WHITE PAPER ON ENDEMIC FLORA AND FAUNA: CAMPUS PLANNING FOR IIT HYDERABAD, KANDI

Prepared by: PRAKRITI, Nature Club of IIT Hyderabad

(JULY 2012)

ACKNOWLEDGEMENTS

It is a pleasure to deliver this white paper to Indian Institute of Technology Hyderabad. Prakriti, Nature Club of IIT Hyderabad, thanks our Director, Professor U. B. Desai for giving us the privilege of preparing this report.

Prakriti thanks Dr. K. P. Sastry and his team at CSIR-Central Institute for Medicinal and Aromatic Plants (CIMAP) for providing us botanical names of species endemic to the Hyderabad region (specifically Sangareddy mandal in Medak district: the site of the new campus), and for giving us a tour of the facilities, gardens, and flora at CIMAP. Thanks also to Dr. Veerabhadra Rao, Horticulture Department of Centre for Cellular and Molecular Biology (CCMB), Hyderabad for arranging a tour of facilities at the Laboratory for Conservation of Endangered Species (LACONES), Clinical Research Laboratory (CRF), and CCMB main campus, and for various tips on planting of trees. In the same vein, we thank Dr. M. N. V. Prasad, Department of Plant Sciences, Hyderabad Central University for tips on species selection and planting of trees. We also thank Dr. Susy Varughese, Chemical Engineering Department of IIT Madras for her useful inputs regarding campus planning and development.

Drs. Anand Mohan and Shubha Ranganathan (members of Prakriti) have planned, compiled, and sorted the information presented herein.

CONTENTS

PREMISE AND SCOPE OF THE REPORT

Indian Institute of Technology (IIT) Hyderabad (henceforth referred to as the Institute) will be located in Kandi village, Sangareddy mandal, adjacent to the national highway- NH 9. The total area of the campus is around 571 acres. Out of this total area, it is expected (per communications with ARCOP) that about 24% would be footprint area and the remaining 76% would be open space area. IIT Hyderabad is committed to ensuring adequate green spaces within the campus, and has made this a hard priority. Besides, Prakriti opines that a campus blessed with modern and comfortable facilities as well as with rich greenery and biodiversity will stimulate fresh thinking and innovation in-line with the vision of IIT Hyderabad. Prakriti has conducted a study on the indigenous flora and fauna of the region to enable this vision, and this white paper is our humble contribution towards this end.

IIT Hyderabad is planned as a residential institution of higher learning; being residential, it will continually host a human population consisting of students, faculty and staff. This makes a planned approach imperative to enhance its aesthetic appeal, eco-friendliness, and to avoid human-animal conflict. Our premise is that distinct areas with clear boundaries- boundaries which are kept sacrosanct- are required for distinct, yet contiguous, existence of flora and fauna along with the human populations. Wherever there is a possibility of conflict, this principle has been adopted to keep human and animal populations at a safe distance from each other. We also admit that such a complete exclusion of both populations is not practically possible, and that there will always be an overlap which, in our recommended locations for species of flora (e.g. fruit-bearing trees like jamun or mango), we have tried to keep to a manageable minimum.

This report primarily concerns itself with species of trees, and on rare occasion with shrubs, endemic to the Central Deccan region. We will highlight species of trees that are ideal for a particular location on the campus. The locations on the campus are those earmarked on the campus master plan (available in the vision document powerpoint on the IITH website): these (six) are **the main driveway, the academic quads, the**

faculty & staff housing, student hostels, the sports complex, and the areas adjoining the artificial lakes. We have identified species endemic to the region, and given choices of species that are ideal for the locations mentioned above. The species choices are guided by considerations of **i) aesthetics, ii) utility (shade/canopy/fruits), and iii) minimal human-animal conflict** (e.g. fruit-bearing trees) depending on which of these three considerations predominates in a location.

