

REPORT ON BASELINE STATUS OF THE BIOLOGICAL ENVIRONMENT AROUND
THE PROPOSED NUCLEAR POWER PARK AT MITHIVIRDI, BHAVNAGAR,
GUJARAT, OF M/S. NUCLEAR POWER CORPORATION Ltd.

Final report submitted to EIL

Arun P R, Murugesan M, Nikhil Raj PP & Azeez PA



Salim Ali Centre for Ornithology and Natural History, Coimbatore- 641 108

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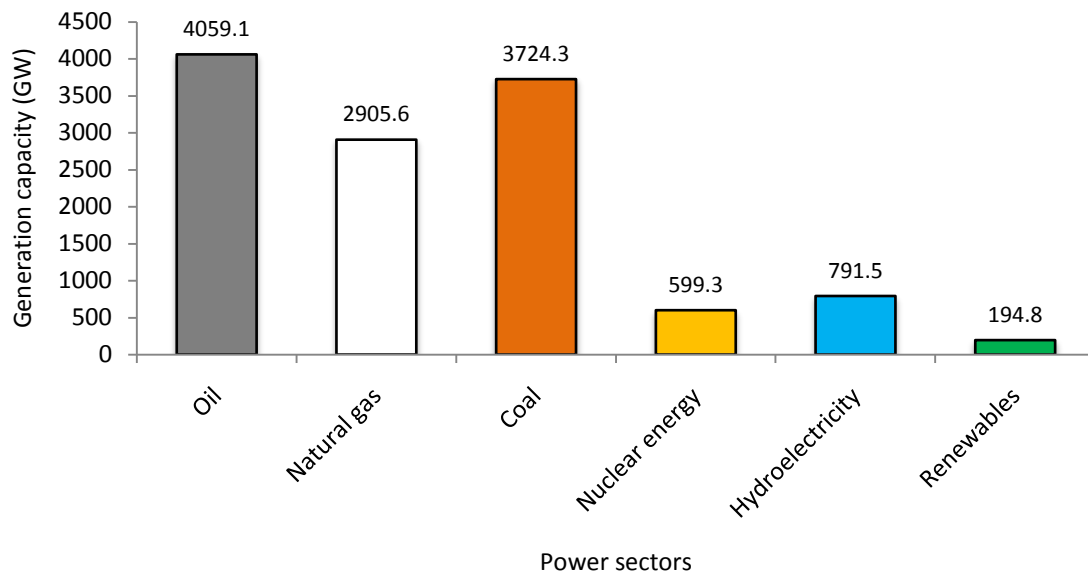
1 INTRODUCTION

Energy security being a fundamental requisite for the present developmental paradigm, there exists a well established correlation between the energy consumption and income generation and economics of world countries. It is also obvious that progress/ development at its each step come with additional energy demands. As the global economy is expected to grow at an average yearly rate of 3.3 until 2050 by quadrupling the world GDP rate to about \$ 227 trillion, the global demand for energy is also predicted to grow at a range of 0.7 to 1.6 % annually (Nezhad, 2009) and the global energy need in the year 2015 will be 1000 MW energy unit for every 5 days as per the world Nuclear energy status reports (<http://www.worldnuclearreport.org>). Mitigation of the climate change problem requires transformation of world's current pattern of energy generation which is primarily fossil fuel based. Arguably, a major step towards this direction would be the replacement of CO₂ emitting energy generation technologies with those options that emit minimum CO₂. Presently, nuclear power provides just over 5% of the world's commercial energy (Figure 3) (Schneider & Froggatt 2012, Sailor et al. 2000), but there are serious apprehensions and barriers delaying any significant expansion.

However, it is also argued that none of these barriers are actually insurmountable (Sailor et al. 2000) and the current statistics shows the total nuclear power capacity around the world has reached up to 375 GW in 2010 (IAEA, 2011). It is envisaged that the contribution from the nuclear power to the total electricity production in Asia by the year 2030 will be 12.6 to 15.9% (IAEA, 2011). It is said that once a nation attain a state of relative degree of development the energy need will also reach a stable state, however a country like India, which is progressing through the ladder of development is right now facing high demand of energy.

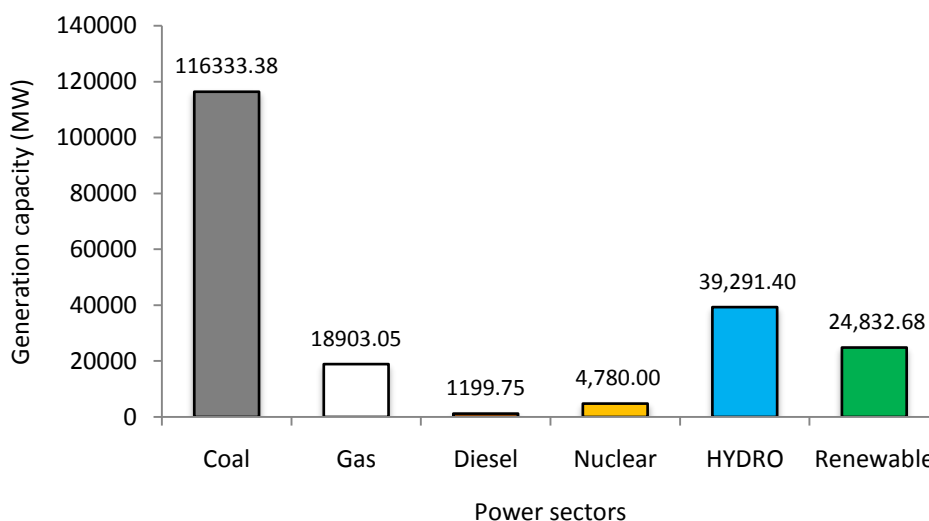
Since liberalisation, India undergoing rapid transformation in terms of national economy, many of the multinational companies started investing for various industries all over the country. The GDP growth rate of the country is also hiking in a remarkable rate. When Indian economy crossed the trillion- dollar mark in 2008, the economists predicted that the country will again have a noteworthy leap in 2016 to make the economy 2\$ trillion mark. As the economy grows the energy demand of the country is expected to grow from the current

200,000 MW to at least over 950,000 MW by the year 2030. The current share of different sectors in the total generation of India as per the latest (June 2012) estimate of Central Electricity Authority of India (CEA) is shown in the figure. (source: http://www.cea.nic.in/reports/monthly/executive_rep/jun12/8.pdf). The Thermal, Nuclear, Hydro and Renewable sectors contributed 66 %, 2%, 19 % and 12% respectively.



Ref: <http://www.bp.com/statisticalreview>

Figure 1. Sector-wise contribution to global energy generation (in GW) in 2011



Indian Scenario, Generation in MWs,

Source, CEA 2012

Figure 2. Contribution of various sectors to the energy generation (India)

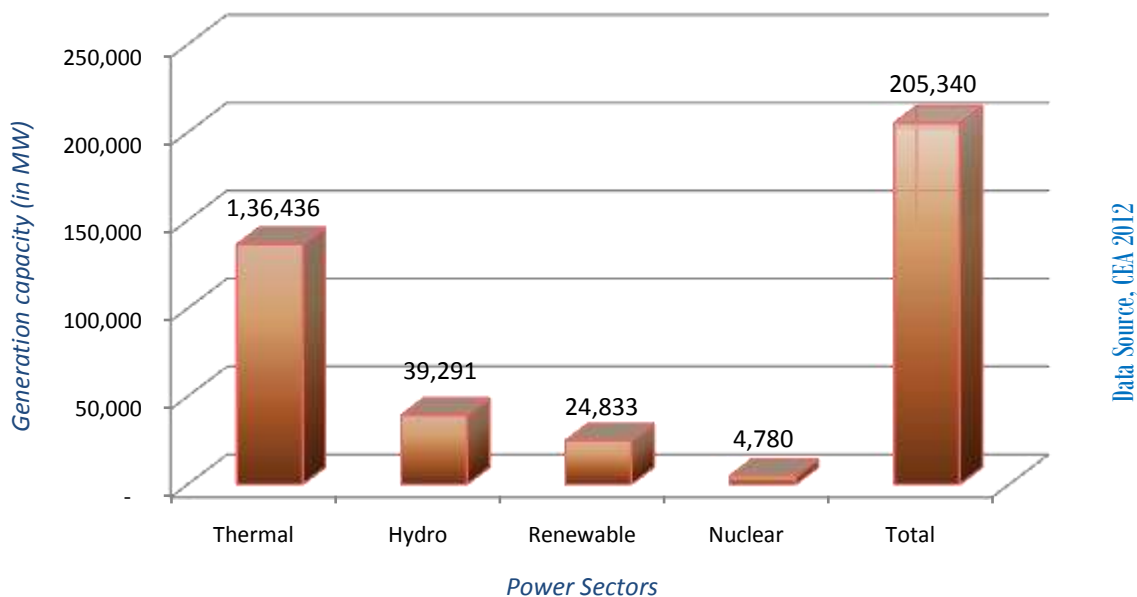
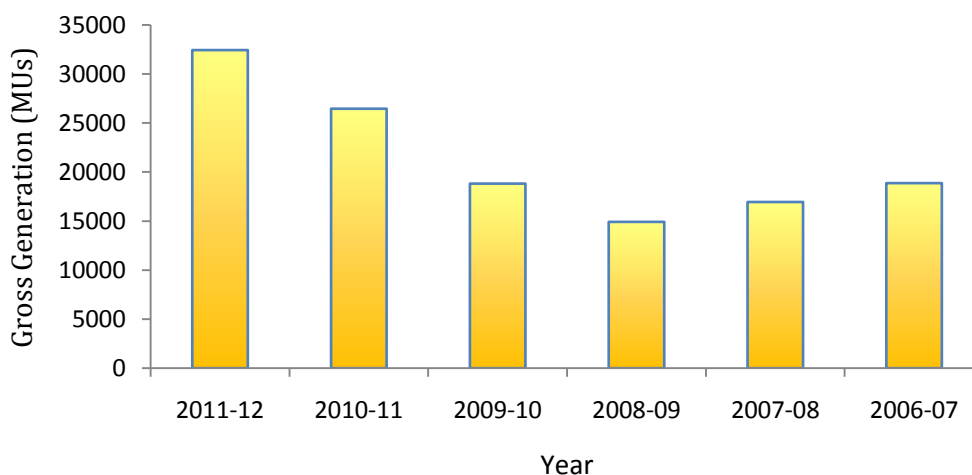


Figure 3. Installed capacity of Indian Power sectors as on 30-06-2012

We do not have many options to cater the energy demand of the nation, the nuclear power is considered as the foremost and efficient solution. Further it is said that the nuclear energy is clean, pollution free, lacking any health hazard, and can very well combat with the present climate change issues.



Source : <http://www.npcil.nic.in/main/AllProjectOperationDisplay.aspx>

Figure 4. Nuclear energy production trend in India

Currently India has an installed capacity 4,780 MW of Nuclear power (Table 1). The Nuclear Power Corporation India Limited (NPCIL) is proposing further capacity additions to this and the

Mithivirdi Nuclear Power park project of 6,000 MW is proposed at around Mithivirdi village of Bhavnagar District, Gujarat.

Table 1. Installed capacity of Nuclear power plants currently operational in India

No.	Plant & Unit	Capacity (MW)	Date of commercial operation
I Tarapur atomic power station (taps), Maharashtra			
1	(a)	160	October 28, 1969
2	(b)	160	October 28, 1969
3	(c)	540	August 18, 2006
4	(d)	540	September 12, 2005
II Rajasthan atomic power station (raps), Rajasthan			
5	(a)	100	December 16, 1973
6	(b)	200	April 1, 1981
7	(c)	220	June 1, 2000
8	(d)	220	December 23, 2000
9	(e)	220	February 4, 2010
10	(f)	220	March 31, 2010
III Madras atomic power station (maps), Tamil Nadu			
11	(a)	220	January 27, 1984
12	(b)	220	March 21, 1986
IV Kaiga generating station, Karnataka			
13	(a)	220	November 16, 2000
14	(b)	220	March 16, 2000
15	(c)	220	May 06, 2007
16	(d)	220	January 20, 2011
V Narora atomic power station (naps), Uttar Pradesh			
17	(a)	220	January 1, 1991
18	(b)	220	July 1, 1992
VI Kakrapar atomic power station (kaps), Gujarat			
19	(a)	220	May 6, 1993
20	(b)	220	September 1, 1995
Grand Total		4780	

Source : <http://www.npcil.nic.in/main/AllProjectOperationDisplay.aspx>

2 STUDY AREA

The Government of India accorded approval to establish a Nuclear Power Park of 6,000 MW capacity at Mithivirdi village in Bhavnagar District, Gujarat comprising of 6 Nuclear Reactors of 1,000 MW each. Development of these facilities shall be in a phased manner, and initially two units are proposed to be constructed. Mithivirdi site is a coastal site on the shores of Gulf of Khambhat and is located in the western part of India in Talaja taluka of Bhavnagar district, Gujarat state (Figure 5). The proposed site is at about 45 km from the nearest major city, Bhavnagar.

The present document reports the status of Baseline biological Environment of the study area of 10 km radial distance around the proposed site as part of the Environmental Impact Assessment (EIA) report.

The study area is comprised mainly of agricultural land. Pearl millet (Bajra) is the (*Pennisetum americanum*) major and widely cultivated crop species in and around the study area followed by Cumin plant (Jeera) (*Cuminum cyminum*) Cotton (*Gossypium herbaceum*), Sorghum (*Sorghum bicolor*), Castor (*Ricinus communis*), Ground nut (*Arachis hypogaea*), Banana (*Musa paradisiaca*), Mango (*Mangifera indica*), Maize (*Zea mays*) Pigeon pea (*Cajanus cajan*) Sapota (*Achras sapota*), Sugarcane (*Saccharum officinale*), Wheat (*Triticum vulgare*) Onion (*Allium cepa*), Garlic (*Allium sativum*), Chilly (*Capsicum annum*), Mustard (*Brassica juncea*), Sunflower (*Helianthus annus*), Sesam (*Sesamum indicum*), Black gram (*Vigna mungo*), Green gram (*Vigna radiata*), Castor seed (*Ricinus communis*) etc. Apart from these, most of the study site is predominantly covered by four different exotic weedy plant species viz., *Argemone mexicana* (Annual herbaceous weed), *Prosopis juliflora* (Perennial weed), *Parthenium hysterophorus* (Annual herbaceous weed) and *Lantana camara* (Perennial bush weed). The immediate surroundings of the proposed project site is also consists of orchards of Mango and Sapota.

The trees such as *Acacia nilotica*, *A. leucophloea*, *A. senegal*, *A. tortilis*, *Aegle marmelos*, *Ailanthus excels*, *Annona squamosa*, *Azadirachta indica*, *Balanites aegyptiaca*, *Cassia fistula*, *C. siamea*, *Cordia dichotoma*, *C. myxa*, *Dalbergia sissoo*, *Delonix elata*, *Grewia tillifolia*, *Phoenix sylvestris*, *Sterculia foetida*, *Phyllanthus emblica*, *Pongamia pinnata*, *Prosopis juliflora*, *P.*

cineraria, *Thespesia populnea*, *Tectona grandis*, *Ziziphus mauritiana* etc. are very common in and around the study area.

