



ENVIS NEWSLETTER



(Sponsored by Ministry of Environment, Forest & Climate Change, Government of India, New Delhi)

INDUSTRIAL CASE STUDY OF HERBAL GARDEN



Volume-VII-I

Jan-Mar-2016

ENVIS CENTER

Department of Science, Technology & Environment
Puducherry Pollution Control Committee

URL : <http://dste.puducherry.gov.in/envisnew/envis1.htm>

3rd Floor, PHB Building,
Anna Nagar,
Puducherry - 605 005.

E-mail: dste.pon@nic.in, envis.pon@nic.in
Website: <http://dste.puducherry.gov.in>



GREENBELT DEVELOPMENT IN INDUSTRIES

Greenbelt is the selection and plantation of a species or group of species of trees and shrubs to reduce the effect of a source of pollutant. Green plants form a surface capable of absorbing pollutants and forming sinks for pollutants. Plants are grown in such a way as to function as pollutant sinks. The Green Belt are also designed and maintained to achieve noise attenuation so as to conform to the day and night noise standards prescribed. The open spaces are suitably landscaped and covered with vegetation of suitable indigenous perennial varieties with specific reference to climate and soil conditions and maintained.

In India, greenbelt development is legally mandatory as per rules and regulation by Ministry of Environment and Forest (MoEF) and Central Pollution Control Board (CPCB) in the year 2010. As per the stipulations of MoEF, green belt is to be provided all around the industrial boundary by planting trees and the total green area including landscaping area will be $1/3^{\text{rd}}$ (About 33%) of the area of the premises. This will include Lay down area which will be later on converted into Green area. Industrial development result in pollution. Green belt not only restrict environmental pollution but also it helps to maintain the ecological balance of the region. The Government of Puducherry also stipulates the green belt development in all the industries for better environment in U.T. The Puducherry Pollution Control Committee has imposed a specific condition in its consent order to develop green belt. The industries also are

following the direction diligently and have developed green belt in their premises, as applicable, as per prevailing rules and regulations. A detailed case study, as an example, for substantiating the green belt initiatives of the industries is described in this newsletter.

Green Belt Development / Environmental protection

An industrial campus is spread over 37 acres. The green belt cover of 25 acres has grass lawns, flowering area, ornamental plants, shrubs, and trees. The total number of trees as on Dec 2016 is 37,000. Care was taken while selecting the tree species for the plantation that are suitable for the local climatic conditions, drought tolerant and reduce the soil erosion by spreading the root surface. Almost all the tree species that are planted include are hardwood have good potential for carbon storage.

Extract of Biodiversity Assessment at campus:

The Extract of study on Carbon sequestration potential and biodiversity assessment from plantation activities within the campus in the year 2014 is given below:

- a. Vegetation is immediately surrounded by the landscape dominated by habitations and hence it is an important green cover available in the locality along with the often green campus of the Pondicherry University.
- b. Even though there are large numbers of indigenous species nurtured on the campus, their individuals are relatively



less in comparison to the individuals of planted exotic species.

- c. Occurrence of bird nests and termite mounds are indicators of ecologically active ecosystem. For an industrial campus, this is an extremely good indicator suggesting that company is following all the safety and pollution control measures.
- d. Campus vegetation is an indicator of number of facts about the performance of safety standards followed by the company and the ecological role offered by the campus vegetation. The soil analysis also suggests that the campus soil is nutrient rich with higher concentrations of N, P, K, S and organic carbon in comparison to the control sites.
- e. Overall efforts towards maintaining the vegetation is acting as an important carbon sink. This carbon sink is mitigating 6625.19 tCO₂e annually at source itself due to the afforestation efforts. Sector-wise Plantation are details provided below: *Azadirachta indica* (Neem), *Samanea saman* (Rain tree), *Acacia auriculiformis* (pencil tree), *Manilkara zapota* (Sapodilla), *Albizia lebbek* (Black siris), *Butea monosperma* (Dhak), *Acanthus ilicifolius* (Acanthus), *Anacardium occidentale* (Cashew), *Annona squamosa* (custard apple), *Acacia catechu* (Cutch Tree), *Bauhinia variegata* (Orchid Tree), *Bauhinia purpuria* (Bauhinia), *Callistemon lanceolatus* (Bottle brush), *Carica papaya* (papaya), *Cassia fistula* (Amaltas), *Casuarina equisetifolia* (Casuarina), *Cocos nucifera* (Coconut), *Delonix regia* (GulMohar), *Emblica*