THE CENTRAL DECCAN PLATEAU REGION

The IIT Hyderabad campus located in Kandi village, Medak District, Andhra Pradesh is located within the eco-region known as the “Central Deccan Plateau Dry Deciduous Forests” (CDPDDF) which itself belongs to the biome of “Tropical and Subtropical Dry Broadleaf Forests” [1]. Nagarjunasagar-Srisailam Tiger Reserve is representative of the typical vegetation of this biome [2]. The CDPDDF eco-region extends across the central Indian states of Madhya Pradesh, Maharashtra, Karnataka, and Andhra Pradesh, encompassing the western parts of the Satpura Ranges and the Godavari River. This large ecoregion –of 2,39,400 sq. km extent- distinctive in several important respects. For one, the dry deciduous forests are neither exceptionally rich in number of species of fauna nor high in numbers of endemic species of plants. However, it is blessed with a rich variety of bird fauna, with more than 300 bird species, including endemic and near-endemic species. Importantly, about 80% of the natural habitat in this region has already been lost [3], making conservation- even of the kind we are attempting- a very crucial task. Cash crop plantations, excessive fuel wood collection, and overgrazing have reduced the existing natural vegetation greatly.

The trees in this eco-region have an upper canopy about 15-25m (50-83ft), and an understory at 10-15m (33-50ft). The undergrowth is sparse. The characteristic tree association is *Hardwickia binata-Albizia amara* woodland with associated species like *Tectona grandis* (Teak)*, Boswellia serrata* (Indian Frankincense) *Lannea coromandelica, Anogeissus latifolia, Albizia lebbek, Lagerstroemia parvifolia, Diospyros tomentosa,* and *Acacia catechu* in the northern parts of the eco-region, whereas the associated species change to *Pterocarpus santalinus, P. marsupium, Chyloroxylon swietenia, Terminalia chebula, T. tomentosa, Albizia lebbek, Dalbergia latifolia* (Black Rosewood) etc. in the southern parts of the eco-region [4].

On the fauna front: apart from the endangered tiger, there are several other large vertebrate species in this region, such as the wild buffalo (*Bubalus arnee*), wild dog (*Cuon alpinus*), sloth bear (*Melursus ursinus*), chousingha (*Tetracerus quadricornis*), gaur (*Bos gaurus*), blackbuck (*Antilope cervicapra*), and chinkara (*Gazella bennettii*) [5].

TREE PLANTING IN IIT HYDERABAD

IIT Hyderabad has made it a hard-priority to be sensitive to local birds and wildlife. Several considerations need to be taken while determining the tree species to be planted in this region: water requirements being a core issue. While shrubby thorny undergrowth and broad-based leaves represent the typical vegetation, several species though not 'indigenous' have become 'indigenized' over a period of time and survive well in this region. Therefore, marginal allowance can be made to include species from an adjoining eco-region, provided the water requirements are the same. As a suggestion to conserve water, we recommend using recycled water for any fountains/waterfalls/lawns that have been planned in the main campus.

In planning for the permanent campus, we suggest the plantation of trees be done at the initial stages in order to ensure an adequate green cover in about 10 years' time, and mature around 25 years from the planting. This view is echoed by the experts we have spoken to in various organizations: they have recommended that the planting of trees on campus be done in a planned manner, in like-manner to the master-plan for construction, so that construction and tree planting go hand-in-hand. This will ensure that no trees are ever cut down to proceed with construction activities. It is fortunate, that as of the time of this report, IIT Hyderabad in its master plan has earmarked distinct areas for academic, residential, and hostel buildings, and has adopted a planning mode that incorporates a vertical spread rather than a horizontal spread of construction. Further, we are even more fortunate that the campus master plan includes artificial water bodies on the campus. These water bodies – if developed properly with appropriate flora and adequately safeguarded- will be crucial in attracting a variety of birds and small fauna, and plant species which can sustain them such as lichens, algae, etc. This care and subsequent establishment of an eco-system will ensure that there is no mosquito menace.

Guidelines for planting:

The following details must be adhered to while planting the trees in order to ensure that the trees have a good survival rate.