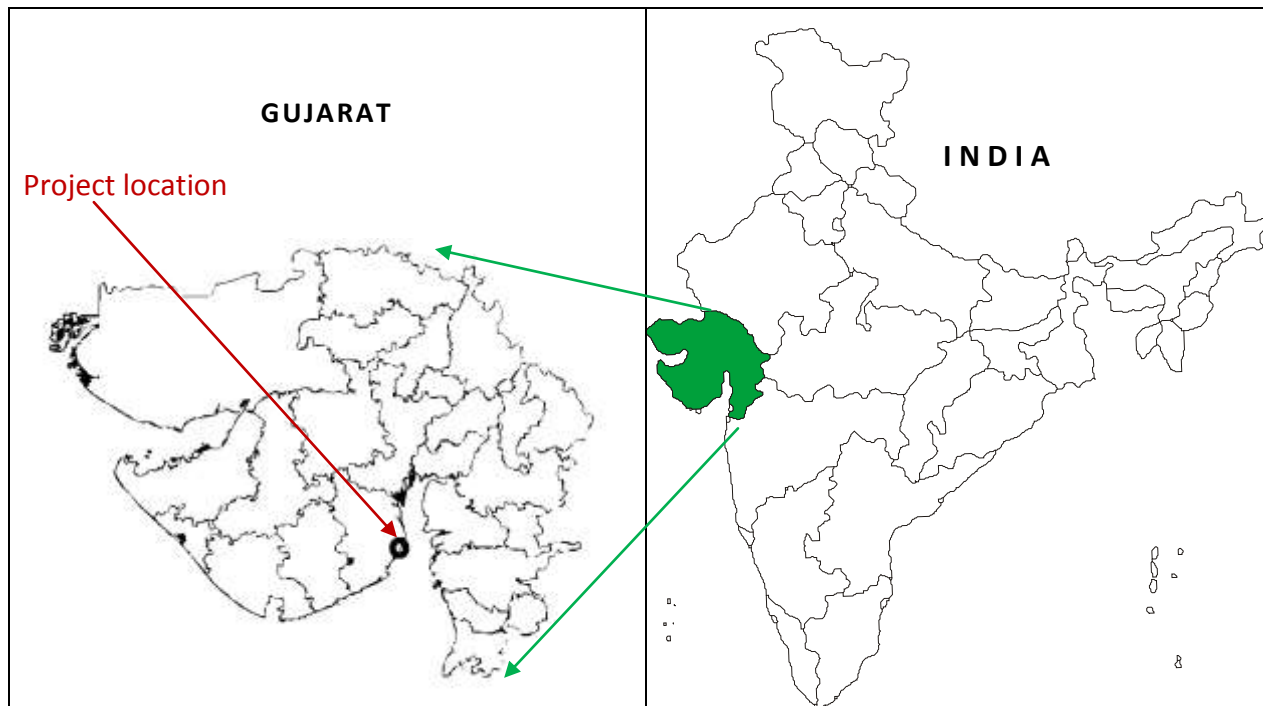


Figure 5 Location map

The following plant species such as *Azima tetracantha*, *Calotropis procera*, *Dichrostachys cinerea*, *Euphorbia neriifolia*, *Grewia villosa*, *Caesalpinia bonduc*, *Capparis sepiaria*, *C. zeylanica*, *Fluggea leucopyros*, *F. virosa*, *Hemidesmus indicus*, *Hibiscus vitifolius*, *Ipomoea staphylina*, *Justicia adhatoda*, *J. betonica*, *Lantana camara*, *Lawsonia inermis*, *Rivea hypocrateriformis*, *Senna auriculata*, *Ziziphus nummularia* etc. are the major shrubs and stragglers encountered during the present study period.

Plants such as *Alysicarpus* spp., *Biophytum reinwardii*, *Cleome viscosa*, *Echinops echinatus*, *Euphorbia hirta*, *Goniogyna hirta*, *Rhynchosia minima*, *Crotalaria obovata*, *Indigofera* spp., *Bulbostylis barbata*, *Cyperus* spp., *Fimbristylis* spp., *Phyllanthus amarus*, *P. maderaspatansis*, *Polygala* sp., *Senna occidentalis*, *S. tora* etc. are the common herbaceous species recorded in the study area.

The grasses like, *Aristida* spp., *Bothriochloa pertusa*, *Andropogon pumilus*, *Brachiaria* spp., *Eremopogon foveolatus*, *Sehima nervosum*, *Cenchrus ciliaris*, *C. barbatus*, *C. setigera*, *Chloris barbata*, *C. tenella*, *Dactyloctenium aegyptium*, *Dicanthium annulatum*, *Digitaria bicornis*, *Eragrostis* spp., *Paspalum scrobiculatum*, *Paspalidium flavidum*, *Phragmites karka*, *Setaria*

verticillata, *Typha angustifolia*, *Themeda triandra*, *T. quadrivalis*, etc. are commonly seen in and around the study site.

Aquatic plant species such as *Ipomoea carnea*, *Pistia stratiotes*, *Lemna minor*, *Eichhornia crassipes* and *Typha angustifolia* were observed in the ponds and other small water reservoirs, which are located around the human habitations.

3 METHODOLOGY

Extensive field surveys were conducted in two seasons, one from 12th September 2011 to 15th September 2011 and another one from 29th December 2011 to 3rd January 2012 by adopting standard methods to document the floral and faunal elements occurring in the study area. For enumerating the overall species occurring in the area, an intensive and extensive pilot survey was made in the area falling within the 10 km radial distance from the proposed project site covering all available habitats such as water bodies, human habitation agricultural lands etc. To quantify the fauna and flora, stratified random sampling was adopted from within this 10km radial plot. Another concentric circular plot of 5 km radius was plotted within this 10 km radius circle and further the area falling under these circles were classified in to six different plots namely N1, N2, W1, W2, S1, and S2 as given in Figure 6.

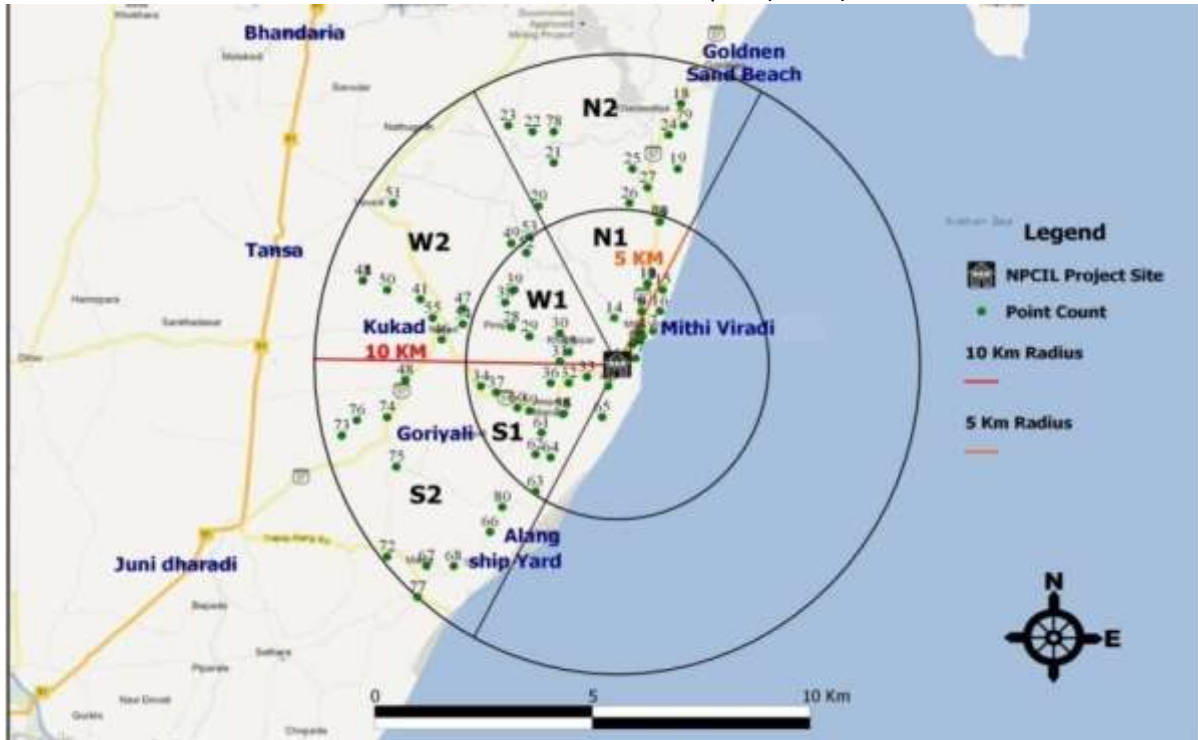
3.1 VEGETATION SAMPLING

Vegetation is one of the best indicators of the ecological health of any given area since it reflects the changes in their structure and distributional pattern. It is universally recognized as an integral component of ecosystems that indicates the effects of changing environmental conditions in an obvious and easily measurable manner and is important in site evaluation and classification. Hence, careful analysis of vegetation is very important to know the distribution and types of floral components in an ecosystem. For phytosociological analysis, quadrat method was used in the present study since it is the most widely used technique for plant census.

A total of 40 quadrats of 10 x 10 m size, by representing all the vegetation types, were laid to find out the quantitative plant community structure of the study area. In the middle of each 10 x 10 m quadrat, a quadrat of 3 x 3 m was laid for shrub density estimation. Similarly, a quadrat of 1 x 1 m was laid within the 3 x 3 m quadrat to document the herbaceous species. All the plants species within the quadrat were counted and recorded. Taxonomic identification of the species encountered in the field was done by referring the flora of Hooker (1872-97), Gamble (1957) and Matthew (1999). Unidentified plant specimens were preserved in 10%

formaldehyde for identification by experts at the Botanical Survey of India, Southern circle, Coimbatore. Nomenclature used in this report is based on the Flora of Tamil Nadu Series 1: Analysis vols. 1-3 (1983-1989) and other relevant publications.

Locations of Point count samples (n=80)



Plant sampling locations (n=40)

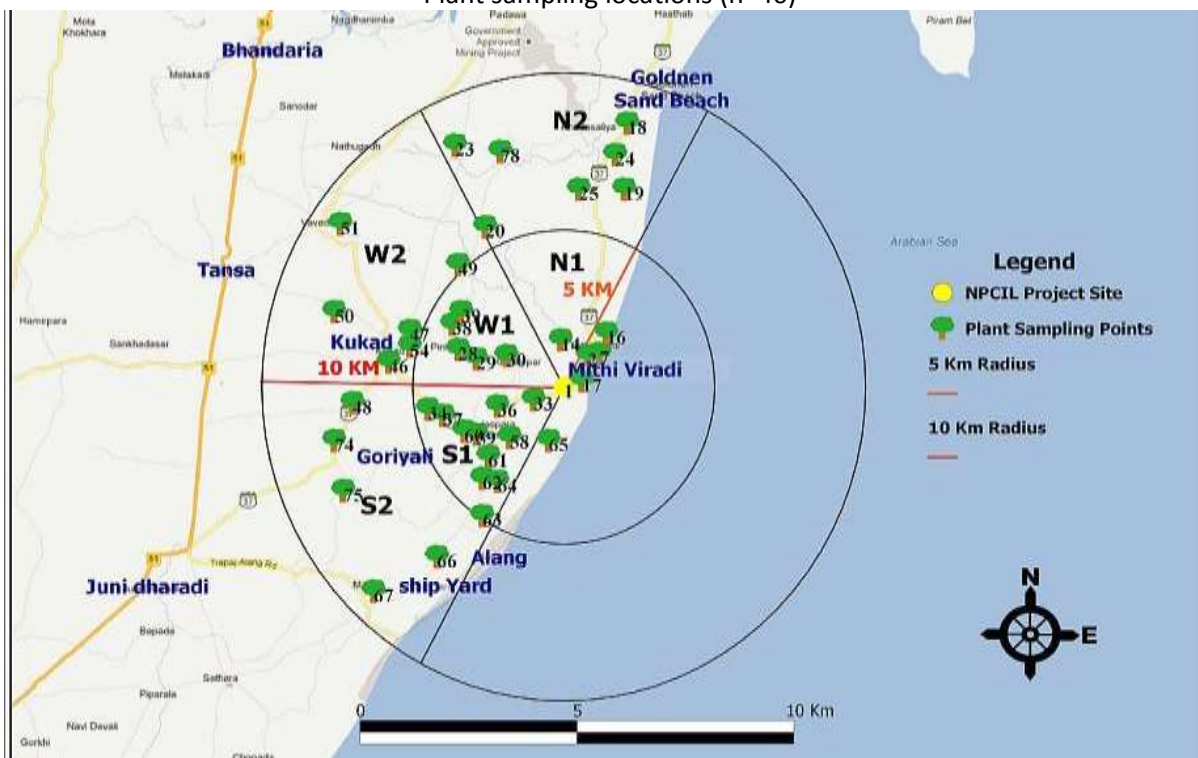


Figure 6. Location of fauna and flora sampling sites (See also Appendix 1)

The vegetation data were analyzed to obtain the quantitative structure and composition of plant communities. For understanding the synthetic characters of the forest vegetation, the species richness and diversity of species in the stands were calculated (Table 2). The vegetation data were tabulated for frequency, density, abundance, relative frequency, relative density, relative abundance, relative dominance, IVI and composition of plant communities, following Curtis and MC Intosh (1950), Philips (1959), Ludwig and Reynolds (1988) and Lande (1996). The Shannon-Wiener's index of diversity (H') was calculated with standard formulas using the software '*Species diversity and richness*', version 2.65, Colwell, 1994-2004 (Table 2).

Table 2. Calculation methods used for vegetation analysis

Parameters	Formula adopted
Frequency (%)	(No. of quadrats in which a species occurred/ Total no. of quadrats studied) \times 100
Abundance	Total number of individuals of the species/ No. of quadrats in which the species occurred
Density	Total no. of individuals of a given species/ Total no. of quadrats examined
Relative density	No. of individuals/ No. of individuals of all species
Relative abundance	(Abundance of species \times 100) / Sum of all abundances
Relative frequency	Number of quadrats occurring/ Total no. of quadrats
IVI	Relative density + Relative dominance + Relative frequency
Simpson Index	$D = \frac{1}{\sum (\text{number of individuals of given species} / \text{Number of individuals of all species})^2}$
Shannon-Weiner index	$H' = - \sum p_i \ln p_i$
Fisher's Alpha	$S = a * \ln(1 + n/a)$

3.2 FAUNAL SAMPLING

Various groups of animals found in the study area were recorded by both direct and indirect methods during the present study period. Different sampling techniques were applied to record different faunal groups in the study area. Animals documented in the present study include butterflies, birds, reptiles and mammals. The following major sampling techniques were used for recording the faunal groups during the present study (Table 3).

Table 3. Sampling techniques used for the faunal study

Taxa	Sampling Methods
Butterflies	Random walk, opportunistic observations
Birds	Random walk, opportunistic observations
Mammals	Tracks and signs, and visual encounter survey
Reptiles	Random walk, opportunistic observations

3.3 BUTTERFLIES

The butterflies in and around the project site were documented by direct observations, random walk and opportunistic observations, during morning (06:00 to 10:00 hrs) and evening (17:00 to 19:00 hrs) hours, by using a pair of binoculars. Butterfly survey was carried out by looking at 5 m distance on either side of the transect. The identification of butterflies was done following Gunathilagaraj et al. (1998), Kunte (2000), Kehimkar (2008) and Larson (1987-88).

3.4 AVIFAUNA

Random walk and opportunistic observations were used for documenting the birds. With the aid of a pair of binoculars the bird sampling were carried out during morning (06:00 to 10:00 hrs) and evening (17:00 to 19:00 hrs) hours. Point count methods were used for enumerating the avian fauna of the study area. Thus, randomly selected points in each parcel (N1, N2, W1, W2, S1 and S2; see also Figure 4) were sampled for birds. The bird observations were repeated twice at each point for five minutes intervals to see the species richness of the area. Direct sightings as well as calls were used for recording the birds. Ali and Ripley (1987) and Grimmet et al. (1998; 2001) were referred for the identification of birds. Grimmet et al. (1998; 2001) was followed for nomenclature.

3.5 MAMMALS

During the present study period, both direct and indirect methods (tracks & signs and visual encounter survey) were used to document the mammals occurring in the area. Indirect evidences such as pugmarks, calls, signs and scats were identified by following Bang et al. (1972), Burnham et al. (1980) and Heyer et al. (1994). Nomenclature by Menon (2003) is followed in this report.

3.6 HERPETOFAUNA

Visual Encounter Survey (VES) method was followed for the survey of the herpetofauna (amphibians and reptiles) in the study area during the present study. VES is a method one in which field personnel walk through an area or habitat for a prescribed time period systematically searching for animals. This is an appropriate technique for inventory and monitoring studies. During the search leaf litter, fallen logs, trees (bark, buttress, root and holes), shrubs, boulders, rocks and rock crevices were examined. The identification of herpetofauna was done with the help of Boulenger (1890), Daniel and Sekar (1989), Daniel (1963 & 1975), Daniel (1992), Daniels (1997 a, b & c), Daniel (2002), Daniels (2005), Indraneil Das (2002), Whitaker and Captain (2004).

