.	
Trends in coverage of environment related programmes and projects with enhanced involvement of youth	Ministry of Sports and Youth Affairs (MoSYA)
Suggestions	
District Nehru Yuva Kendras may be persuaded to participate in the National Environmental Awareness Campaign or conduct more programmes on biodiversity conservation to increase the awareness levels among the youth.	
Trends in visits to protected areas (PAs), natural history museums and exhibitions and zoological / botanical gardens	State forest departments (Wildlife Wing), Central Zoo Authority (CA), CEE
Suggestions	
State Forest Departments should conduct more programmes for school students in the Zoo's and establish Interpretation Centres to educate people on biodiversity conservation.	
Trends in number of Biodiversity Management Committees (BMCs) constituted/operationalized. Trends in number of People's Biodiversity Registers (PBRs) prepared.	National Biodiversity Authority (NBA)/ State Biodiversity Board (SBBs)
Suggestions	
Twenty nine states have established SBBs and may take adequate steps to form more BMCs and prepare more PBRs.	

Description of indicator	Responsible agencies
Trends in number of Joint Forest Management Committees (JFMCs) constituted / operationalizedTrends in number of civil society organizations / NGOs, Panchayati Raj Institutions, Community Forest Rights (CFR) Committees (under Forest Right Act (FRA), 2006) engage in creating environmental awareness	State Forest Departments, MoEF & CC CEE Ministry of Panchayati Raj (MoPR) Ministry of Tribal Affairs (MoTA)
Suggestions	
The number of JFMCs to be increased to improve the awareness level among the stakeholders. The Ministry of Panchayati Raj (MoPR) and the Ministry of Tribal Affairs (MoTA) should contribute more to improve the awareness level among the stakeholders.	

With the increasing population in our country, the short term Aichi target will certainly be achieved with the active participation of various agencies in spreading the message of biodiversity conservation. The youth population is quite high in our country and their knowledge on biodiversity conservation may be tapped and they may be made to play a crucial role in using the social media to spread the message.

Source

1. *National Biodiversity Action Plan* (NBAP), Year 2014
2. *Convention on Biological Diversity* (*https://www.cbd.int/sp/targets/*)

Persistent Organic Pollutants (POPs)

U. Thirunavukkarasu

Industrialization and Chemicals

The world has witnessed a great surge in industrial production in the late 40s. Numerous chemical compounds were used in many industrial applications and in processes like crop production, pest control and pharmaceuticals. The same chemicals which have wide industrial purposes appear to affect human and environmental health. Certain chemicals remain in the environment and travel through the food chain and bio-accumulate in the living system.

Persistent Organic Pollutants

Persistent Organic Pollutants (POPs) are organic chemical substances that are persistent in the environment, resisting degradation and cause adverse effects to life and environment. They are known to bio-accumulate and travel through the food chain. The common examples of POPs are pesticides like DDT, poly chlorinated biphenyl (PCBs) and Dioxins.

Stockholm convention on Persistent Organic Pollutants

Considering the dangerous effects of POPs on human and environment health, the United Nations through its constituent body United Nations Environment Programme (UNEP), deliberated the issue among the member countries and led to the Stockholm Convention on Persistent Organic Pollutants on 22nd May 2001. The convention came into force on 17th May 2004. At the global level, there are 179 countries complying with the convention and still many countries are in the process of ratifying it. The convention greatly dwells upon the "dirty dozen"- the twelve most notorious persistent organic pollutants. The "dirty dozen" are primarily classified into three groups viz 1.Pesticides 2.Industrial chemicals 3.By- products. They are Aldrin, Chlordane, DDT, Dieldrin, Endrin, Heptachlor, Hexachlorobenzene, Mirex, Toxaphene, Polychlorinated biphenyls (PCBs), Polychlorinated dibenzo-*p*-dioxins (PCDD) and Polychlorinated dibenzofurans (PCDF).

Source of Persistent Organic Pollutants

The major source of POPs is manmade. Some are intentionally produced (e.g. pesticides like dichlorodiphenyl trichloroethane (DDT) and Dieldrin) some other POPs unintentionally arise through the processes (e.g.: dioxins and poly chlorinated dibenzofurans). The natural sources of POPs are very minimal and the

known natural sources are -volcanoes and biosynthetic pathways.