Planting of saplings is best done in July (at the end of the first month's rain from the South-West Monsoon). This means that the months of May and June should be used for digging and preparation of pits and procuring of species for planting. Pits for planting must be 2 feet in diameter, and 2 feet in depth. Soil conditions should be loamy prepared with a mix of native soil and compost/dung to increase the organic content of the soil. It is important to use organic farmyard manure, as the initial period after planting is the crucial period for sapling survival and will require adequate soil nutrients. **Red soil must be avoided at all costs**, and used only sparingly to increase clay content to 10% in the soil mix and allow for water retention.

Adequate spacing needs to be allowed for between successive trees, in order to allow for them to grow comfortably. We suggest that the spacing between the trees be at least 10 metres along any direction. However, for the trees to be planted along the main driveway, we suggest a gap of atleast 20 metres be maintained between successive trees. This assumes that the trees on the main driveway will have a broad canopy. These trees will grow to tall heights providing an imposing view as one drives through. Since planting on the main driveway will typically be done in a straight line, more space needs to be given for their growth.

Tree saplings procured must be 9 months to 1 year old, and must have attained a height of around 1.5 to 2 feet. Planting younger saplings will result in a very low survival rate as the plants are not strong enough.

After planting, watering of saplings is required twice-a-week for a period of about a year (we estimate around 25 litres/week). For the second year, the plants do not require watering during the monsoon period. During the rest of the second year (autumn,

winter, spring, summer) they require watering once-a-week. From the third year onwards, the plants will sustain themselves if they have survived thus far. Thus, it is primarily in the first year of planting that adequate care is required to ensure that the saplings survive and grow well. Tree guards are also important in the initial period, to ensure that the plants are not damaged or disturbed by humans, animals or winds.

From the above, it is clear that the planting of species is a very specialized activity that needs expert hands. We therefore suggest that procurement of saplings be done through organizations that are dedicated to botanical research and conservation of species rather than through contractors. A botany specialist is required –on a consultation basis- for the procuring of the species, identification and selection of healthy saplings, and guidance in planting details. The actual planting of the trees may be done by IIT Hyderabad students, faculty, staff and campus residents. This will promote a community feeling among the IITH community, and be an important symbol of participation in campus development.

Brief description of trees:

The list of selected endemic species for planting is given in Table 1. A number of the species in the list are not easily available in the Andhra Pradesh Forest Department (e.g. Memecylon Umbellatum). Therefore, by including these trees in the permanent campus, IIT Hyderabad will make an important contribution to the conservation of threatened indigenous plant species.

In our list, we do not make a distinction between northern and southern parts of the eco-region, and list all species belonging to the eco-region among the recommended choices at various locations in the campus. This is to have a larger number of tree species to select from. Given that the number of tree species in the eco-region is small, glossing over this distinction gives us a greater chance of having species that serve the three purposes mentioned already (aesthetics, utility, minimal human-animal conflict). By word of explanation, we anticipate human-animal conflict whenever there is both

commercial interest in the tree species (either in its fruit, flower, bark, or wood) as well as intrinsic value to the eco-system (either to the birds, or small fauna like squirrels). For further details on each tree, please refer to the addendum to this report which includes a brief write-up, and a picture(s).