4 OBSERVATIONS

The present study documented the flora and fauna of 10 km radial distance from the proposed site of the project using direct and indirect field methods along with secondary sources. Relevant satellite imageries and toposheets were also referred for data collection.

4.1 FLORAL DIVERSITY

The area falling under the 10 km radial distance is surrounded by both aquatic and terrestrial ecosystems. Diverse systems such as marine, cultivated lands, wetlands and human habitation were present in the study area that supported diverse floral species.

A total of 426 species of plants (including wild, ornamental and cultivated plants) belonging to 281 genera and spreading over 80 plant families were documented and identified in the 10 km radial distance from the proposed project site of the study area (Appendix 3). Among them, 331 species are belonging to dicotyledons and 95 species are coming under monocots.

4.1.1 FAMILIAL COMPOSITION

Among the 80 families reported in the study area, the family Poaceae is the dominant one and is represented with 60 species. The other notable dominant plant families recorded in the study area include Fabaceae 33 species, Euphorbiaceae 27 species, Asteraceae 21 species and Cyperaceae with 20 species (Figure 7).

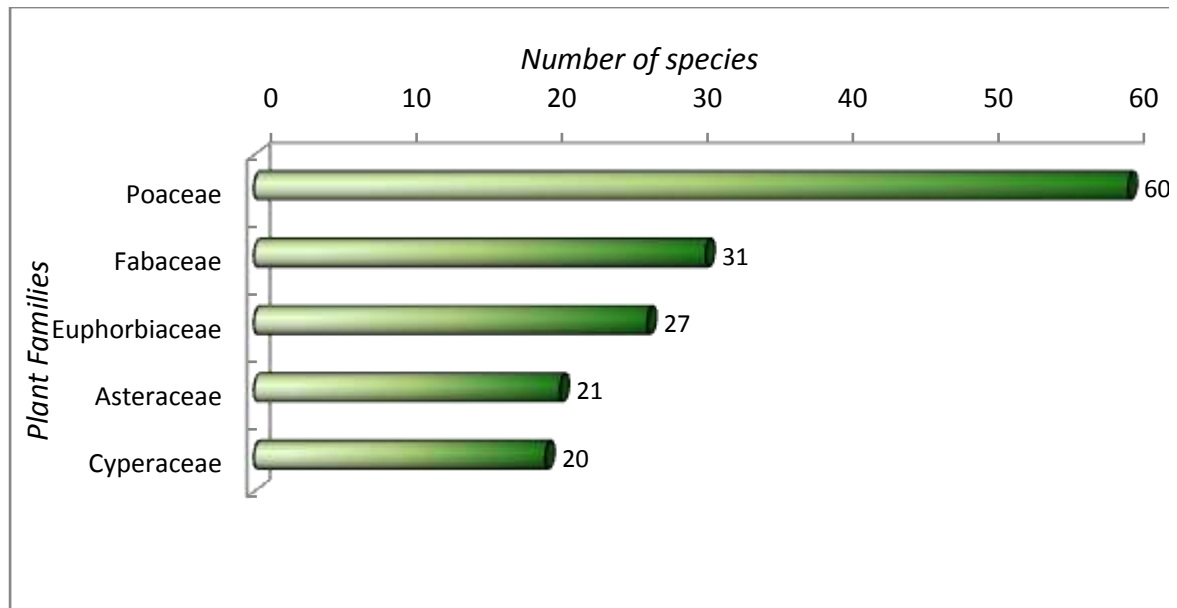


Figure 7. Dominant plant families of the study area

4.1.2 DOMINANT GENERA

Of the 281 genera recorded during the present study period, the genus *Fimbristylis* is the dominant one represented with 11 species followed by *Acacia* and *Eragrostis* with 8 species each, *Cyperus* and *Euphorbia* with 7 species each, *Ipomoea* and *Sida* with 6 species each and *Acalypha*, *Ficus* and *Senna* with 5 species each (Figure 8).

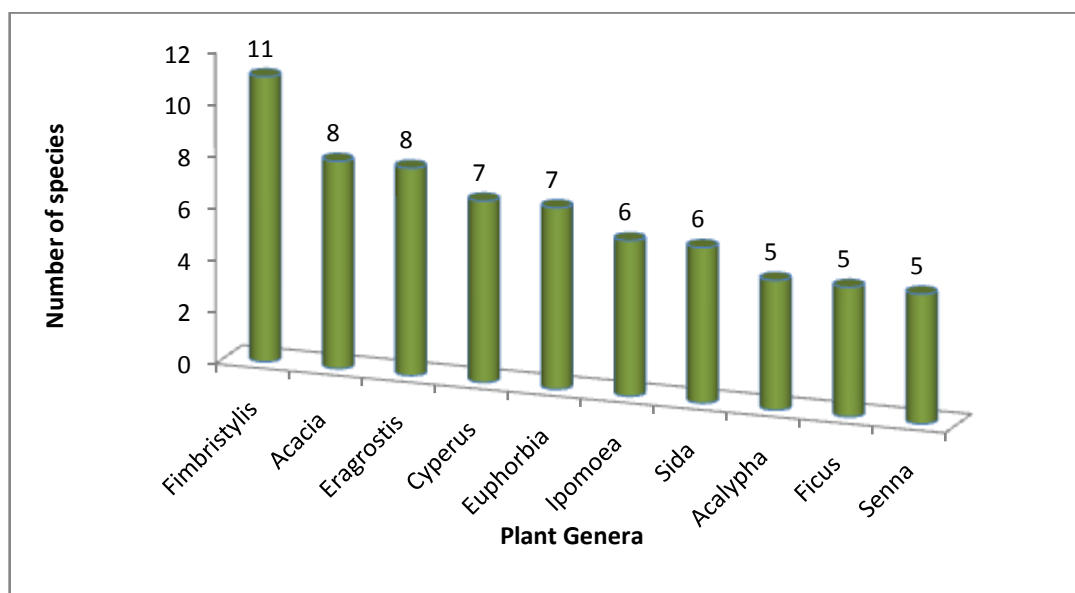


Figure 8 Dominant genera of the study area

4.1.3 HABIT WISE REPRESENTATION

Based on habit types, among the 426 plant species, herbaceous plants were dominant in the study area and was represented with 171 species, followed by trees (104 species), shrubs (51 species) grasses (60 species) and climbers/stragglers with 40 species (Figure 9).

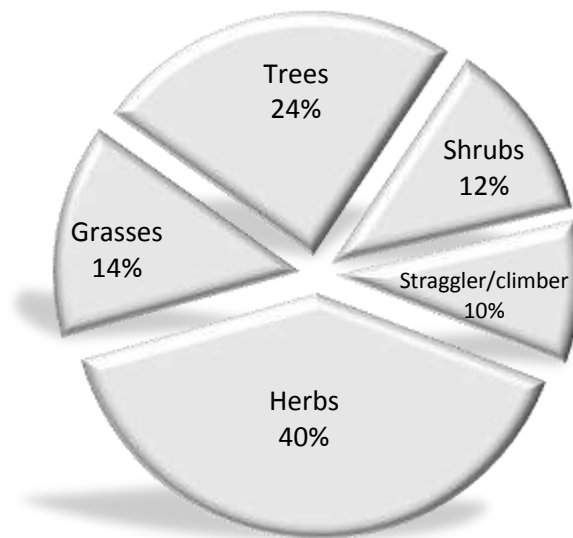


Figure 9 Habit wise representation of plants from the study area

4.2 PHYTOSOCIOLOGY

4.2.1 TREE COMMUNITY STRUCTURE

In order to find out the plant community structure in the present study area, phytosociological studies were carried out during the present study period in different vegetation and landscapes of the study area. A total of 1227 individuals of trees, belonging to 40 tree species, coming under 33 genera in 40 quadrats (10 x 10 m), have been recorded during the present study period from different landscapes. The tree community parameters were calculated from the data and presented in the Table 4.

Among the 40 species, the exotic tree species, *Prosopis juliflora* was represented by maximum number of individuals (n=114) followed by *Azadirachta indica* (n=89), *Balanites aegyptiaca* (n=79), *Acacia tortilis* (n=78) and *Prosopis cineraria* with 73 individuals. Likewise, the species such as *Bombax malabarica* (n=3) *Phyllanthus emblica* and *Mangifera indica* (n=5) each, were represented with least number of individuals recorded during the present study period.

Table 4. Tree community parameters of the present study area

Name of the species	Fre (%)	Abu	Den	RF	RA	RD	IVI
<i>Acacia leucophloea</i>	40	2.25	0.90	3.33	2.53	2.93	8.79
<i>Acacia nilotica</i>	30	1.92	0.58	2.49	2.15	1.87	6.52
<i>Acacia tortilis</i>	47.5	4.11	1.95	3.95	4.61	6.36	14.92
<i>Ailanthes excelsa</i>	32.5	1.23	0.40	2.70	1.38	1.30	5.39
<i>Alangium salviifolium</i>	47.5	1.95	0.93	3.95	2.19	3.02	9.15
<i>Albizia lebbek</i>	17.5	1.14	0.20	1.46	1.28	0.65	3.39
<i>Avicennia marina</i>	5	2.50	0.13	0.42	2.81	0.41	3.63
<i>Azadirachta indica</i>	52.5	4.24	2.23	4.37	4.76	7.25	16.38
<i>Balanites aegyptiaca</i>	52.5	3.76	1.98	4.37	4.23	6.44	15.03
<i>Bombax malabarica</i>	7.5	1.00	0.08	0.62	1.12	0.24	1.99
<i>Borassus flabellifer</i>	47.5	3.53	1.68	3.95	3.96	5.46	13.37
<i>Butea monosperma</i>	12.5	4.20	0.53	1.04	4.72	1.71	7.47
<i>Cassia siamea</i>	25	2.10	0.53	2.08	2.36	1.71	6.15
<i>Commiphora mukul</i>	30	3.50	1.05	2.49	3.93	3.42	9.85
<i>Cordia dichotoma</i>	42.5	2.71	1.15	3.53	3.04	3.75	10.32
<i>Cordia myxa</i>	45	2.00	0.90	3.74	2.25	2.93	8.92
<i>Delonix elata</i>	37.5	2.27	0.85	3.12	2.55	2.77	8.44
<i>Erythrina stricta</i>	22.5	1.67	0.38	1.87	1.87	1.22	4.97
<i>Ficus benghalensis</i>	37.5	1.27	0.48	3.12	1.42	1.55	6.09
<i>Ficus microcarpa</i>	15	1.33	0.20	1.25	1.50	0.65	3.40
<i>Ficus racemosa</i>	27.5	1.55	0.43	2.29	1.74	1.39	5.41
<i>Flacourtia indica</i>	20	3.00	0.60	1.66	3.37	1.96	6.99
<i>Giliricidia sepium</i>	22.5	1.56	0.35	1.87	1.75	1.14	4.76
<i>Gmelina arborea</i>	20	1.13	0.23	1.66	1.26	0.73	3.66
<i>Grewia tilifolia</i>	12.5	1.60	0.20	1.04	1.80	0.65	3.49
<i>Hibiscus tiliaceous</i>	17.5	1.57	0.28	1.46	1.77	0.90	4.12
<i>Mangifera indica</i>	10	1.00	0.10	0.83	1.12	0.33	2.28
<i>Manilkara hexandra</i>	22.5	1.33	0.30	1.87	1.50	0.98	4.35
<i>Millingtonia hortensis</i>	12.5	1.20	0.15	1.04	1.35	0.49	2.88
<i>Morinda pubescens</i>	42.5	2.71	1.15	3.53	3.04	3.75	10.32
<i>Parkinsonia aculeata</i>	25	1.40	0.35	2.08	1.57	1.14	4.79
<i>Phyllanthus emblica</i>	10	1.00	0.10	0.83	1.12	0.33	2.28
<i>Prosopis cineraria</i>	45	4.06	1.83	3.74	4.56	5.95	14.25
<i>Prosopis juliflora</i>	60	4.75	2.85	4.99	5.34	9.29	19.62
<i>Salvadora persica</i>	40	3.81	1.53	3.33	4.28	4.97	12.58
<i>Sapindus emarginatus</i>	20	2.38	0.48	1.66	2.67	1.55	5.88
<i>Tamarindus indica</i>	40	1.25	0.50	3.33	1.40	1.63	6.36
<i>Terminalia catappa</i>	15	1.00	0.15	1.25	1.12	0.49	2.86
Unknown sp.	60	2.63	1.58	4.99	2.95	5.13	13.07
<i>Ziziphus mauritiana</i>	32.5	1.46	0.48	2.70	1.64	1.55	5.89

Where: Fre (%)—Frequency in percentage; Abu—Abundance; Den—Density; RF—Relative Frequency; RA—Relative Abundance; RD—Relative Density; IVI—Important value Index

The maximum density value recorded for *Prosopis juliflora* (2.85) followed by *Azadirachta indica* (2.23), *Balanites aegyptiaca* (1.98), *Acacia tortilis* (1.95) and *Prosopis cineraria* (1.83). The highest Relative density value recorded for *Prosopis juliflora* (9.29) followed by *Azadirachta indica* (7.25), *Balanites aegyptiaca* (6.44), *Acacia tortilis* (6.36) and *Prosopis cineraria* (5.95).

The maximum abundance value recorded for *Prosopis juliflora* (4.75) followed by *Azadirachta indica* (4.24), *Butea monosperma* (4.20), *Acacia tortilis* (4.11) and *Prosopis cineraria* (4.06). The highest relative abundance value recorded for *Prosopis juliflora* (5.34) followed by *Azadirachta indica* (4.76), *Butea monosperma* (4.72), *Acacia tortilis* (4.61) and *Prosopis cineraria* (4.56).

The highest Important Value Index (IVI) was recorded for *Prosopis juliflora* (19.62) followed by *Azadirachta indica* (16.38), *Balanites aegyptiaca* (15.03), *Acacia tortilis* (14.92) and *Prosopis cineraria* (14.25).

The Shannon-Weiner index of diversity for tree species community in the study area is 3.3367. The Simpson index of diversity is 0.96. The Fishers Alpha diversity is 7.9299.

Based on the present study, *Prosopis juliflora*, an exotic species, showed the highest importance value index among the trees. Broadly IVI followed the pattern similar to that of density and basal area. Thus, the present study shows that though there are many species of trees growing in this area, *Prosopis juliflora* is the dominant component and other species are still need to be established. However, though *Prosopis juliflora* showed the highest IVI value, some other native species such as *Azadirachta indica* and *Balanites aegyptiaca* also more or less have similar value as that of *P. juliflora*. (See also the methodology part for the formulae and derivations)

4.2.2 SHRUB SPECIES COMMUNITY STRUCTURE

A total of 2282 individuals of shrubs, belonging to 36 species, falling under 32 genera in 40 quadrats (10 x 10 m), have been recorded during the present study period from different landscapes. The shrub community parameters were calculated from the data and presented in the Table 5.

Table 5. Shrub community parameters of the present study area.