Trans-boundary movement of Persistent Organic Pollutants

The Persistent Organic Pollutants are known for its trans-boundary movements. POPs can travel long distances and are known to affect distant places from its source. A country of POPs production affects a non POPs producing country also. The issue of POPs remains a trans-boundary international problem. POPs may travel either as gaseous matter or attached to particulate substances in the air and return to the ground through snow, hail or rain. It also travels through oceans and rivers. Since POPs are less-water soluble, they gets deposited or attached to sediments and particles in the water. On disturbance, they may get reintroduced to the aquatic or land based ecosystems. Recent studies suggest that the raising micoplastic pollution in our water bodies and oceans greatly enhances the risk of POPs.

POPS are lipophilic, they pass through the food chain and gets stored in the fat of living organisms. They get magnified when POPs pass from one organism to another or species to other.

Persistent Organic Pollutants and Diseases

The persistent organic pollutants cause diseases ranging from immunological to reproductive, behavioral, developmental and neurological problems in humans and animals. The major source of POPs to humans and animals are through food and in some cases through water. The deteriorating health of marine organisms and related surge in the diseases due to POPs can be positively co-related.

The Way out

The current approach in managing the POPs induced health crisis is of avoidance rather than removal from the eco system. The Stockholm Convention and the scientific studies on the source, movement pattern, bioaccumulation, biomagnifications, impact on the organisms and etiology recommends avoidance and restraint of POPs usage in various industrial and societal application rather than recovering it through doubtful technological measures (photo catalytic degradation).

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1. *www.epa.gov/*
2. *www.wikipedia.org*
3. *https://treaties.un.org*
4. *http://chm.pops.int/Convention*
5. *http://www.cep.unep.org/*

Exotic Avenue Trees for Hill Stations

M. Kumaravelu

The Nilgiris encompass a great plateau and are spread over 2543 sq.km. The Nilgiri hills stand aloft from the plains, descend steeply into the Mysore plateau northwards and merge with the Western Ghats in the north-west, west and south-west. Varied elevations and soil types, including black, brown, yellow and red soil support innumerable plant species. Over 2700 species of flowering plants, 160 species of fern and fern allies, countless types of flowerless plants, mosses, fungi, algae, land lichens are found in the shoals (Montana forest) of the Nilgiris. Besides the thorn scrub, dry & moist deciduous forest, wet evergreen forest and marshes have a number of plant species. Most of the plant species found within the above said forests are native to the region concerned.

During the mid 19th century, a number of exotic species from Europe and Australia were introduced in the Nilgiris. Particularly, tree species like Black Wattle (*Acacia mollissima*) and Blue Gum (*Eucalyptrus globulus*) were most successfully introduced in the Nilgiris. In the year 1932, Captain Dun introduced Australian Black wood (*Acacia melanoxylon*) and silver wattle (*Acacia dealbata*). In due course, a few deodars and pines were introduced in the Nilgiris. Blue gum was introduced to meet the firewood supply for the locals and wattle for tannin content from its bark. Blue gum trees came in useful for the extraction of Eucalyptus oil and the supply of industrial materials, particularly for India Viscose Ltd., and TAN India Ltd.

However, some of the Eucalyptus species were grown as avenue plantation since it has beautiful flowers. Some other exotic trees like Jacaranda and Gulmohur were also introduced as avenue plantations within the public gardens and road side.

Eucalyptus ficifolia

Eucalyptus trees grow large in size. Some of the species reach 300 feet in height. And some of the Eucalyptus species yield valuable oil, pulp and firewood. Among the 140 species of Australian origin in the Nilgiris, the Eucalyptus globules and *Eucalyptus grandis* have been the most successful.

Eucalyptus ficifolia is one of the most splendid and ornamental variety. Normally, this tree flowers between May and August. The flowers are borne on panicles of 5 to 7 flowers on long stalks rich red colours over the dark green foliage. *Eucalyptus ficifolia* is commonly known as Red flowering gum. This tree grows up to 40 feet mostly at a higher elevation, between 1500 and 2000 msl. This tree is grown at this elevation; the flowering is tremendous. During the flowering season, entire trees have flowers and a splendid appearance. The, comfortable canopy of this tree provides a home for nesting birds also.

Jacaranda mimosifolia

Jacaranda is native of Brazil, and widely introduced in India. Jacarandas planted in the plains have a poor flowering status. This tree blooms nicely in hilly areas. This tree flowers during March to May every year. The blue flower attracts many people as well as bees during the flowering season. Well grown jacaranda spreads branches as an umbrella and stands as a shade tree. This is a highly suitable tree for dry areas as well as hilly terrain.