TABLE 1. LIST OF ENDEMIC SPECIES FOR PLANTING

S. No.	Botanical Name	Common Name(s) [6]	Suggested Location
1.	Acacia catechu	Cutch tree	Main Driveway-Center, Faculty/Staff Housing
2.	Aegle Marmelos	Bael	Academic Quads, Faculty/Staff Housing
3.	Albizia Amara	Krishna Siris	Main Driveway-Center, Academic Quads
4.	Albizia Lebbeck	Siris tree	Academic Quads, Faculty/Staff Housing
5.	Anogeissus Latifolia	Axle wood tree	Faculty/Staff Housing, Student Hostels
6.	Azadirachta Indica	Neem	Faculty/Staff Housing, Artificial Lakes
7.	Bauhinia Purpurea	Purple orchid tree	Main Driveway-Center, Academic Quads
8.	Boswellia Serrata	Indian Frankincense	Faculty/Staff Housing Student Hostels
9.	Butea Monosperma	Flame of the Forest/Palash/Dhak	Main Driveway-Sides, Sports Complex
10.	Caesalpinia Sappan	Sappan Wood	Main Driveway-Center, Student Hostels
11.	Cassia Occidentalis	Coffee Senna	Shrubby Undergrowth - All
12.	Chloroxylon swietenia	Ceylon satinwood	Faculty/Staff Housing, Artificial Lakes
13.	Dalbergia Latifolia	Black Rosewood	Main Driveway-Sides, Artificial Lakes
14.	Diospyros Ebenum	Indian Ebony	Faculty/Staff Housing
15.	Erythrina stricta var. suberosa	Corky Coral tree/ Dhaul Dhak/ Balabhadrika	Main Driveway-Sides, Academic Quads
16.	Erythrina variegeta	Indian Coral Tree/Sunshine Tree (Official flower of	Student Hostels, Sports Complex

		Okinawa Prefecture, Japan)	
17.	Ficus Bengalensis	Banyan	Main Driveway – Roundabout, Artificial Lakes
18.	Hardwickia-Binata	Anjan	Academic Quads
19.	Lagerstroemia Parviflora	Small flowered crape myrtle	Academic Quads, Student Hostels
20.	Lannea Coromandelica	Indian Ash tree	Student Hostels, Sports Complex
21.	Limonia Acidissima	Wood Apple	Faculty/Staff Housing, Academic Quads
22.	Mangifera Indica	Mango Tree	Faculty/Staff Housing
23.	Memecylon Umbellatum	Ironwood tree/Anjan/Mandi	Main Driveway-Sides
24.	Pongamia Pinnata	Indian Beech tree	Main Driveway- Sides, Academic Quads
25.	Pterocarpus marsupium	Indian Kino tree	Artificial Lakes
26.	Pterocarpus Santalinus	Red Sandalwood	Artificial Lakes
27.	Shorea Robusta	Sal	Academic Quads, Student Hostels
28.	Sterculia Urens	Gum Karaya	Academic Quads, Artificial Lakes
29.	Syzygium Cumini	Jamun	Faculty/Staff Housing, Artificial Lakes
30.	Tamarindus Indica	Tamarind tree	Faculty/Staff Housing
31.	Tectona grandis	Teak	Academic Quads, Faculty/Staff Housing
32.	Terminalia Catappa	Indian Almond	Faculty/Staff Housing, Artificial Lakes
33.	Terminalia chebula	Chebulic Myrobalan	Faculty/Staff Housing, Student Hostels
34.	Terminalia tomentosa	Asan	Artificial Lakes

REFERENCES

1. [www.worldwildlife.org/science/wildfinder/profiles//im0201.html], accessed on February 1st, 2012.
2. Wikramanayake E. D. et al. **Where can tigers live in the future? A framework for idenftifying high-priority areas for the conservation of tigers in the wild**, 255-272. In Seidensticker J., Christie S., and Jackson P. (Editors). Riding the tiger: Tiger conservation in human dominated landscapes, Cambridge University Press, Cambridge, UK (1999).
3. Wikramanayake E., Dinerstein E., Loucks C. B., et al., **Terrestrial Ecoregions of the Indo-Pacific - A Conservation Assessment**, Island Press (2002).
4. Puri G. S., Gupra R. K., Meher-Homji V. M. P. S., Forest Ecology vol 2., Oxford and IBH Publishing Company, New Delhi (1989).
5. Hilton-Taylor C. (Compiler), **2000 IUCN red list of threatened species**, International Union for Conservation of Nature and Natural Resources, Cambridge, UK (2000).
6. [www.flowersofindia.in], accessed on February 28th, 2012.