Name of the species	Fre (%)	Abu	Den	RF	RA	RD	IVI
<i>Abutilon hirtum</i>	60.00	3.54	2.13	4.22	2.67	3.72	10.62
<i>Abutilon indicum</i>	70.00	4.04	2.83	4.92	3.05	4.95	12.92
<i>Acacia caesia</i>	40.00	2.25	0.90	2.81	1.70	1.58	6.09
<i>Acacia torta</i>	17.50	1.57	0.28	1.23	1.19	0.48	2.90
<i>Acalypha fruticosa</i>	25.00	3.40	0.85	1.76	2.57	1.49	5.81
<i>Azima tetracantha</i>	35.00	1.86	0.65	2.46	1.40	1.14	5.00
<i>Cadaba fruticosa</i>	30.00	1.33	0.40	2.11	1.01	0.70	3.82
<i>Caesalpinia bonduc</i>	47.50	1.53	0.73	3.34	1.15	1.27	5.76
<i>Calotropis procera</i>	67.50	4.89	3.30	4.75	3.69	5.78	14.22
<i>Capparis sepiaria</i>	40.00	2.25	0.90	2.81	1.70	1.58	6.09
<i>Chromolaena odorata</i>	72.50	5.79	4.20	5.10	4.37	7.36	16.83
<i>Cissus trifoliata</i>	42.50	2.18	0.93	2.99	1.64	1.62	6.25
<i>Clerodendrum phlomidis</i>	65.00	2.96	1.93	4.57	2.24	3.37	10.18
<i>Cressa cretica</i>	7.50	4.67	0.35	0.53	3.52	0.61	4.66
<i>Datura metal</i>	47.50	1.79	0.85	3.34	1.35	1.49	6.18
<i>Euphorbia nerifolia</i>	47.50	4.84	2.30	3.34	3.66	4.03	11.03
<i>Fluggea leucopyros</i>	55.00	3.55	1.95	3.87	2.68	3.42	9.96
<i>Fluggea virosa</i>	25.00	2.10	0.53	1.76	1.59	0.92	4.26
<i>Grewia villosa</i>	15.00	4.50	0.68	1.05	3.40	1.18	5.64
<i>Hibiscus vitifolius</i>	57.50	4.48	2.58	4.04	3.38	4.51	11.94
<i>Jatropha gossypifolia</i>	40.00	1.69	0.68	2.81	1.27	1.18	5.27
<i>Justicia adhatoda</i>	20.00	2.00	0.40	1.41	1.51	0.70	3.62
<i>Lantana camara</i>	40.00	5.13	2.05	2.81	3.87	3.59	10.27
<i>Lawsonia inermis</i>	32.50	2.92	0.95	2.28	2.21	1.67	6.16
<i>Leptadenia reticulata</i>	7.50	1.33	0.10	0.53	1.01	0.18	1.71
<i>Maytenus emarginata</i>	25.00	2.80	0.70	1.76	2.11	1.23	5.10
<i>Mimosa hamata</i>	55.00	7.09	3.90	3.87	5.35	6.84	16.06
<i>Pentatropis microphylla</i>	27.50	3.55	0.98	1.93	2.68	1.71	6.32
<i>Phoenix laurierii</i>	30.00	1.58	0.48	2.11	1.20	0.83	4.14
<i>Phyllanthus reticulatus</i>	27.50	2.82	0.78	1.93	2.13	1.36	5.42
<i>Randia parviflora</i>	22.50	2.78	0.63	1.58	2.10	1.10	4.77
<i>Rivea hypocrateriformis</i>	45.00	2.28	1.03	3.16	1.72	1.80	6.68
<i>Senna auriculata</i>	52.50	2.81	1.48	3.69	2.12	2.59	8.40
<i>Typha angustifolia</i>	45.00	20.06	9.03	3.16	15.14	15.82	34.13
<i>Ziziphus nummularia</i>	52.50	6.95	3.65	3.69	5.25	6.40	15.34
<i>Ziziphus oenoplia</i>	32.50	3.15	1.03	2.28	2.38	1.80	6.46

Where: Fre (%) - Frequency in percentage; Abu - Abundance; Den - Density; RF - Relative Frequency; RA - Relative Abundance; RD - Relative Density; IVI - Important value Index

Among the 36 species, *Typha angustifolia* was the dominant one represented by maximum number of individuals (n=361) followed by *Chromolaena odorata* (n=168), *Mimosa hamata* (n=156), *Ziziphus nummularia* (n=146) and *Calotropis procera* with 132 individuals. Likewise,

the species such as *Leptadenia reticulata* (n=4) and *Acacia torta* (n=11), were represented with least number of individuals.

The maximum density value was recorded for *Typha angustifolia* (9.03) followed by *Chromolaena odorata* (4.20), *Mimosa hamata* (3.90), *Ziziphus nummularia* (3.65) and *Calotropis procera* (3.30). Likewise, the highest Relative density value recorded for *Typha angustifolia* (15.82) followed by *Chromolaena odorata* (7.39), *Mimosa hamata* (6.84), *Ziziphus nummularia* (6.40) and *Calotropis procera* (5.78).

The maximum abundance value recorded for *Typha angustifolia* (20.06) followed by *Mimosa hamata* (7.09), *Ziziphus nummularia* (6.95), *Chromolaena odorata* (5.79) and *Lantana camara* (5.13). Likewise, the highest relative abundance value recorded for *Typha angustifolia* (15.82) followed by *Chromolaena odorata* (7.36), *Mimosa hamata* (6.84), *Ziziphus nummularia* (6.40), and *Calotropis procera* (5.78).

The highest Important Value Index (IVI) was recorded for *Typha angustifolia* (34.13) followed by *Chromolaena odorata* (16.83), *Mimosa hamata* (16.06), *Ziziphus nummularia* (15.34) and *Calotropis procera* (14.22).

The Shannon-Weiner index of diversity for shrub community in the study area is 3.1916. The Simpson index of diversity is 0.94. The Fishers Alpha diversity is 6.0731.

The present study indicates that the diversity of species richness and species diversity of scrub species is high in the study area, since the Shannon diversity is high (3.1916). (for calculation please refer the methodology part).

4.2.3 HERBACEOUS PLANT COMMUNITY STRUCTURE

A total of 5767 numbers herbaceous plants, belonging to 83 species, spreading over 68 genera in 40 quadrats (10 x 10 m), were recorded during the present study period from the study area. The herbaceous plant community parameters were, calculated from the data and presented in the Table 6.

Of the 83 species recorded here, *Chloris tenella* was represented by maximum number of individuals (n=365) followed by *Heteropogon contortus* (n=319), *Brachiaria remota* (n=259), *Dicanthium annulatum* (n=216) and *Alysicarpus longifolia* with 186 species. Likewise, the

species such as *Acanthus illicifolius* (n=3) and *Polygala* sp. (n=7) each, were representing least number of individuals, recorded during the present study period.

The maximum density value recorded for *Chloris tenella* (9.13) followed by *Heteropogon contortus* (7.98), *Brachiaria remota* (6.48), *Dicanthium annulatum* (5.40) and *Alysicarpus longifolia* (4.65). The highest Relative density value recorded for *Chloris tenella* (6.33) followed by *Heteropogon contortus* (5.53), *Brachiaria remota* (4.49), *Dicanthium annulatum* (3.75) and *Alysicarpus longifolia* (3.23).

The maximum abundance value recorded for *Chloris tenella* (11.06) followed by *Heteropogon contortus* (8.86), *Brachiaria remota* (8.35), *Alysicarpus longifolius* (6.89) and *Dicanthium annulatum* (6.75). The highest relative abundance value recorded for *Chloris tenella* (3.93) followed by *Heteropogon contortus* (3.15), *Brachiaria remota* (2.97), *Alysicarpus longifolius* (2.45) and *Dicanthium annulatum* (2.40).

The highest Important Value Index (IVI) was recorded for *Chloris tenella* (12.37) followed by *Heteropogon contortus* (10.98), *Brachiaria remota* (9.44), *Dicanthium annulatum* (8.19) and *Alysicarpus longifolia* (7.40).

The Shannon-Weiner index of diversity for herbaceous species community in the study area was found to be 4.1054. The Simpson index of diversity was 0.98. The Fishers Alpha diversity is 13.747. The present study indicates that the diversity of species richness and species diversity is high in the study area, since the Shannon diversity is high (4.1054) (for calculation please refer the methodology part).

Table 6 Herbaceous plant community parameters of the present study area.

Name of the species	Fre (%)	Abu	Den	RF	RA	RD	IVI
<i>Acanthus illicifolius</i>	5.00	1.50	0.08	0.13	0.53	0.05	0.71
<i>Alternanthera sessilis</i>	47.50	2.84	1.35	1.21	1.01	0.94	3.16
<i>Alternanthera tenella</i>	42.50	4.00	1.70	1.08	1.42	1.18	3.69
<i>Alysicarpus longifolia</i>	67.50	6.89	4.65	1.72	2.45	3.23	7.40
<i>Alysicarpus rugosus</i>	52.50	3.24	1.70	1.34	1.15	1.18	3.67
<i>Amaranthus spinosus</i>	60.00	3.25	1.95	1.53	1.16	1.35	4.04
<i>Amaranthus viridis</i>	52.50	1.48	0.78	1.34	0.53	0.54	2.40
<i>Anisomeles indica</i>	40.00	1.94	0.78	1.02	0.69	0.54	2.25
<i>Anisomeles malabarica</i>	57.50	3.39	1.95	1.47	1.21	1.35	4.02
<i>Apluda mutica</i>	65.00	5.73	3.73	1.66	2.04	2.58	6.28
<i>Baccoba monnerii</i>	22.50	5.33	1.20	0.57	1.90	0.83	3.30
<i>Biophytum reinwardii</i>	55.00	2.95	1.63	1.40	1.05	1.13	3.58

Name of the species	Fre (%)	Abu	Den	RF	RA	RD	IVI
<i>Boerhaavia diffusa</i>	65.00	1.31	0.85	1.66	0.47	0.59	2.71
<i>Boerhaavia erecta</i>	47.50	1.47	0.70	1.21	0.52	0.49	2.22
<i>Bothriochloa pertusa</i>	45.00	2.00	0.90	1.15	0.71	0.62	2.48
<i>Brachiaria remota</i>	77.50	8.35	6.48	1.98	2.97	4.49	9.44
<i>Celosia polygonoides</i>	42.50	1.88	0.80	1.08	0.67	0.55	2.31
<i>Centella asiatica</i>	32.50	4.38	1.43	0.83	1.56	0.99	3.38
<i>Chloris barbata</i>	65.00	3.19	2.08	1.66	1.14	1.44	4.23
<i>Chloris dolichostachya</i>	17.50	2.29	0.40	0.45	0.81	0.28	1.54
<i>Chloris tenella</i>	82.50	11.06	9.13	2.10	3.93	6.33	12.37
<i>Cleome monophylla</i>	50.00	1.20	0.60	1.27	0.43	0.42	2.12
<i>Cleome viscosa</i>	67.50	2.30	1.55	1.72	0.82	1.08	3.61
<i>Commelina benghalensis</i>	55.00	1.91	1.05	1.40	0.68	0.73	2.81
<i>Corchorus tridens</i>	52.50	1.81	0.95	1.34	0.64	0.66	2.64
<i>Crotalaria obovata</i>	52.50	4.67	2.45	1.34	1.66	1.70	4.70
<i>Croton bonplandianum</i>	72.50	5.03	3.65	1.85	1.79	2.53	6.17
<i>Dactyloctenium aegyptium</i>	65.00	4.08	2.65	1.66	1.45	1.84	4.95
<i>Desmostachya bipinnata</i>	42.50	5.24	2.23	1.08	1.86	1.54	4.49
<i>Dicanthium annulatum</i>	80.00	6.75	5.40	2.04	2.40	3.75	8.19
<i>Echinops echinatus</i>	60.00	3.25	1.95	1.53	1.16	1.35	4.04
<i>Enicostemma axillare</i>	40.00	3.50	1.40	1.02	1.24	0.97	3.24
<i>Eremopogon foveolatus</i>	25.00	3.40	0.85	0.64	1.21	0.59	2.44
<i>Euphorbia geniculata</i>	45.00	2.89	1.30	1.15	1.03	0.90	3.08
<i>Euphorbia hirta</i>	45.00	4.22	1.90	1.15	1.50	1.32	3.97
<i>Evolvulus alsinoides</i>	32.50	4.54	1.48	0.83	1.61	1.02	3.47
<i>Gloriosa superba</i>	17.50	1.43	0.25	0.45	0.51	0.17	1.13
<i>Goniogyna hirta</i>	45.00	4.06	1.83	1.15	1.44	1.27	3.86
<i>Hedyotis corymbosa</i>	47.50	2.89	1.38	1.21	1.03	0.95	3.19
<i>Heteropogon contortus</i>	90.00	8.86	7.98	2.29	3.15	5.53	10.98
<i>Hyptis suaveolens</i>	67.50	2.93	1.98	1.72	1.04	1.37	4.13
<i>Indigofera linnaei</i>	32.50	5.54	1.80	0.83	1.97	1.25	4.05
<i>Indoneesiella echioides</i>	35.00	3.64	1.28	0.89	1.30	0.88	3.07
<i>Iseilema laxum</i>	75.00	5.93	4.45	1.91	2.11	3.09	7.11
<i>Lagascea mollis</i>	57.50	1.83	1.05	1.47	0.65	0.73	2.84
<i>Malvastrum coromandelianum</i>	65.00	2.81	1.83	1.66	1.00	1.27	3.92
<i>Martynia annua</i>	47.50	4.32	2.05	1.21	1.53	1.42	4.17
<i>Nicandra physalodes</i>	35.00	3.43	1.20	0.89	1.22	0.83	2.94
<i>Ocimum canum</i>	47.50	2.95	1.40	1.21	1.05	0.97	3.23
<i>Oldenlandia umbellata</i>	25.00	2.80	0.70	0.64	1.00	0.49	2.12
<i>Parthenium hysterophorus</i>	67.50	6.59	4.45	1.72	2.34	3.09	7.15
<i>Pavonia odorata</i>	60.00	1.29	0.78	1.53	0.46	0.54	2.53
<i>Pedaliium murex</i>	45.00	2.17	0.98	1.15	0.77	0.68	2.59
<i>Phyllanthus amarus</i>	65.00	3.38	2.20	1.66	1.20	1.53	4.39
<i>Phyllanthus maderaspatensis</i>	72.50	3.52	2.55	1.85	1.25	1.77	4.87
<i>Plumbago zeylanica</i>	40.00	1.94	0.78	1.02	0.69	0.54	2.25

Name of the species	Fre (%)	Abu	Den	RF	RA	RD	IVI
<i>Polycarpha corymbosa</i>	15.00	2.17	0.33	0.38	0.77	0.23	1.38
<i>Polygala</i> sp.	12.50	1.40	0.18	0.32	0.50	0.12	0.94
<i>Pulicaria wightiana</i>	20.00	1.75	0.35	0.51	0.62	0.24	1.38
<i>Pupalia lappacea</i>	22.50	3.00	0.68	0.57	1.07	0.47	2.11
<i>Ruellia patula</i>	65.00	5.04	3.28	1.66	1.79	2.27	5.72
<i>Salicornia brachiata</i>	7.50	6.33	0.48	0.19	2.25	0.33	2.77
<i>Sebastiania chamaelea</i>	60.00	2.79	1.68	1.53	0.99	1.16	3.68
<i>Sehima nervosum</i>	25.00	3.90	0.98	0.64	1.39	0.68	2.70
<i>Senna italica</i>	25.00	1.30	0.33	0.64	0.46	0.23	1.33
<i>Senna occidentalis</i>	60.00	2.17	1.30	1.53	0.77	0.90	3.20
<i>Senna tora</i>	52.50	2.33	1.23	1.34	0.83	0.85	3.02
<i>Sida acuta</i>	57.50	2.74	1.58	1.47	0.97	1.09	3.53
<i>Sida cordata</i>	40.00	2.56	1.03	1.02	0.91	0.71	2.64
<i>Sida cordifolia</i>	47.50	1.47	0.70	1.21	0.52	0.49	2.22
<i>Sonchus oleraceus</i>	47.50	1.37	0.65	1.21	0.49	0.45	2.15
<i>Striga asiatica</i>	30.00	3.08	0.93	0.76	1.10	0.64	2.50
<i>Taraxacum officianale</i>	42.50	1.53	0.65	1.08	0.54	0.45	2.08
<i>Tephrosia purpurea</i>	50.00	5.15	2.58	1.27	1.83	1.79	4.89
<i>Trianthema portulacastrum</i>	22.50	6.00	1.35	0.57	2.13	0.94	3.64
<i>Tribulus lanuginosus</i>	20.00	1.50	0.30	0.51	0.53	0.21	1.25
<i>Tribulus terrestris</i>	52.50	2.19	1.15	1.34	0.78	0.80	2.92
<i>Tridax procumbens</i>	60.00	3.38	2.03	1.53	1.20	1.40	4.13
<i>Triumfetta rhomboidea</i>	27.50	1.36	0.38	0.70	0.49	0.26	1.45
<i>Urena lobata</i>	42.50	2.00	0.85	1.08	0.71	0.59	2.38
<i>Waltheria indica</i>	45.00	2.00	0.90	1.15	0.71	0.62	2.48
<i>Xanthium indicum</i>	47.50	3.21	1.53	1.21	1.14	1.06	3.41
<i>Zornia gibbosa</i>	60.00	3.88	2.33	1.53	1.38	1.61	4.52

Where: Fre (%)-Frequency in percentage; Abu-Abundance; Den-Density; RF-Relative Frequency; RA-Relative Abundance; RD-Relative Density; IVI-Important value Index

4.3 AVIFAUNA

A total of 139 species of birds were observed during the present survey in the 10 km radial distance from the proposed project site (Appendix 2). The habitat types of the area include agriculture land, scrub jungle, plantation, costal area, salt pans, wetlands, marshlands and fallow grasslands. The common wetland or wetland associated species of the area include Eurasian Spoonbill (*Platalea leucorodia*), Fulvous Whistling-duck (*Dendrocygna bicolor*), Painted Stork (*Mycteria leucocephala*), Little Cormorant (*Phalacrocorax niger*), Black Ibis (*Pseudibis papillosa*) and Black-headed Ibis (*Threskiornis melanocephalus*). The common terrestrial species of the area include Ashy-crowned Sparrow Lark (*Eremopterix griseus*), Rosy Starling (*Sturnus roseus*) and Indian Peafowl (*Pavo cristatus*).