Poinciana regia

Poinciana regia is commonly known as Gulmohur or Peacock flower. Gulmohur is a native of Madagascar Island, also found all over India. This tree is suitable for the plains as well as hilly regions. It is an evergreen tree, more like umbrella. Flowers vary from light orange to deep-crimson in colour. Normally, flowering is between April to June. High time for flowering is during May; hence it is called the May Flower Tree. It is a most suitable tree for avenue and ornamentation, and can be planted between 500 to 1500 msl. in the hilly track.

In general, exotic tree species do not have much capacity to protect the ecology of the area where they have been introduced. To protect the local varieties and to reduce the impact on the local environment, in the year 1989 the Government of Tamilnadu ordered the further expansion of exotic species, particularly Blue gum. However, some species like Eucalyptus, Jacaranda, Gulmohur can be planted in public parks and along the roadside. Roadside plantations can be aesthetic as well as reduce the pollution from vehicular emissions such as CO_2 and noise.

Acknowledgement

The author of this article expresses his gratitude to Dr. S. Rajan, scientist, Ministry of Ayush, who helped in studying the exotic tree species.

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Folk deities associated with the sacred groves of India

M. Amirthalingam

Sacred groves are small patches of forest left untouched by the local communities and protected by the local folk deities. Several such groves are reported in many parts of India. The deities protecting the sacred groves vary from state to state. In India, dedicating groves to the local deities is a common practice of pre-agricultural, hunting and gathering societies. Also, it safeguards many plant species like trees, climbers, orchids and ferns and they also provide food and shelter for myriad of birds and animals which otherwise would have become extinct. It is a naturalist's paradise and now playing a crucial role in the conservation of forests, water and soil.

India is a country of sacred cows, sacred monkeys and sacred trees, sacred ponds, rivers, mountains, precincts and sacred groves which are protected by some deities. These deities are generally mother goddesses which are primitive in nature. The mother goddesses are usually found in the form of unshaped stone lumps smeared with vermilion, lying in the open air.

Sacred groves dedicated to the deities are found throughout India. The deities may be of male or a mother goddess, animals and ancestors (Patnaik and Pandey, 1998). At the dawn of religious thinking, deities were imagined by primitive societies to reside in stones, trees, animals and woods. Kosambi (1962) and Gadgil and Vartak (1976, 1981) state that most of the cults associated with the sacred groves in Maharashtra are Mother Goddess cults. The deity is generally feminine, as indication of its origin in early times, when birth was still the most miraculous of all events. The mother goddess never has a male consort, a reminder of the age when marriage in the present form was totally unknown. The red paint smearing the goddess represents, of course, the blood of sacrificial victims. In West Bengal, the cults surrounding the sacred groves range from tribal deities and ancestral spirits to deities such as Kali, Sitala, Manasa (Dev, 2007). Deities such as Grama Devta, Jaher, Sitala, Manasa, Bhairabhi, Sabitri, Gouri, Chakrasini, Santalburi, Jugithakur and Kali are the folk deities which are protecting the sacred groves in the Midnapore district of West Bengal (Malhotra, K.C., S. Stanley, N.S. Hemam and Ketaki Das, 1997).

The presiding deities of the sacred groves in Karnataka are its sacred groves. The groves in the state broadly come under two classes: smaller groves or *kans* (these are entirely protected) and larger groves or *devarkadu/devarkan* (these groves also function as a resource forest offering both sustenance and ecological security) and Jatakappa, Bhutappa and Choudamma, Mailara, Bhairava and

Govardhan are some of the other deities to whom these groves are dedicated.

Sacred groves in Kerala are locally known as Ayyappan *kavu* or Sasthan *kavu*, Bhagavathi *kavu* or Amman *kavu*, Vanadevatha and Cheema or Cheerumba depending upon the ownership and the deities to whom these groves are dedicated.

In Maharashtra, the principal deity of the Mahadeokoli is Maruti. The male forest gods are Vaghoba, Vira, Cheda, Bhiroba, Khandoba, Vetal, Mhasha, Chevata, etc. The deities may be installed in a forest patch or even under a single tree. Female deities include Kamaljai, Mariai, Bhavani, Bhagvati and Tathawade. Sontheimer (1989) traces the origin of Khandoba to the worship of the ant-hill, the seat of snakes, Goddess Shirkai in Poona district. In southwest Bengal and in Koraput district of Orissa, the deities are mostly female (Hemam, et. al., 1997; Malhotra, et. al., 1997). In Tamil Nadu, sacred groves are guarded by folk deities and sprits (vanadevathai) such as Aiyanar, Sastha, Muniyappa, Karuppuswami, Veeran, Andavar and goddesses such as Selliyamman, Kali, Ellaikali, Ellaipidari, Sapta Kannis, Pechiyamman, Rakkachiyamman and Nagadevadhai (Amirthalingam, 1998).