offcinalis (Amla), *Ficus benghalensis* (Banyan Tree), *Ficus religiosa* (Pipal), *Hibiscus spp* (China Rose), *Jatropha curcas* (Ratan jot), *Peltophorus pterocarpums* (Yellow Flame), *Pithecellobium dulce* (Madras thorn), *Polyalthia longifolia* (Ashoka), *Pongamia pinnata* (Pungam), *Psidium guajava* (Guava), *Punica granatum* (Anar), *Spathodea campanulata* (African tulip tree), *Tamarindus indica* (Imlee) and *Thespesia populnea* (poovarasu) and *Dalbergia sissoo* (Shisham).

- f. Most of the planted tree species within the premise are ecologically important such as *Acacia catechu* and *Swietenia mahagoni* species conserve moisture. These species also contribute in checking soil erosion by spreading their root system. Similarly, *Acacia auriculiformis* provides dense and dark green foliage, which remains throughout the dry season, makes it an excellent shade tree and also grows faster, even on infertile and degraded soils. Most of the planted species improve the soil physio-chemical properties such as water holding capacity, organic carbon, nitrogen and potassium through litter fall and its recycling. Their phyllodes provide good, long lasting mulch. Some of the planted tree species in the campus act as wind barrier during the cyclone.
- g. Some of the important faunal species found within the premise and surrounding areas were frogs, lizards, snakes etc. species such as *Euphlyctis cyanophlyctis* (Diroglossid Frog), *Euphlyctis exadactylus* (Green pond



frog), *Tomopterna breviceps* (Indian burrowing frog), *Hoplobatrachus tigerinus* (Asian bull frog), *Polypedates maculatus* (Himalayan tree frog), *Hemidactylus leschenaultii* (Lizard), *Eryx conicus* (Sand Boa Snake), *Ptyas mucosa* (Rat snake), *Lycodon aulicus* (Indian wolf snake), *Bungarus caeruleus* (Indian Krait), *Viper russeli* (Russell's viper), *Echis carinata* (Saw Scaled Viper), *Paradoxurus hermaphrodites* (Civet cat), *Pteropus conspicillatus* (Spectacled flying fox), *Funambulus palmarum* (India palm squirrel), *Mus saxicola* (Brown Spiny mouse), *Chamaeleo calyptratus* (Veiled chameleon), *Calotes versicolor* (Garden Lizard), *Boiga trigonata* (Cat Snake), *Cerberus rhynchops* (Dog faced snake) and *Naja naja* (Cobra) had been found. The rich biodiversity is due to the dense forest within the unit premises.

- h. Some of the common birds in the project area are *Oriolus xanthornus* (Black hooded Oriole), *Dicrurus macrocercus* (Black Drongo), *Acridotheres tristis* (Common Myna), *Dendrocitta vagabunda* (Rufous Treepie), *Tephrodornis pondicerianus* (Common Woodshrike), *Aegithina tiphia* (Common iora), *Terpsiphone paradise* (Paradise flycatcher), *Dicaeum erythrorhynchos* (Tickell's Flowerpecker), *Megalaima haemacephala* (Coppersmith Barbet) etc. The forested habitat of the unit provides a very good habitat for many of these listed species.

- i. Puducherry receives large number of aquatic migratory birds. The important lake such as Ousteri receives more than 40 species throughout the season. The nearby ecological rich area of the unit premises can serve as a nesting, foraging and breeding sites for most of these species.

j. Nursery:

A separate nursery for multiplication/propagation of tree saplings and shrubs for further development of greeneries is maintained.

k. Development of ground covers/lawn

Ground covers are ideal one for the factory area, because the ground covers are not disturbing the vertical space.

l. Herbal garden

Apart from that the unit is cultivating Herbal plants collection of about an area of 3 acres with nearly 450 species. A team of 8 people headed by a Senior Horticulturist is responsible for in the campus with separate annual outlay.