Among them, species such as Ashy-crowned Sparrow Lark (*Eremopterix griseus*), Rosy Starling (*Sturnus roseus*), Eurasian Spoonbill (*Platalea leucorodia*), Fulvous Whistling-duck (*Dendrocygna bicolor*), Painted Stork (*Mycteria leucocephala*), Little Cormorant (*Phalacrocorax niger*), Black Ibis (*Pseudibis papillosa*) and Black-headed Ibis (*Threskiornis melanocephalus*) were fairly common in most of the study area.

Among the 139 species of birds, the birds such as Black-headed Ibis, Lesser Flamingo, European Roller, Eurasian Curlew, River Tern and Painted Stork are coming under near threatened category as per IUCN (IUCN 2012). Apart from these, according to Indian Wildlife Protection Act (1972), the following birds viz., Indian Peafowl (*Pavo cristatus*), Eurasian Spoonbill (*Platalea leucorodia*), (IWLPA 1972) Black Kite (*Milvus migrans*) and Black-shouldered Kite (*Elanus caeruleus*) are falling under Schedule-I (Anonymous 2002).

Table 7 Bird species of Conservation importance recorded from the area

No.	Local Name	Scientific Name	IUCN status	IWPA, 1972
1.	Black Kite	<i>Milvus migrans</i>	-	Schedule I
2.	Black-headed Ibis	<i>Threskiornis melanocephalus</i>	Near Threatened	
3.	Black-shouldered Kite	<i>Elanus caeruleus</i>	-	Schedule I
4.	Brahminy Kite	<i>Haliastur indus</i>	-	Schedule I
5.	Eurasian Curlew	<i>Numenius arquata</i>	Near Threatened	
6.	Eurasian Spoonbill	<i>Platalea leucorodia</i>	Near Threatened	
7.	European Roller	<i>Coracias garrulus</i>	Near Threatened	
8.	Indian Peafowl	<i>Pavo cristatus</i>	-	Schedule I
9.	Lesser Flamingo	<i>Phoenicopterus minor</i>	Near Threatened	
10.	Painted Stork	<i>Mycteria leucocephala</i>	Near Threatened	
11.	River Tern	<i>Sterna aurantia</i>	Near Threatened	
12.	Shikra	<i>Accipiter badius</i>	-	Schedule I

Source: IUCN, 2012 and Indian Wildlife Protection Act 1972.

The richness of bird species in each plot was tested, the species turn over rate at each sample points were calculated. More number of species was observed in the plot S1 and S2. However the species turn over rate was more in the plot N2.

The southern part of the study area (S1 and S2) comprised of varied range of habitats, including the in land wetlands, scrub jungles, vast areas of grasslands, cultivated lands, coastal wetlands and salt pans, this could be the very reason for the high species richness in the parcel S1 and S2.

The inland water bodies and the agriculture fields in the parcel N2 provides good feeding area for many of the bird species. Hence the area is found frequented by several bird species.

4.4 BUTTERFLIES

A total of 46 butterfly species belonging to 5 families were recorded during the present study period (Appendix 4). At family level, the family Nymphalidae is the dominant one with 18 species followed by Pieridae with 13 species and Hesperidae & Papilionidae with 5 species. Species such as Chocolate Pansy, Common Castor, Common Jezebel, Plain Tiger, Common Crow, Lime Butterfly, Common Grass Yellow and Small Orange Tip were commonly seen in and around the proposed project site. Of the 46 species recorded, the following butterflies fall under rare/threatened and endemic category. Crimson Rose, Danaid Eggfly and Common Pierrot are protected under schedule-I of Indian Wildlife Protection Act 1972. Common Gull is included under schedule-II and Common Crow under schedule - IV of the Act. Blue Mormon and Crimson Rose are endemic species found occurring in the present study area, the distributions of which are restricted to the Peninsular India and Srilanka (Kunte, 2000).

4.5 MAMMALS

The present study area is a suitable habitat for Nilgai (*Boselaphus tragocamelus*). Several Nilgai sightings were recorded during the present study period throughout the study area (Table 8). Based on direct sightings, secondary information and information gathered from local public a total of 15 species of mammals were recorded in the present study area.

Table 8 List of mammals recorded during the present study period

Sl. No.	Common name	Scientific name
1	Nilgai	<i>Boselaphus tragocamelus</i>
2	Spotted Deer	<i>Axis axis</i>
3	Three-striped Palm Squirrel	<i>Funambulus palmarum</i>
4	Jackal	<i>Canis aureas</i>
5	Striped Hyaena*	<i>Hyaena hyaena</i>
6	Blackbuck*	<i>Antelope cervicapra</i>
7	Wild Boar*	<i>Sus scrofa</i>
8	Jungle Cat*	<i>Felis chaus</i>
9	Chinkara*	<i>Gazella bennettii</i>
10	Sambar*	<i>Rusa unicolor</i>
11	Bengal Fox*	<i>Vulpes bengalensis</i>
12	Honey Badger*	<i>Mellivora capensis</i>
13	Indian Crested Procupine*	<i>Hystrix indica</i>
14	Indian Hedgehog*	<i>Paraechinus micropus</i>
15	Indian Wolf*	<i>Canis lupus pallipes</i>

Sl. No.	Common name	Scientific name
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*Inferred from Indirect evidences/ secondary sources

4.6 REPTILES

A total of 17 species of reptiles were recorded in and around the study area based on both direct sightings and secondary informations. Species those are included based on secondary information marked with single asterisk, species included based on the information gathered from local people marked with two asterisk marks and species included based on the direct sightings with three asterisk marks.

Table 9 List of reptiles recorded

Sl. No.	Common name	Scientific name
1	Small Blind Snake	<i>Typhlops</i> sp.*
2	Saw-Scaled Viper	<i>Echis carinatus</i> *
3	Russell's Viper	<i>Daboia russelii</i> **
4	Sand Boa	<i>Eryx johnii</i> *
5	Wolf Snake	<i>Lycodon striatus</i> *
6	Common Rat Snake	<i>Ptyas mucosus</i>
7	Indian Rock Python	<i>Phython molurus</i> *
8	Common Krait	<i>Bungarus caeruleus</i> **
9	Spectacled Cobra	<i>Naja Naja</i> **
10	Chequered Keel Back	<i>Xenochrophis piscator</i> *
11	Indian Flapshell Turtle	<i>Lissemys punctata</i> ***
12	Indian Softshell Turtle	<i>Aspideretes gangeticus</i> ***
13	Yellow-green House Gecko	<i>Hemidactylus flaviviridis</i> ***
14	Fanthroated Lizard	<i>Sitana ponticeriana</i> ***
15	Indian Garden Lizard	<i>Calotes versicolor</i> ***
16	Keeled Grass Skink	<i>Mabuya carinata</i> ***
17	Monitor Lizard	<i>Varanus bengalensis</i> ***

* Inferred from Indirect evidences/ secondary sources; ** Gathered from local people;*** Direct observation; Nomenclature after Das (2003)

4.7 AMPHIBIANS

Based on field observations and the available secondary information, a total of 7 species of amphibians could be recorded from the study area as given in the following table.

Table 10. List of Amphibian species recorded

Sl. No.	Scientific name	Common name
1.	<i>Bufo stomaticus</i>	Marbled Toad*
2.	<i>Euphlyctis cyanophlyctis</i>	Indian Skipper Frog
3.	<i>Limnonectes limnocharis</i>	Cricket Frog
4.	<i>Tomopterna breviceps</i>	Short-headed Burrowing Frog*
5.	<i>Hoplobatrachus tigerinus</i>	Indian Bull Frog

Sl. No.	Scientific name	Common name
6.	<i>Microhyla ornata</i>	Ornate Narrow-mouthed Frog
7.	<i>Hoplobatrachus crassus</i>	Jerdon's Bull Frog*

* species included based on secondary information

4.8 FISHES

Based on various secondary information a total of 15 species of fishes are commonly reported from the Gujarat coasts, including coastline adjoining the present study area.

Table 11. List of fishes reported from the area

Sl. No.	Common name	Scientific name
1.	Indian Conger Eel	<i>Conger cinereus</i>
2.	Milk Fish	<i>Chanos chanos</i>
3.	Blue Spot Grey Mullet	<i>Valamugil seheli</i>
4.	Grey Mullet	<i>Mugil cephalus</i>
5.	Spade fish	<i>Ephippus orbis</i>
6.	Japanese Thread-fin bream	<i>Nemipterus japonicus</i>
7.	Long Spine Sea-bream	<i>Argyrops spinifer</i>
8.	Indian Salmon	<i>Eleutheronema tetradactylum</i>
9.	Bombay Duck	<i>Horpodon neherius*</i>
10.	Jew fish	<i>Pseudoscioena sp.*</i>
11.	Jew fish	<i>Diacanthus sp.*</i>
12.	Thread Fin	<i>Polynemus indicus*</i>
13.	Jew fish	<i>Pristopomas spp.*</i>
14.	Mud Skipper	<i>Bolephthalmus*</i>
15.	Shark	<i>Characarias spp.*</i>

* Sources:
Anonymous 2011 and Kizhakudan (2003)

4.9 SENSITIVE AREAS

There are no notified sensitive areas like national parks or wildlife sanctuaries located within the 10 km radial distance of the proposed project site at Mithivirdi. The Blackbuck National Park in Velavadar is the nearest one to the project site, which is situated at a distance of about 70 km away from the project site.

5 ECOLOGICAL IMPACTS

Under normal conditions, the major ecological impacts that can be ideated from the proposed nuclear power project in Mithivirdi, Gujarat are those during the construction and operation phases of the project. The land mass in and around the proposed nuclear project area is dominated by scrub jungle. The other land type includes plantations, settlements and crop lands.

5.1 IMPACTS DURING CONSTRUCTION PHASE

According to the Detailed Project Report (DPR) a land mass of 777 ha is being acquired for the construction of the project structures and 100 ha of land area for townships in *Kukud* (37 ha) and *Navagam* (63 ha) village boundaries. The conversion of these land masses in to built-up area will have impacts on the local flora and fauna.

Impact on the local ecosystem from the construction activities are from following major sources/ activities:

- Clearing of vegetation cover and levelling of the land mass
- Movement of people and materials transportation
- Gaseous and particulate matter emissions, and
- Dumping of waste materials

5.1.1 CLEARING OF VEGETATION COVER AND LEVELLING

The land mass of the proposed project site as well as the township areas are dominated by scrub jungle. The major plant species observed in the project area include: *Prosopis juliflora*, *Ficus benghalensis*, *Acacia tortilis*, *Acacia leucophloea*, *Acacia senegal*, *Ziziphus oenoplia*, *Ziziphus nummularia*, *Prosopis cineraria*, *Azadirachta indica*, *Chloris tenella*, *Rivea hypocrateriformis*, *Grewia tiliifolia*, *Phyllanthus emblica*, *Capparis sepiaria*, *Cissus trifoliata*, *Fluggea virosa*, *Fluggea leucopyros*, *Enicostemma axillare*, *Pentatropis microphylla*, *Mimosa hamata*, *Acacia nilotica*, *Pedaliium murex*, *Typha angustifolia*, *Argemone Mexicana*, and *Lantana camara*.

Similarly *Prosopis juliflora* is the dominant species in the proposed location for township at Kukad. The other major plant species observed at the site include *Butea monosperma*, *Acacia*

leucophloea, Acacia senegal, Ziziphus oenoplia, Ziziphus nummularia, Ziziphus jujuba, Prosopis cineraria, Capparis sepiaria, Albizia lebbeck, Iseilema laxum, Chloris tenella, Cenchrus setigerus, Alysicarpus longifolia, Lantana camara and Mimosa hamata.

About five thousand trees (GBH >20cm) are likely to get affected during the execution of the proposed project. Large amount of vegetative cover in the form of herbs and shrubs would also get removed from the proposed construction areas. The major tree species to be removed from the project site with their estimated number are given in the Table 12. During the present study it was observed that, in the proposed project site, only one species i.e., *Ficus benghalensis* posses larger GBH, ranging from 120-380 cm. The GBH ranged between 20 to 40 cm among other trees.

Table 12. List of tree species to be removed from the proposed project site

Sl. No.	Name of the major tree species	Estimated No of trees
1	<i>Ficus benghalensis</i>	16
2	<i>Grewia tiliifolia</i>	68
3	<i>Albizia lebbeck</i>	112
4	<i>Azadirachta indica</i>	53
5	<i>Prosopis juliflora</i>	2041
7	<i>Acaia leocophloea</i>	76
8	<i>Acacia tortilis</i>	39
9	<i>Acacia senegal</i>	48
10	<i>Phyllanthus emblica</i>	23
11	<i>Prosopis cineraria</i>	235
12	<i>Butea monosperma</i>	62
13	<i>Prosopis cineraria</i>	51
14	<i>Balanites aegyptiaca</i>	47
15	<i>Sapindus emarginatus</i>	15
16	<i>Parkinsonia aculeata</i>	53
17	<i>Alangium salviifolium</i>	24
18	<i>Cordia gharaf</i>	19
Total		2982

Although no critical habitat/vegetation will be involved, clearing of vegetation cover will affect the faunal species inhabiting the area through loss of habitat and resources. However this impact will be mitigated to a great extend through the proposed greenbelt development.

The land mass of the proposed 877 ha of the total construction site is characterized by undulating terrain with small hillocks and plains. Levelling of these structures may result in damaging the natural flow channels in the area. The total count of the trees was made using a combination of direct count from aerial photographs of the area and ground truthing of this

data in random quadrats. During the present survey four such tree quadrats were examined within the proposed project site. Based on the survey data, 59 individuals of trees belonging to 12 species were recorded from these quadrats.

Table 13 Tree data from the project location

Sl. No.	Number of species	Number of individuals
Q1	7	16
Q2	5	17
Q3	9	19
Q4	6	7

5.1.2 MOVEMENT AND MATERIALS TRANSPORTATION

The movement of man and materials is inevitably associated with the construction works. The major part of the proposed project area is located in slightly disturbed area. The major road net work running close to the land, the state highway 37 is almost 1.5 km away from the location. The movement of work force and materials may disturb the local movements of animals and birds in the region. There is a natural water body which discharges to the sea during the monsoon season.

5.1.3 POLLUTION

The noise of the vehicle, labours and machineries during the construction phase may disturb the local fauna. Continuous exposure to sound can create psychological stress that may lead to severe metabolic and behavioural changes to animals. The sound generates continuously from the machineries may force the birds and animals to leave their nests. The dust produced during the construction period may also have impact on the local flora by reducing the photosynthetic ability resulting in stunted growth. Similarly the plantation and the cultivated crops in the area also may get affected by the dust particles. The dust thus produced may increase the Suspended Particulate Matter (SPM) in the ambient air.

One of the attractive features of the nuclear energy from other major energy sources is its pollution free nature. However, there is a chance of emission of carbon dioxide (8 gm CO₂/K Wh), sulphur and nitrogen oxide from the plant. Emission of these green house gases, though it is negligible amount, can cause changes in the ambient air quality. During our field visit we have found that the water body is frequented by many birds and animals.

5.2 ENDANGERED AND PROTECTED SPECIES

There were no endangered or threatened species of fauna present in the proposed project sites and no species specific management program is required. However there are certain near threatened category birds (Table 7) recorded from the area and general habitat improvement programmes such as green belt development and conservation of available water bodies within the area would help minimise the possible impacts on them.