The tribes of Chhattisgarh believe that the goddess Mata is residing in the groves such as '*devgudi*' and '*Gaondevi*' and guarding them.

In Uttaranchal, the Dev Vans are dedicated either to goddess Nanda, Hariyaji, Kotgari, Aeri, Kanardevi, Kalika, Kokila, and Chamunda or to a male deity like Haru Saim, Gangnath, Chaumu, etc. One such example is Shyahi Devi forest in Almora, which was recently offered to the goddess for conservation.

Sacred groves of Kalbisht, Chamarkhan, Chitai and Ghorakhal in the Kumaun region of Uttarakhand are supposed to be protected by the folk deities such as Golu/Gwal/Gwel Devta or Goria baba (Dhaila and Adhikari, 2007).

The 'Umanglai' (sacred deities or sylvan-deities) of Manipur are the only mysterious deities believed to reside in the sacred groves. Mayokpha sacred grove at Elangbam Leikai Keisamthong is associated with the deity 'Pungjao Lakpa', an incarnation of 'Pakhangba' (snake). There are sacred groves associated with snakes and provide natural shelter for birds and mammals, particularly the Rhesus monkey and flying fox (Ashalata Devi, Khan and Tripathi, 2004).

In Tamil Nadu, sacred groves are guarded by the folk deities and spirits (vanadevatai) such as Ayyanar, who is a guardian deity; Sastha, Muniyappa, Karuppuswami, Veeran are the *Kaaval teivam* or protective deity); Andavar is believed to a powerful wish-fulfilling deity; and goddesses Selliyamman, Kali, Ellaikali, Ellaipidari, Pechiyamman, Rakkachiyamman and Nagadevadhai are the deities of fertility and wealth and the Sapta Kannis are the deity which are associated with streams that is the source of water (Amirthalingam, 1998).

It is interesting to note why the sacred groves are offered to the local folk deities. The reason is that these deities are associated with the local people's socio-religious and socio-cultural life and thus these groves are protected with fear and faith. People believe that any damage to the sacred grove, harm to the fauna residing in it or felling of any tree may invite the wrath of the local deity, causing diseases and failure of agricultural crops. Even taking a dry twig is forbidden in the groves. Therefore, many people

will not even take dead wood out of the sacred groves. Folklore plays an important role in conservation of sacred groves. Not only tribal people, the rural people also preserve the sacred groves by their traditional customs, rituals, ceremonies and folk-beliefs.

Ecologically, sacred groves play an important role in the conservation of species diversity. It is a home for indigenous flora and fauna, which contains some endangered, rare and threatened and indigenous medicinal plant species. Maintenance of soil fertility is done by decomposing the leaves, wood and twigs. Thus, the nutrient cycle is maintained. It controls the soil erosion and surface water runoff and thus retention of subsoil water and recharging the ground water level is managed. They also serve as a seed source through dispersal by birds for the ecological restoration of degraded landscapes. It represents the last remnants of the native vegetation. However, the deities of the sacred groves protect them for future generations.

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Carbon Negative –the ultimate solution to offset Carbon Emission

T. R. Gowthama

There is a potential need for the extensive usage of technologies promoting negative emissions i.e. removal of carbon-di-oxide (CO_2) from the atmosphere. That is what the climate mitigation goals framed by Intergovernmental panel for Climate Change says carbon negative or negative emissions are different from reducing emission. The latter reduces the contribution of CO_2 to the atmosphere whereas the former literally takes out the existing CO_2 from the atmosphere.

There are a number of technologies that can reduce the level of CO_2 from the atmosphere, like biomass with carbon capture, biochar, ocean fertilization, enhanced weathering, etc.