Such a response from industries will go long way in increasing the green cover and also in the carbon sequestration which is the need of the hour.

Photographs of the Unit Herbal Garden



List of Plant species available in the campus

Flowering Plant	Ipomea quamoclit	Andrographis paniculata	Kleinia grandiflora	Grass
Artabotrys uncinatus	Lagenaria vulgaris	Artemisia nilagirica	Maranta arundinacea	Aponogeton monostachyon
Catharanthus roseus	Mimosa pudica	Asparagus racemosus	Martynia annua	Cymbopogon martini
Coleus aromaticus	Momordica charantia	Atropa belladonna	Merremia hederacea	Cymbopogon citratus
Curculigo orchiooides	Oxalis corniculata	Bacopa monnieri	Murraya koenigii	Cyperus rotundus
Gardenia jasminoides	Pergularia daemia	Biophytum sensitivum	Ocimum americanum	
Michelia champaca	Piper betel	Caralluma edulis	Ocimum basilicum	Nuts
Polianthes tuberosa	Sansevieria roxburghiana	Cassia tora	Orthosiphon spiralis	Areca catechu
	Tinospora cordifolia	Centella asiatica	Pedaliium murex	Desmostachya bipinnata
Vine/Creeper	Tylophora indica	Centrantherum punctatum	Petiveria alliaceae	Myristica fragrans
Abrus precatorius	Vitex peduncularis	Coleus amboinicus	Phyla nodiflora	Vetiveria zizanioides
Aloe barbadensis		Coleus aromaticus	Pontederia vaginalis	
Alpinia galangal	Spices	Coleus vetiveroides	Pyllanthus amarus	Fruit Trees
Aristolochia bracteolata	Acorus calamus	Cretaeava nurvala	Salacia oblonga	Annona reticulata
Aristolochia indica	Cinnamomum camphora	Crotalaria verucosa	Sida acuta	Annona squamosa
Atlantia monophylla	Piper longum	Datura discolor	Solanum trilobatum	Artocarpus communis
Basella alba		Enicostema hyssopifolium	Stachytarpheta urticaefolia	Averrhoa carambola
Basella rubra	Herbaceous Plants	Euphorbia antignorum	Talinum triangulare	Calocarpum sapota
Ceropegia junicea	Abutilon crispum	Euphorbia geniculata	Terminalia arjuna	Carica papaya
Cissus quadrangularis	Acalypha alnifolia	Euphorbia hirta	Trichopus zeylanicus	Citrus aurantifolia
Cissus pallida	Adhatoda vasica	Gloriosa superba	Urginea indica	Citrus deumana
Cissus repens	Aerva lanata	Gymnema sylvestre	Wedelia chinensis	Coccoloba uvifera
Clitoria ternatea	Alpinia calcarata	Homalomena aromatica	Withania somnifera	Ficus carica
Cocculus hirsutus	Alpinia galangal	Hydrocotyle javanica		Ficus racemosa
Cucurbita maxima	Andrographis echiioides	Hygrophila auriculata		Glycosmis pentaphylla