The inland wetlands, marshy land, the coastal area, scrub jungle, saltpans and the agriculture fields provide ample habitat for the avian fauna in and around the Mithivirdi region. Among the near threatened bird species observed from the area all of them except European Roller are wetland species that prefer wetlands, marsh lands and the coastal area (Grimmet et al, 2000). Therefore any alteration in such habitats would negatively affect these species such as Black-headed Ibis (*Threskiornis melanocephalus*), Lesser Flamingo (*Phoenicopterus minor*), Eurasian Curlew (*Numenius tenuirostris*), and Painted Stork (*Mycteria leucocephala*). On the other side the European Roller (*Coracias garrulus*), a terrestrial bird species prefers the open woodland and cultivation, may be affected by the conversion of 603 ha of agriculture land. However only a small portion of land will be used for the nuclear power plant and majority of the land will be as exclusion zone and will form a natural habitat for the bird species, animals and other plant species and thus will not affect them.

5.3 IMPACTS OF PROPOSED PROJECT ON VEGETATION AND CROPS

The proposed project site is completely surrounded by double cropped agricultural lands. Among the crop species Kesar mango variety is one of the major and commonly cultivated fruit crop around the proposed project site. Unlike the Thermal power plants, the Sulphur Dioxide (SO₂) and Nitrogen Oxides (NO_x) emissions during the operation of the nuclear power plant would be negligibly low, since no fossil fuel combustion is involved. Low doses of Sulphur dioxide are harmless to plants and sulphur is one of the major nutrients for the plants (Wilhelm Knabe, 1976). Hence there are no significant harmful emissions that could affect the vegetation and crops around the Mithivirdi Nuclear Power Park during its normal operations.

6 ECOLOGICAL MANAGEMENT PLAN

The major concerns over the ecological system as a result of establishment of the nuclear project at Mithivirdi area are discussed in the previous chapter of this report. Mitigating those adversities with suitable management strategies is important to minimise the impacts.

As mentioned earlier, levelling of the land mass during the construction phase of the project shall be undertaken with proper landscaping, avoiding any alteration in the existing natural drainage pattern along with the waterbodies. Clearing the vegetation is unavoidable, hence planting trees and other plants in the surrounding areas to compensate for this loss can enhance the habitat quality of the area. A list of plant species suggested for plantation in and around the project site is given in Table 14 & Table 15. Further to this, development of green patches and belts of trees along the road sides and pathways around the townships can contribute to minimise the impacts from the operation phase of the project. It is also suggested that growing the suggested trees can also help to remove the dust and other particulate matters from the air.

6.1 GREEN BELT DEVELOPMENT IN AND AROUND THE PROPOSED PROJECT SITE

There is a considerable amount of construction activities to be involved in the present nuclear power project site and proposed township areas. Felling of trees and clearing vegetation would lead to loss of feeding and breeding habitats to several species inhabiting the environs of the project sites. Hence, the compensatory afforestation programme by concerned authority (NPCIL) is necessary for the proposed project site. So the NPCIL must take up some plantation programmes, especially in proposed project site and proposed township area and its surrounding areas. The Gujarat state Forest Department may be consulted in this regard and as far as possible only native tree species should be used for planting. Budgetary provisions should be made for such conservation measures. Based on our study and observations on tree species found naturally occurring in and around the project site, we suggested some of the species that are best suited for planting as given in the following table. A total of 32 tree species recommended for planting in and around the project site (Table 14).

Apart from these, suitability of different plants for different type of planting locations is also given.

Table 14 List of tree species suggested for green belt development

Sl. No.	Binomial name	Family	Type of planting
1.	<i>Anthocephalus cadamba</i>	Rubiaceae	All areas
2.	<i>Avicennia marina</i>	Avicenniaceae	Near the seashore
3.	<i>Alstonia scholaris</i>	Apocynaceae	Township
4.	<i>Bambusa arundinacea</i>	Poaceae	Plant Boundary limits
5.	<i>Bambusa vulgaris</i>	Poaceae	Plant Boundary limits
6.	<i>Calophyllum inophyllum</i>	Clusiaceae	All areas
7.	<i>Couroupita guianensis</i>	Lecythidaceae	All areas
8.	<i>Filicium decipiens</i>	Sapindaceae	All areas
9.	<i>Hibiscus tiliaceus</i>	Malvaceae	All areas
10.	<i>Lagerstroemia reginae</i>	Lythraceae	All areas
11.	<i>Madhuca longifolia</i>	Sapotaceae	All areas
12.	<i>Bassia latifolia</i>	Sapotaceae	All areas
13.	<i>Ailanthus excelsa</i>	Simaroubaceae	Avenue trees
14.	<i>Mangifera indica</i>	Anacardiaceae	Avenue trees
15.	<i>Manilkara hexandra</i>	Sapotaceae	All areas
16.	<i>Mimusops elengi</i>	Sapotaceae	All areas
17.	<i>Plumeria acuminata</i>	Apocynaceae	Plant Boundary limits
18.	<i>Plumeria alba</i>	Apocynaceae	Plant Boundary limits
19.	<i>Plumeria rubra</i>	Apocynaceae	Plant Boundary limits
20.	<i>Syzygium cumini</i>	Myrtaceae	All areas
21.	<i>Terminalia arjuna</i>	Combretaceae	Avenue trees
22.	<i>Terminalia catappa</i>	Combretaceae	All areas
23.	<i>Thespesia populnea</i>	Malvaceae	All areas
24.	<i>Ficus benghalensis</i>	Moraceae	Avenue trees
25.	<i>Ficus religiosa</i>	Moraceae	Avenue trees
26.	<i>Ficus racemosa</i>	Moraceae	Avenue trees
27.	<i>Ficus microcarpa</i>	Moraceae	Avenue trees
28.	<i>Murraya paniculata</i>	Rutaceae	Township
29.	<i>Phyllanthus emblica</i>	Euphorbiaceae	All areas
30.	<i>Tectona grandis</i>	Verbenaceae	Avenue trees
31.	<i>Cassia siamea</i>	Caesalpiniaceae	Avenue trees
32.	<i>Cassia fistula</i>	Caesalpiniaceae	Township

The species suggested here are commonly seen in and around the project area, fast growing and drought resistant. Seedlings / saplings of these species can be easily raised & procured through local nurseries. The selection of plant species for the green belt development depends on various factors such as climate, elevation and soil. The plants suggested for green belt were selected based on the following desirable characteristics.

- Fast growing and providing optimum penetrability.
- Evergreen with minimal litter fall.
- Wind-firm and deep rooted.
- The species should form a dense canopy.
- Indigenous and locally available species.
- Trees with high foliage density, larger leaf sizes and hairy on surfaces.
- Ability to withstand conditions like inundation and drought.
- Soil improving plants, such as nitrogen fixing plants, rapidly decomposable leaf litter.
- Attractive appearance with good flowering and fruit bearing.
- Bird and insect attracting plant species.
- Sustainable green cover with minimal maintenance
- Species which can trap/sequester carbon

The green belt plantation may start well in advance along the boundary of the project land with a minimum breadth of 25 meters planting multiple species from the list above interspersed avoiding mono specific stands.

6.2 BIRDS AND INSECT ATTRACTING PLANTS SUGGESTED FOR PLANTING

Apart from these, a total of 20 species of bird and insect attracting plants are suggested for planting in all around the study area (mainly along roadsides and township areas) for enhancing the arrival of bird and insects to the study area. Plant species those produce dense inflorescence and large flowers are considered here as insect attracting plants since these flowers produce large quantity of nectars. Likewise, plants those bearing fleshy fruits considered as bird attracting plants. Apart from these, few species like *Butea monosperma*, *Erythrina stricta* etc. produce dense inflorescence with large flowers and those plants attracts large number of insects and nectarivorous birds and hence these species are considered here as both insect and bird attracting species.

The sound pollution during the construction phase can be checked using sophisticated machineries. It is also advisable to restrict such activities only during day time. On the other hand avoiding dawn and dusk hours for construction work can reduce its impacts considerably, since most of the animals and birds are active during these times.

Table 15 List of Bird and Insect attracting plants suggested for planting.

No.	Name of the species	Name of the family	Growth form
1.	<i>Ixora arborea</i> ***	Rubiaceae	Tree
2.	<i>Ziziphus oenoplia</i> ***	Rhamnaceae	Straggler
3.	<i>Z. nummularia</i> ***	Rhamnaceae	Shrub
4.	<i>Butea monosperma</i> **	Fabaceae	Tree
5.	<i>Erythrina stricta</i> **	Fabaceae	Tree
6.	<i>Murraya paniculata</i> *	Rutaceae	Shrub
7.	<i>Pongamia pinnata</i> *	Fabaceae	Tree
8.	<i>Bauhinia racemosa</i> *	Caesalpinaceae	Tree
9.	<i>Filicium decipiens</i> ***	Sapindaceae	Tree
10.	<i>Flacourtia indica</i> **	Flacourtiaceae	Tree
11.	<i>Mimusops elengi</i> ***	Sapotaceae	Tree
12.	<i>Syzygium cumini</i> ***	Myrtaceae	Tree
13.	<i>Ficus benghalensis</i> **	Moraceae	Tree
14.	<i>Ficus racemosa</i> **	Moraceae	Tree
15.	<i>Ficus religiosa</i> **	Moraceae	Tree
16.	<i>Ficus microcarpa</i> var. <i>microcarpa</i> **	Moraceae	Tree
17.	<i>Ficus microcarpa</i> var. <i>retusa</i> **	Moraceae	Tree
18.	<i>Streblus asper</i> **	Moraceae	Tree
19.	<i>Mangifera indica</i> *	Anacardiaceae	Tree
20.	<i>Balanites aegyptiaca</i> *	Balanitaceae	Tree

*Nectar yielding plants; **Fruit yielding plants; ***both nectar and fruit yielding plants.

The radiation hazard is one of the major concerns over any nuclear facility, since it can directly affect the ecosystem of the area including man and wildlife. The present Nuclear power project proposal has ensured that “the nuclear radiation dose at exclusion zone boundary also called fence post (1.0 km radius around the plant) is only a small fraction of the radiation dose permitted for general population. Stringent limits of AERB (Atomic Energy Regulatory Board) for dose limits at exclusion boundary are met during accident condition”.

Similarly adequate dilution is assured for the liquid effluents to make it in the permissible limit of radioactivity and temperature (NPCIL, 2011). Further the proposed effluent treatment plant ensures the marine disposal standard of the effluents. The solid wastes are restricted inside the exclusion zone boundary and the noise level of the machineries during the operation phase is restricted below 85 dBA (NPCIL, 2011).

7 REFERENCES

- Ali, S. and S.D. Ripley, 1987. Handbook of the birds of India and Pakistan together with those of Bangladesh, Nepal, Bhutan and Sri Lanka. Compact ed. Delhi: Oxford University Press.
- Anonymous, 2002. A BNHS review of the Avifaunal list of the Wildlife (Protection) Act, 1972. ENVIS newsletter: Avian Ecology and Inland wetlands. *BUCEROS*, Vol.7 (3): 1-56.
- Anonymous 2011. Detailed Project Report (Pre-project Feasibility report) for Gujarat Nuclear Power Park. NPCIL Doc. No. GNPP/PPFR/01000/01/Rev. 1. P. 1-99.
- Balasubramanian, P. and Lalitha Vijayan, 2004. Conservation Strategies and Action Plans for the Avifauna of Tamil Nadu: in Tamil Nadu Biodiversity Strategy and Action Plan-Cordate Diversity (Edr. R. Annamalai). 76-99.
- Bang, P., P. Dhalstrom, and G. Vevers, 1972. Collins guide to animal tracks and signs. Collins, London. 100pp.
- Bibby, C.J., N.D. Burgess and D.A. Hill, 1992. Bird Census Techniques. Academic Press publishers, 257p.
- Boulenger, G.A. 1890. The fauna of British India, including Ceylon and Burma, Reptilia and Batrachia. Taylor and Francis xviii + 541 p.
- Burnham, K.P., D.R. Anderson and J.L. Laake, 1980. Estimation of density from line transect sampling of biological populations. Wildlife Monographs 72.pp 202.
- Cogger, H.G., H.A. Ford, C.N. Johnson, J. Holman and D. Butler, 2003. Impacts of Land Clearing on Australian Wildlife in Queensland. (World Wide Fund for Nature Australia: Brisbane).
- Colwell, R.K. 1994-2004. EstimateS: Statistical estimation of species richness and shared species from samples. Version 7. Persistent URL <purl.oclc.org/estimates>.
- Curtis, J.T. & R.P. Mc Intosh, 1950. The interrelations of certain analytic and synthetic phytosociological characters. *Ecology* 31: 434-455.
- Daniel, J.C. 1963. Field guide to the amphibians of Western India. Part 1. *J. Bombay. Nat. Hist. Soc.* 60 (2): 415-438; Part 2. 60(3): 690-702.
- Daniel, J.C. 1975 Field guide to the amphibians of Western India. Part III. *J. Bombay. Nat. Hist. Soc.* 72(2):506-522.
- Daniel, J.C. 1992. The book of Indian Reptiles, Bombay Natural History Society, Bombay. pp. 136.
- Daniel, J.C. 2002. The book of Indian reptiles and amphibians. Oxford University Press, Oxford House, Mumbai.238pp.
- Daniel, J.C. and A.G Sekar, 1989. Field guide to the amphibians of Western India. Part IV. *J. Bombay. Nat. Hist. Soc.* 86 (2):194-202.

- Daniels, R.J.R. 1997a. A Field Guide to the Frogs and Toads of the Western Ghats, India: Part I., *Cobra*, 27:1-25.
- Daniels, R.J.R. 1997b. A Field Guide to the Frogs and Toads of the Western Ghats, India: Part II., *Cobra*, 28:1-22.
- Daniels, R.J.R. 1997c. A Field Guide to the Frogs and Toads of the Western Ghats, India: Part III., *Cobra*, 29:1-24.
- Daniels, R.J.R. 2005. Amphibians of peninsular India. Universities press, Hyderabad, 268 pp.
- Das, I. 1997. Checklist of the reptiles of India with English common names. *Hamadryad* 22(1): 32-4
- Das, I. 2003. Growth of knowledge on the reptiles of India, with an introduction to systematics, taxonomy and nomenclature. *J. Bombay Nat. Hist. Soc.* 100 (2 & 3): 446-501.
- David Lindenmayer and Mark Burgman, 2005. Practical Conservation biology. P.1-609. CSIRO publishing, Australia.
- Demaria, F. 2010. Ship breaking at Alang-Sosiya (India): An ecological distribution conflict. *Ecological Economics*. doi:10.1016/j.ecolecon.2010.09.006
- Gamble, J.S. and C.E.C. Fischer, 1915-1936. The Flora of the Presidency of Madras. Part 1-11. (Part 1-7 by Gamble and 8-11 by Fischer). Adlard & Sons Ltd., London. (repr. ed. Vols. 1-3. 1957).
- Gopalkrishna Laljibhai Shah, 1978. Flora of Gujarat State, Volume 1. Sardar Patel University. p. 1-1074.
- Gopalkrishna Laljibhai Shah, 1978. Flora of Gujarat State, Volume 2. Sardar Patel University. p. 1-1074.
- Grimmet, R., C. Inskipp, and T. Inskipp. 2001. Pocket Guide to the Birds of the Indian Subcontinent. Oxford University Press, New Delhi. p. 1-384.
- Grimmet, R., C. Inskipp, and T. Inskipp. 1998. Birds of the Indian Subcontinent. Christopher Helm Publishers Ltd. London. p. 888.
- Grimmet, R., C. Inskipp, and T. Inskipp. 2000. Pocket guide to the birds of the Indian subcontinent. Oxford University Press., New York, 384pp.
- Gunathilagaraj K, Perumal TNA, Jayaram K and Ganesh KM (1998). Some South Indian Butterflies: field guide. Published under Project Lifescape, Indian Academy of Science, Bangalore. pp: 274.
- Henry, A.N., G.R. Kumari, and V. Chitra. 1987. Flora of Tamil Nadu, India. Ser. 1: Analysis. Vol. 2. Botanical Survey of India, Coimbatore.
- Henry, A.N., V. Chitra, and N.P. Balakrishnan. 1989. Flora of Tamil Nadu, India. Ser. 1: Analysis. Vol. 3. Botanical Survey of India, Coimbatore.
- Herzog, S.K. Kessler, M and Cahill TM. 2002. Estimating Species Richness of Tropical Bird Communities from Rapid Assessment Data. *The Auk*. 119:3.