Generating electricity from biomass is one approach to reduce greenhouse gas emission as it neutralizes the carbon pollution prevalent in the atmosphere. Carbon neutrality is not a good thing to address to developing nations; they have even more important issues like starvation, infant mortality, malnutrition, water scarcity, etc. Developed nations can become carbon neutral, but still we might have around six billion people from the developing nations who can pollute the earth with its towering carbon emission. Hence, the concept 'Carbon Neutrality' by itself has no meaning and effectual. Apparently, the developed nations have no option but to switch to *Carbon Negative* from *Carbon Neutral***.** This is the only way to counterbalance rising carbon emission from developing nations. Meanwhile, developed nations can take responsibility for their own carbon emission as well as work on the emissions of other nations.

Bhutan, a tiny landlocked nation lying within the picturesque Himalayan range has stunned the whole world last year by planting around 50,000 trees in less than an hour by a group of 100 volunteers. That's not the end of it as the same Buddhist nation planted around 1, 08,000 trees last month to celebrate the birth of their prince i.e. first child of King Khesar and Queen Jetson. This Himalayan nation with the population of about 7, 50,000 people has some eye-popping environmental benchmarks to its credit. For them, environmental conservation and management is not just a matter of concern but a core principle in their nation's growth agenda.

Bhutan, with its dense forest cover, absorbs around 6 million tonnes of carbon from the atmosphere whereas it emits just around 1.5 million tonnes of carbon annually. This gigantic deficit of about 4.5 million tonnes is what makes them a Carbon Negative country of the world.

Besides, Bhutan is the only country to value its achievement by measuring Gross National Happiness (GNH) instead

of Gross Domestic Product (GDP), where non-economic aspects of well-being are given importance.

Just like this tiny Himalayan nation, every nation can incorporate environmental conservation, protection and management in their respective government's framework and guidelines, thereby bringing down the nation's carbon footprints.

Effective measures can be adopted in order to reduce carbon footprint. However, it can never touch zero unless or until negative emission principles come into picture.

Although Carbon Neutral is accepted worldwide, especially in the developed nations, they should understand the fact that it shall not have a considerable impact.

Ultimately, the only solution to balance carbon emission is by becoming a Carbon Negative country.

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The IPL and the Environment !

M. Lakshmi Sree

The final tense moments in a cricket match – last 6 balls to go and the score board showing an unreachable target to achieve. The batsman, bowler and fielders shedding their sweat in the ground while facing the arc lights. The batsman bats and if the runs are chased with fours and sixes, the score board changes and the crowd goes into a frenzy shouting in favour of the winning team. The adrenaline level is rising – the players and the spectators alike. This is a typical 20 – 20 Indian Premier League (IPL) match that is currently being played in the country.

What has IPL to do with our environment? What are the effects of an IPL match on the environment? Let us give some thought to this aspect.

You all would have woken up to the news item in dailies High Court of Bombay summoning BCCI to shift its matches out of Maharashtra. It is a grave truth that when the state is facing an acute water crisis, you are permitting an IPL match and the need of water is enormous in terms of watering the cricket ground and so on. It is a very important point to be taken note of in almost all the Indian cities hosting an IPL match. It is estimated that 60,000 litres of water per month will be required to maintain the pitches. On an average, another 50,000 litres of water at the

stadium towards drinking and sanitation for the spectators are also required.

Electricity consumption is another aspect. As the match is played under flood lights, the power required to produce lights is very high. Average requirement of power is 2 kw. This adds to the energy crisis during the summer months. When many people are living without power for irrigation, power looms, etc. and face frequent power cuts in their residences, the IPL needs to be given a second thought.

As many people get together in a stadium to watch the match, it adds to the carbon emission in the atmosphere as people may come in their own vehicles, buses, cars, autos, etc. Carbon footprint is defined: *Carbon footprint is the measure of the amount of the carbon-di-oxide released into the atmosphere by a single endeavour, or by a company, household or individual through day-to-day activities over a given period.*

The scorching summer has dried all the rivers, streams wells, lakes, ponds and other water bodies in the country. Even in the recently deluged Chennai, people have started to face a water shortage. Many wells have gone dry. Nobody will even believe if you say that you had floods in Chennai! It is a striking reality we are facing today.

If we had taken some preventive measures like desilting of the existing lakes in Chennai city, we would not have faced this situation – flood and drought.

We must also admit the fact that some parts of the city did not face floods due to the presence of a lake, temple tank which is even now filled with water to ease the summer and providing the much needed water.

Due to the ban imposed on Chennai Super Kings on betting charges, we Chennaites will not witness any match in our Singara Chennai! I think it is a real blessing in disguise as additional power consumption at the stadium, water and carbon emissions are prevented!! Let us take it as a positive development.

Source

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