Holoptelea intergrifolia	Cassia siamea	Martynia annua	Simarouba glauca	Capparis zeylanica	Stevia rebaudiana
Limonia acidissima	Chloroxylon swietenia	Melia composita	Spilanthes paniculata	Colubrina asiatica	Triumfetta rhomboidea
Malpighia punicifolia	Cicca acidia	Memecylon umbellatum	Stereospermum colasis	Crotalaria verrucosa	
Olea europaea	Clerodendrum inerme	Michelia champaca	Strebulus asper	Datura innoxia	Vegetable
Prunus laurocerasus	Coccoloba uvifera	Mitragyna parvifolia	Strychnos nuxvomica	Datura metal	Abelmoschus moschatus
Punica granatum	Commiphora caudata	Murraya koenigii	Terminalia bellirica	Eupatorium triplinerve	Allium ruberosum
Syzygium aromaticum	Cordia rothii	Naringi crenulata	Terminalia chebula	Gmelina asiatica	Clerodendrum phlomides
Syzygium cumini	Costus igneus	Nyctanthes arbotristis	Vitex agnus-castus	Gossypium arboreum	Curcuma amada
Syzygium malaccense	Crescentia cujete	Oxystelma esculentum	Walsura trifoliata	Jatropha glandulifera	Curcuma longa
Theobroma cacao	Cretaeve nurvala	Pandanus odoratissimus	Wrightia tinctoria	Justicia gendarussa	Dioscorea alata
Vitis vinifera	Delonix elata	Pisonia grandis		Lawsonia inermis	Dioscorea alata
	Dichrostachys cinerea	Plumbago zeylanica	Greens	Leonotis nepetaefolia	Dioscorea bulbifera
Ornamental Plants and Tree	Diospyros candolleana	Pongamia pinnata	Hemigraphis colorata	Nilgiranthus ciliatus	Diospyros candolleana
Adenocalymma allicea	Drypetes roxburghii	Prosopis spicigere	Sauropus androgynus	Nyctanthes arbotristis	Hedychium coronarium
Aegle marmelos	Elaeocarpus sphaericus	Prunus avium		Ocimum kilimandscharicum	Justicia tranquebariensis
Aglaia elaeagnoidea	Erithrina indica	Putranjiva roxburghii	Shrub	Ocimum tenuiflorum	Nyctanthes arbotristis
Alangium salvifolium	Eucalyptus citriodora	Rauvolfia tetraphylla	Abutilon indicum	Orthosiphon spiralis	Solanum torvum
Alocasia macrorrhiza	Euphorbia pulcherrima	Rhizophora mucronata	Adhatoda vasica	Pavonia zeylanica	Zingiber officinale
Amherstia nobilis	Haldina cordifolia	Rivina humilis	Antidesma ghesaembilla	Plumbago zeylanica	
Barringtonia acutangula	Holoptelea integrifolia	Ruellia prostrata	Argemone Mexicana	Polyalthia suberosa	Thorny Plant
Bauhinia tomentosa	Indigofera tinctoria	Sansevieria roxburghiana	Asclepias curassavica	Pouzolzia auriculata	Aloe vera
Breynia vitis idaea	Kalanchoe pinnata	Santalum album	Baliospermum montanum	Rauvolfia serpentina	Euphorbia trigona
Calophyllum inophyllum	Kigelia africana	Saraca asoca	Brugmansia suaveolens	Rhinacanthus nasutus	Opuntia elatior
Cassia alata	Lawsonia inermis	Sesbania sesban	Caesalpinia bonducella	Ricinus communis	Opuntia sp.
Cassia auriculata	Madhuca longifolia	Schefflera racemosa	Calotropis procera	Selaginella plana	



Picture of Exotic and Migratory Birds in the Unit



Editorial Board (ENVIS Centre, PPCC)

M. DWARAKANATH

Member Secretary (PPCC)

Sh.P. VIPIN BABU

Scientist/ ENVIS Co-ordinator

Smt. J. NITHIYA

Programme Officer

Sh. G. SIVASUBRAMANIAN

IT Asst.

ENVIS PROJECT Sponsored by
Ministry of Environment, Forest & Climate Change
Government of India, New Delhi.

For Details Please Contact:

The Member Secretary,
Puducherry Pollution Control Committee
3rd Floor, PHB Building, Anna Nagar,
Puducherry - 5.

Ph: 0413-2201256 | Fax : 0413 -2203494

e-mail: envis.pon@nic.in, dste.pon@nic.in

website : <http://dste.puducherry.gov.in>

URL: <http://dste.puducherry.gov.in> / envisnew / envis1.htm

If undelivered Please
Return the News letter

To:
The Member Secretary
Puducherry Pollution
Control Committee,
3rd Floor, PHB Building
Anna Nagar, Puducherry - 5.

Book - Post

To