- Heyer, W.R., M. Donnelly, R.W. Mc Diarmid, L.C. Hayek and M.S. Foster, 1994. Measuring and Monitoring Biological Diversity. Standard Methods for Amphibians. Smithsonian Institution Press, Washington, 364p.
- Hooker, J.D. (ed.) 1897. The Flora of British India Vols. 1-7. Reeve & Co., London.
- [http://www.mpeda.com/fisheryresources/ OtherFishes/ OtherFishes.htm](http://www.mpeda.com/fisheryresources/OtherFishes/OtherFishes.htm). (Accessed on 13th Aug 2012).
- IAEA, 2011. Nuclear Technology Review 2011, International Atomic Energy Agency, Vienna.
- Kazmierczak, K. and B. van Perlo, 2000. A field guide to the Birds of India, Sri Lanka, Pakistan, Nepal, Bhutan, Bangladesh and the Maldives, OM book service, New Delhi. p. 1-352.
- Kehimkar, I. 2008. The book of Indian Butterflies. Sponsored by Tata Social Welfare Trust. BNHS, Oxford University Press, Bombay, India, 497 pp.
- Kizhakudan, Joe.K. and K.N. Fofandi, 2003. Marine ornamental fishes of Gujarat. Sustainable Fisheries Development: Focus on Gujarat. Pp. 180-185.
- Kunte, K. 2000. India-a landscape butterflies of Penninsular India. Ed. Madhav Gadgil. Foreward Professor. E O, Wilson. Indian Academy of Sciences. University Press (India) Limited. 254 pp.
- Lande, R. 1996. Statistics and Partitioning of Species Diversity, and Similarity among Multiple Communities. *Oikos*. 76(1): 5-13.
- Larsen, T.B. 1987a. The Butterflies of Nilgiri mountains of Southern India (Lepidoptera: Rhopalocera). *J. Bomb. Nat. Hist. Soc.* 84: 26- 54.
- Larsen, T.B. 1987b. The Butterflies of Nilgiri mountains of Southern India (Lepidoptera: Rhopalocera). *J. Bomb. Nat. Hist. Soc.* 84: 291- 316.
- Larsen, T.B. 1987c. The Butterflies of Nilgiri mountains of Southern India (Lepidoptera: Rhopalocera). *J. Bomb. Nat. Hist. Soc.* 84: 560- 584. .
- Larsen, T.B. 1988 The Butterflies of Nilgiri mountains of Southern India (Lepidoptera: Rhopalocera). *J. Bomb. Nat. Hist. Soc.* 85: 26- 43.
- Laurance, W. F., B. M. Croes, N. Guissouegou, R. Buij, M. Dethier and A. Alonso, 2008. Impacts of roads, hunting and habitat alteration on nocturnal mammals in African rainforests. *Conservation Biology*. 22:721-732.
- Laurance, W. F., B. M. Croes, N. Guissouegou, R. Buij, M. Dethier and A. Alonso, 2008. Impacts of roads, hunting and habitat alteration on nocturnal mammals in African rainforests. *Conservation Biology*. 22:721-732.
- Ludwig John, A. and James F. Reynolds 1988. Statistical ecology: a primer of methods and computing. Wiley Press, New York, New York. 337 pp.
- Manakadan, R. and A. Pittie, 2001. Standardized common and scientific Names of the birds of the Indian subcontinent. *Buceros* 6(1): i-ix, 1-37.
- Matthew, K.M. 1999. The Flora of the Palni Hills, South India. The Rapinat Herbarium, St. Joseph's College, Tiruchirappalli.

- Menon, V. 2003. A field guide to Indian Mammals. Dorling Kindersley (India) Pvt. Limited. pp. 1-200.
- Nair, N.C., and A.N. Henry. 1983. Flora of Tamil Nadu, India, Ser. 1: Analysis Vol. 1. Botanical Survey of India, Coimbatore.
- Nezhad, H. 2009. World Energy Scenarios to 2050: Issues and options. Decision Sciences Metropolitan State University, Minneapolis, MN. P. 1-70.
- NPCIL 2011. www.npcil.nic.in.
- Philips, E.A. 1959. Methods of vegetation study. Henry Holt & Co., New York.
- Sailor, W.C., David Bodansky, Chaim Braun, Steve Fetter and Bob van der Zwaan, 2000. Nuclear Power: A Nuclear Solution to Climate Change? *Science* vol. 288 (5469), pp. 1177-1178.
- Santapau, H. 1962. The flora of Saurashtra. Vol. 2 of Flora of India series. Saurashtra Research Society.
- Santapau, H. 1988. The Flora of Saurashtra: Hydrocharitaceae to poaceae, Vol. 3 Flora of India series. Saurashtra Research Society.
- Schneider, M. and Froggatt, A. 2012 The World Nuclear Industry Status Report 2012, Mycle Schneider Consulting, 99p
- UNESCO, 2004. Impacts and challenges of a large coastal industry. Alang-Sosiya Ship-Breaking Yard, Gujarat, India. Coastal region and Small Island papers 17, UNESCO, Paris, 65 pp.
- Whitaker, R. and A. Captain, 2004. Snakes of India-the field guide, Draco Books, Chennai. pp. 479.
- Wilhelm Knabe, 1976. Effects of sulphur dioxide on terrestrial vegetation. *Ambio*. 5(5-6): 213-218.

8 APPENDICES

Appendix 1. Sampling locations and distance from the center of the Project site

Point No	Longitude E (degrees)	Latitude N (Degrees)	Distance from the project site KM
1	72.233	21.477	0.85
2	72.241	21.487	2.25
3	72.243	21.484	2.12
4	72.243	21.484	2.12
5	72.245	21.484	2.28
6	72.245	21.483	2.21
7	72.247	21.487	2.67
8	72.241	21.494	2.94
9	72.241	21.494	2.94
10	72.243	21.503	3.94
11	72.243	21.503	3.94
12	72.243	21.503	3.94
13	72.243	21.503	3.94
14	72.232	21.492	2.46
15	72.248	21.501	3.99
16	72.248	21.494	3.34
17	72.239	21.479	1.42
18	72.254	21.561	10.46
19	72.253	21.54	8.19
20	72.207	21.528	6.94
21	72.212	21.542	8.25
22	72.205	21.552	9.53
23	72.197	21.554	10.04
24	72.25	21.551	9.28
25	72.238	21.54	7.83
26	72.237	21.529	6.61
27	72.243	21.534	7.26
28	72.198	21.489	4.14
29	72.204	21.486	3.39
30	72.214	21.487	2.60
31	72.214	21.478	1.99
32	72.217	21.471	1.45
33	72.223	21.473	0.85
34	72.188	21.47	4.67
35	72.217	21.481	1.89
36	72.211	21.471	2.12
37	72.193	21.468	4.12
38	72.196	21.497	4.83

Point No	Longitude E (degrees)	Latitude N (Degrees)	Distance from the project site KM
39	72.199	21.501	4.87
40	72.23	21.47	0.00
41	72.168	21.498	7.56
42	72.149	21.504	9.77
43	72.149	21.504	9.77
44	72.149	21.504	9.77
45	72.149	21.504	9.77
46	72.175	21.485	6.34
47	72.182	21.495	6.02
48	72.163	21.472	7.45
49	72.198	21.516	6.23
50	72.157	21.501	8.82
51	72.159	21.529	10.26
52	72.203	21.513	5.65
53	72.204	21.518	6.07
54	72.182	21.49	5.78
55	72.172	21.492	6.90
56	72.215	21.461	1.95
57	72.215	21.461	1.95
58	72.215	21.461	1.95
59	72.204	21.462	3.02
60	72.2	21.463	3.43
61	72.208	21.455	2.96
62	72.206	21.448	3.62
63	72.206	21.436	4.63
64	72.211	21.447	3.32
65	72.228	21.46	1.13
66	72.191	21.423	6.79
67	72.17	21.412	9.28
68	72.179	21.412	8.59
69	72.247	21.523	6.19
70	72.247	21.523	6.19
71	72.247	21.523	6.19
72	72.157	21.415	10.16
73	72.142	21.454	9.95
74	72.157	21.46	8.19
75	72.16	21.444	8.30
76	72.147	21.459	9.31
77	72.167	21.402	10.31
78	72.212	21.552	9.34
79	72.255	21.554	9.75
80	72.195	21.431	5.83

Appendix 2 List of birds documented during the study period.

Sl. No.	Local Name	Scientific Name	Distribution	Status
1	Alexandrine Parakeet	<i>Psittacula eupatria</i>	R	O
2	Ashy Drongo	<i>Dicrurus leucophaeus</i>	W	R
3	Ashy Prinia	<i>Prinia socialis</i>	R	C
4	Ashy-crowned Sparrow Lark	<i>Ermopterix grisea</i>	R	C
5	Asian Koel	<i>Eudynamys scolopacea</i>	R	O
6	Asian Openbill	<i>Anastomus Oscitans</i>	R	A
7	Bank Myna	<i>Acridotheres ginginianus</i>	R	A
8	Barn Swallow	<i>Hirundo rustica</i>	W	R
9	Baya Weaver	<i>Ploceus philippinus</i>	R	C
10	Bay-backed Shrike	<i>Lanius vittatus</i>	R	C
11	Black Drongo	<i>Dicrurus macrocercus</i>	R	A
12	Black Ibis	<i>Pseudibis papillosa</i>	R	A
13	Black Kite	<i>Milvus migrans</i>	R	C
14	Black-crowned Night-heron	<i>Nycticorax nycticorax</i>	R	R
15	Black-headed Cuckooshrike	<i>Coracina melanoptera</i>	R	R
16	Black-headed Gull	<i>Larus ridibundus</i>	W	R
17	Black-headed Ibis	<i>Threskiornis melanocephalus</i>	R	C
18	Black-shouldered Kite	<i>Elanus caeruleus</i>	R	C
19	Black-winged Stilt	<i>Himantopus himantopus</i>	R	C
20	Blue-eared Kingfisher	<i>Alcedo meninting</i>	R	R
21	Blue-faced Malkoha	<i>Phaenicophaeus viridirostris</i>	R	R
22	Blue-tailed Bee-eater	<i>Merops philippinus</i>	W	C
23	Brahminy Kite	<i>Haliastur indus</i>	R	O
24	Brahminy Starling	<i>Sturnusa pagodarum</i>	R	C
25	Bronze-winged Jacana	<i>Metopidius indicus</i>	R	C
26	Brown Shrike	<i>Lanius cristatus</i>	IR	O
27	Cattle Egret	<i>Bubulcus ibis</i>	R	A
28	Chestnut-headed Bee-eater	<i>Merops leschenaulti</i>	IR	O
29	Cinnamon Bittern	<i>Ixobrychus cinnamomeus</i>	W	R
30	Comb Duck	<i>Sarkidiornis melanotos</i>	R	R
31	Common Babbler	<i>Turdoides caudatus</i>	R	A

Sl. No.	Local Name	Scientific Name	Distribution	Status
32	Common Coot	<i>Fulica atra</i>	R	C
33	Common Hoopoe	<i>Upupa epops</i>	W	C
34	Common Iora	<i>Aegithinia tiphia</i>	R	O
35	Common Kingfisher	<i>Alcedo atthis</i>	R	C
36	Common Moorhen	<i>Gallinula Chloropus</i>	R	C
37	Common Myna	<i>Acridotheres tristis</i>	R	A
38	Common Sandpiper	<i>Actitis hypoleucos</i>	W	C
39	Common Shelduck	<i>Tadorna tadorna</i>	E	C
40	Common Stonechat	<i>Saxicola torquatus</i>	W	R
41	Common Tailorbird	<i>Orthotomus sutorius</i>	R	C
42	Common Woodshrike	<i>Tephrodornis pondicerianus</i>	R	C
43	Coppersmith Barbet	<i>Megalaima haemacephala</i>	R	O
44	Cotton Pygmy-goose	<i>Nettapus coromandelianus</i>	R	O
45	Crested Lark	<i>Galerida cristata</i>	R	O
46	Desert Wheater	<i>Oenanthe xanthopyrna</i>	W	R
47	Eurasian Collared Dove	<i>Streptopelia decaocto</i>	R	A
48	Eurasian Curlew	<i>Numenius arquata</i>	R	O
49	Eurasian Golden Oriole	<i>Oriolus oriolus</i>	R	O
50	Eurasian Spoonbill	<i>Platalea leucorodia</i>	R	C
51	Eurasian Wigeon	<i>Anas penelope</i>	W	C
52	European Roller	<i>Coracias garrulus</i>	P	C
53	Forest Wagtail	<i>Dendronanthus indicus</i>	IR	C
54	Fulvous Whistling-duck	<i>Dendrocygna bicolor</i>	R	C
55	Garganey	<i>Anas querquedula</i>	W	O
56	Glossy Ibis	<i>Plegadis falcinellus</i>	R	C
57	Great Cormorant	<i>Phalacrocorax carbo</i>	R	O
58	Great Egret	<i>Casmerodius albus</i>	R	O
59	Great Thick-knee	<i>Esacus recurvirostris</i>	R	R
60	Great White Pelican	<i>Pelecanus onocrotalus</i>	W	R
61	Greater Coucal	<i>Centropus sinensis</i>	R	C
62	Greater Flamingo	<i>Phoenicopterus ruber</i>	W	O
63	Greater Hoopoe Lark	<i>Alaemon alaudipes</i>	R	R

Sl. No.	Local Name	Scientific Name	Distribution	Status
64	Green Bee-eater	<i>Merops orientalis</i>	R	C
65	Green Sandpiper	<i>Tringa ochropus</i>	W	R
66	Grey Francolin	<i>Francolinus pondicerianus</i>	R	C
67	Grey Heron	<i>Ardea cinerea</i>	R	C
68	Grey-breasted Prinia	<i>Prinia hodgsonii</i>	R	O
69	House Crow	<i>Corvus splendens</i>	R	A
70	House Sparrow	<i>Passer domesticus</i>	R	A
71	House Swift	<i>Apus affinis</i>	R	A
72	Indian Cormorant	<i>Phalacrocorax fuscicollis</i>	R	R
73	Indian Peafowl	<i>Pavo cristatus</i>	R	C
74	Indian Pond-heron	<i>Ardeola grayii</i>	R	A
75	Indian Robin	<i>Saxicoloides fulicata</i>	R	A
76	Indian Roller	<i>Coracias benghalensis</i>	R	C
77	Indian Silverbill	<i>Lonchura malabarica</i>	R	A
78	Intermediate Egret	<i>Mesophoyx intermedia</i>	R	O
79	Jungle Babbler	<i>Turdoides striatus</i>	R	O
80	Large Grey Babbler	<i>Turdoides malcolmi</i>	R	A
81	Large-billed Crow	<i>Corvus macrorhynchos</i>	R	A
82	Laughing Dove	<i>Streptopelia tranquebarica</i>	R	A
83	Lesser Coucal	<i>Centropus bengalensis</i>	R	R
84	Lesser Flamingo	<i>Phoenicopterus minor</i>	W	O
85	Lesser Whistling-duck	<i>Dendrocygna javanica</i>	R	C
86	Lesser Whitethroat	<i>Sylvia curruca</i>	W	R
87	Little Cormorant	<i>Phalacrocorax niger</i>	R	A
88	Little Egret	<i>Egretta garzetta</i>	R	A
89	Little Grebe	<i>Tachybaptus ruficollis</i>	R	C
90	Little Stint	<i>Calidris minuta</i>	W	C
91	Long-tailed Shrike	<i>Lanius schach</i>	R	O
92	Mallard	<i>Anas platyrhynchos</i>	W	O
93	Marsh Sandpiper	<i>Tringa stagnatilis</i>	W	C
94	Northern Shoveler	<i>Anas clypeata</i>	W	C
95	Northern Pintail	<i>Anas acuta</i>	W	C

Sl. No.	Local Name	Scientific Name	Distribution	Status
96	Oriental Magpie Robin	<i>Copsychus saularis</i>	R	O
97	Oriental Skylark	<i>Alauda gulgula</i>	R	O
98	Paddyfield Pipit	<i>Anthus rufulus</i>	R	A
99	Painted Stork	<i>Mycteria leucocephala</i>	R	A
100	Pale-billed Flowerpecker	<i>Dicaeum erythrorhynchos</i>	R	O
101	Pied Kingfisher	<i>Ceryle rudis</i>	R	C
102	Plain Prinia	<i>Prinia inornata</i>	R	A
103	Plum-headed Prakeet	<i>Psittacula cyanocephala</i>	R	O
104	Purple Heron	<i>Ardea purpurea</i>	R	C
105	Purple Sunbird	<i>Nectarinia asiatica</i>	R	O
106	Purple Swampphen	<i>Porphyrio porphyrio</i>	R	C
107	Red-backed Shrike	<i>Lanius collurio</i>	IPV	O
108	Red-rumped Swallow	<i>Hirundo daurica</i>	R	O
109	Red-vented Bulbul	<i>Pycnonotus cafer</i>	R	A
110	Red-wattled Lapwing	<i>Vanellus indicus</i>	R	A
111	River Tern	<i>Sterna aurantia</i>	R	C
112	Rock Pigeon	<i>Columba livia</i>	R	A
113	Rose-ringed Parakeet	<i>Psittacula krameri</i>	R	A
114	Rosy Starling	<i>Sturnus roseus</i>	W	A
115	Ruddy Shelduck	<i>Tadorna ferruginea</i>	W	O
116	Rufous Treepie	<i>Dendrocitta vagabunda</i>	R	C
117	Rufous-fronted Prinia	<i>Prinia buchanani</i>	R	O
118	Shikra	<i>Accipiter badius</i>	R	O
119	Sirkeer Malkoha	<i>Phaenicophaeus leschenaultii</i>	R	R
120	Small Buttonquail	<i>Turnix sylvatica</i>	S	C
121	Spot-billed Duck	<i>Anas poecilorhyncha</i>	R	A
122	Spotted Dove	<i>Streptopelia chinensis</i>	R	A
123	Syke's (Crested) Lark	<i>Galerida deva</i>	R	O
124	Thick-billed Flowerpecker	<i>Dicaeum agile</i>	R	O
125	Tree Pipit	<i>Anthus trivialis</i>	W	O
126	Twany Pipit	<i>Anthus campestris</i>	W	O
127	Western Reef-egret	<i>Egretta gularis</i>	R	C

Sl. No.	Local Name	Scientific Name	Distribution	Status
128	White Wagtail	<i>Motacilla alba</i>	W	C
129	White-bellied Drongo	<i>Dicrurus caerulescens</i>	R	O
130	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	R	C
131	White-browed Wagtail	<i>Motacilla maderaspatensis</i>	R	C
132	White-cheeked Barbet	<i>Megalaima viridis</i>	R	O
133	White-throated Kingfisher	<i>Halcyon smyrnensis</i>	R	C
134	Wire-tailed Swallow	<i>Hirundo smithii</i>	R	O
135	Yellow Wagtail	<i>Motacilla flava</i>	W	C
136	Yellow-crowned Woodpecker	<i>Dendrocopos maharattensis</i>	R	O
137	Yellow-eyed Babbler	<i>Chrysomma sinense</i>	R	O
138	Yellow-footed Green Pigeon	<i>Treron curvirostra</i>	R	R
139	Yellow-wattled Lapwing	<i>Vanellus malabaricus</i>	R	C

R: Resident; W: Winter visitor; S: Summer visitor; IPV: Isolated record Passage visitor; IR: Isolated records; E; erratic (Kazmierczak and Van Perlo, 2000); A: Abundant; C: Common; O: Occasional; R: Rare.

Appendix 3 List of plant species recorded in the study area.

Sl. No.	Plant Name	Family	Habit	Habitat	Type
1.	<i>Abrus precatorius</i> L.	Fabaceae	Straggler	Terrestrial	Wild
2.	<i>Abutilon hirtum</i> (Lam.) Sweet	Malvaceae	Shrub	Terrestrial	Wild
3.	<i>Abutilon indicum</i> (L.) Sweet	Malvaceae	Shrub	Terrestrial	Wild
4.	<i>Abutilon palmeri</i> A. Gray	Malvaceae	Shrub	Terrestrial	Exotic
5.	<i>Acacia auriculiformis</i> A. Cunn ex Benth.	Mimosaceae	Tree	Terrestrial	Exotic
6.	<i>Acacia caesia</i> (L.) Willd.	Mimosaceae	Straggler	Terrestrial	Wild
7.	<i>Acacia farnesiana</i> (L.) Willd.	Mimosaceae	Tree	Terrestrial	Exotic
8.	<i>Acacia leucophloea</i> (Roxb.) Willd.	Mimosaceae	Tree	Terrestrial	Wild
9.	<i>Acacia nilotica</i> (L.) Willd. ex Del.	Mimosaceae	Tree	Terrestrial	Wild
10.	<i>Acacia senegal</i> (L.) Willd.	Mimosaceae	Tree	Terrestrial	Wild
11.	<i>Acacia torta</i> (Roxb.) Craib	Mimosaceae	Straggler	Terrestrial	Wild
12.	<i>Acacia tortilis</i> (Forsk.) Hayne.	Mimosaceae	Tree	Terrestrial	Exotic
13.	<i>Acalypha alnifolia</i> Klein ex Willd.	Euphorbiaceae	Herb	Terrestrial	Wild
14.	<i>Acalypha brachystachya</i> Hornem.	Euphorbiaceae	Herb	Terrestrial	Wild
15.	<i>Acalypha fruticosa</i> Forssk.	Euphorbiaceae	Shrub	Terrestrial	Wild
16.	<i>Acalypha indica</i> L.	Euphorbiaceae	Herb	Terrestrial	Wild
17.	<i>Acalypha paniculata</i> Willd.	Euphorbiaceae	Herb	Terrestrial	Wild
18.	<i>Acanthospermum hispidum</i> DC.	Asteraceae	Herb	Terrestrial	Wild
19.	<i>Acanthus ilicifolius</i> Linn.	Acanthaceae	Herb	Semi-aquatic	Wild

Sl. No.	Plant Name	Family	Habit	Habitat	Type
20.	<i>Achras sapota</i> Linn.	Sapotaceae	Tree	Terrestrial	Cultivated
21.	<i>Achyranthes aspera</i> L.	Amaranthaceae	Herb	Terrestrial	Wild
22.	<i>Aegle marmelos</i> (L.) Correa	Rutaceae	Tree	Terrestrial	Wild
23.	<i>Aeluropus lagopoides</i> (Linn.) Trin. ex Thw.	Poaceae	Grass	Semi-aquatic	Wild
24.	<i>Ailanthus excelsa</i> Roxb.	Simaroubaceae	Tree	Terrestrial	Wild
25.	<i>Alangium salviifolium</i> (L.f.) Wang.	Alangiaceae	Tree	Terrestrial	Wild
26.	<i>Albizia lebbbeck</i> (L.) Willd.	Mimosaceae	Tree	Terrestrial	Wild
27.	<i>Allium cepa</i> L.	Amaryllidaceae	Herb	Terrestrial	Cultivated
28.	<i>Allium sativum</i> L.	Amaryllidaceae	Herb	Terrestrial	Cultivated
29.	<i>Aloe vera</i> (L.) Burm.f.	Aloeaceae	Herb	Terrestrial	Wild
30.	<i>Alstonia scholaris</i> (L.) R.Br.	Apocynaceae	Tree	Terrestrial	Cultivated
31.	<i>Alternanthera paronychioides</i> A. St.-Hilaire	Amaranthaceae	Herb	Terrestrial	Wild
32.	<i>Alternanthera pungens</i> Kunth	Amaranthaceae	Herb	Terrestrial	Wild
33.	<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	Amaranthaceae	Herb	Aquatic	Wild
34.	<i>Alternanthera tenella</i> Colla.	Amaranthaceae	Herb	Semi-aquatic	Wild
35.	<i>Alysicarpus longifolius</i> Wight & Arn.	Fabaceae	Herb	Terrestrial	Wild
36.	<i>Alysicarpus monilifer</i> (L.) DC.	Fabaceae	Herb	Terrestrial	Wild
37.	<i>Alysicarpus rugosus</i> DC.	Fabaceae	Herb	Terrestrial	Wild
38.	<i>Amaranthus spinosus</i> L.	Amaranthaceae	Herb	Terrestrial	Wild
39.	<i>Amaranthus viridis</i> L.	Amaranthaceae	Herb	Terrestrial	Wild

Sl. No.	Plant Name	Family	Habit	Habitat	Type
40.	<i>Ammannia baccifera</i> Linn.	Lythraceae	Herb	Semi-aquatic	Wild
41.	<i>Andropogon pumilus</i> Roxb.	Poaceae	Grass	Terrestrial	Wild
42.	<i>Anisomeles indica</i> (L.) Kuntze	Lamiaceae	Herb	Terrestrial	Wild
43.	<i>Anisomeles malabarica</i> (L.) R. Br. ex Sims.	Lamiaceae	Herb	Terrestrial	Wild
44.	<i>Annona squamosa</i> L.	Annonaceae	Tree	Terrestrial	Cultivated
45.	<i>Anthocephalus cadamba</i> (Roxb.) Miq.	Rubiaceae	Tree	Terrestrial	Cultivated
46.	<i>Arachis hypogaea</i> Linn.	Fabaceae	Herb	Terrestrial	Cultivated
47.	<i>Argemone mexicana</i> L.	Papaveraceae	Herb	Terrestrial	Exotic
48.	<i>Aristida adscensionis</i> L.	Poaceae	Grass	Terrestrial	Wild
49.	<i>Aristida funiculata</i> Trin & Rupr.	Poaceae	Grass	Terrestrial	Wild
50.	<i>Aristida hystrix</i> L.	Poaceae	Grass	Terrestrial	Wild
51.	<i>Aristida setacea</i> Retz.	Poaceae	Grass	Terrestrial	Wild
52.	<i>Aristolochia indica</i> L.	Aristolochiaceae	Climber	Terrestrial	Wild
53.	<i>Asparagus racemosus</i> Willd.	Asparagaceae	Straggler	Terrestrial	Wild
54.	<i>Avicennia marina</i> (Forsk.) Vierh.	Acanthaceae	Tree	Semi-aquatic	Wild
55.	<i>Azadirachta indica</i> A. Juss.	Meliaceae	Tree	Terrestrial	Wild
56.	<i>Azima tetracantha</i> Lam.	Salvadoraceae	Shrub	Terrestrial	Wild
57.	<i>Bacopa monnieri</i> (L.) Pennell	Scrophulariaceae	Herb	Aquatic	Wild
58.	<i>Balanites aegyptiaca</i> (L.) Del.	Balanitaceae	Tree	Terrestrial	Wild
59.	<i>Bambusa arundinacea</i> (Retz.) Willd.	Poaceae	Grass	Terrestrial	Wild

Sl. No.	Plant Name	Family	Habit	Habitat	Type
60.	<i>Bambusa vulgaris</i> Schrad. ex Wendl.	Poaceae	Grass	Terrestrial	Ornamental
61.	<i>Barleria buxifolia</i> L.	Acanthaceae	Herb	Terrestrial	Wild
62.	<i>Barleria prionitis</i> L.	Acanthaceae	Herb	Terrestrial	Wild
63.	<i>Bassia latifolia</i> Roxb.	Sapotaceae	Tree	Terrestrial	Wild
64.	<i>Bauhinia purpurea</i> L.	Caesalpiniaceae	Tree	Terrestrial	Cultivated
65.	<i>Bauhinia racemosa</i> Lam.	Caesalpiniaceae	Tree	Terrestrial	Wild
66.	<i>Bidens pilosa</i> L.	Asteraceae	Herb	Terrestrial	Wild
67.	<i>Biophytum reinwardtii</i> (Zucc.) Klotzsch.	Oxalidaceae	Herb	Terrestrial	Wild
68.	<i>Bixa orellana</i> L.	Bixaceae	Tree	Terrestrial	Ornamental
69.	<i>Blainvillea acmella</i> (L.) Philipson	Asteraceae	Herb	Terrestrial	Wild
70.	<i>Blepharis maderaspatensis</i> (L.) Heyne ex Roth	Acanthaceae	Herb	Terrestrial	Wild
71.	<i>Blepharis repens</i> (Vahl) Roth	Acanthaceae	Herb	Terrestrial	Wild
72.	<i>Blumea lacera</i> (Burm.f) DC.	Asteraceae	Herb	Terrestrial	Wild
73.	<i>Blumea mollis</i> (D.Don) Merr.	Asteraceae	Herb	Terrestrial	Wild
74.	<i>Boerhavia diffusa</i> L.	Nyctaginaceae	Herb	Terrestrial	Wild
75.	<i>Boerhavia erecta</i> L.	Nyctaginaceae	Herb	Terrestrial	Wild
76.	<i>Bombax ceiba</i> L.	Bombacaceae	Tree	Terrestrial	Wild
77.	<i>Borassus flabellifer</i> L.	Arecaceae	Tree	Terrestrial	Wild
78.	<i>Bothriochloa pertusa</i> (L.) A. Camus	Poaceae	Grass	Terrestrial	Wild
79.	<i>Bougainvillea spectabilis</i> Comm. ex. Juss.	Nyctaginaceae	Straggler	Terrestrial	Ornamental

Sl. No.	Plant Name	Family	Habit	Habitat	Type
80.	<i>Brachiaria ramosa</i> (L.) Stapf	Poaceae	Grass	Terrestrial	Wild
81.	<i>Brachiaria remota</i> (Retz.) Haines	Poaceae	Grass	Terrestrial	Wild
82.	<i>Brassica juncea</i> (L.) Czern.	Brassicaceae	Herb	Terrestrial	Cultivated
83.	<i>Breynia retusa</i> (Dennst.) Alston	Euphorbiaceae	Shrub	Terrestrial	Wild
84.	<i>Breynia vitis-idaea</i> (Burm.f.) Fischer	Euphorbiaceae	Shrub	Terrestrial	Wild
85.	<i>Bulbostylis barbata</i> (Rottb.) C.B. Clarke	Cyperaceae	Herb	Terrestrial	Wild
86.	<i>Butea monosperma</i> (Lam.) Taub.	Fabaceae	Tree	Terrestrial	Wild
87.	<i>Cadaba fruticosa</i> (L.) Druce	Capparidaceae	Straggler	Terrestrial	Wild
88.	<i>Caesalpinia coriaria</i> (Jacq.) Willd.	Caesalpiniaceae	Tree	Terrestrial	Exotic
89.	<i>Caesalpinia bonduc</i> (L.) Roxb.	Caesalpiniaceae	Straggler	Terrestrial	Wild
90.	<i>Calophyllum inophyllum</i> L.	Clusiaceae	Tree	Terrestrial	Wild
91.	<i>Calotropis procera</i> (Ait.) R.Br.	Apocynaceae	Shrub	Terrestrial	Wild
92.	<i>Canavalia cathartica</i> Thouars	Fabaceae	Straggler	Terrestrial	Wild
93.	<i>Capparis decidua</i> (Forssk.) Edgew.	Capparidaceae	Tree	Terrestrial	Wild
94.	<i>Capparis grandis</i> L.	Capparidaceae	Tree	Terrestrial	Wild
95.	<i>Capparis sepiaria</i> L.	Capparidaceae	Straggler	Terrestrial	Wild
96.	<i>Capparis zeylanica</i> L.	Capparidaceae	Straggler	Terrestrial	Wild
97.	<i>Capsicum annum</i> L.	Solanaceae	Shrub	Terrestrial	Cultivated
98.	<i>Cardiospermum halicacabum</i> L.	Sapindaceae	Climber	Terrestrial	Wild
99.	<i>Carica papaya</i> L.	Caricaceae	Tree	Terrestrial	Cultivated

Sl. No.	Plant Name	Family	Habit	Habitat	Type
100.	<i>Cassia fistula</i> L.	Caesalpiaceae	Tree	Terrestrial	Wild
101.	<i>Cassia javanica</i> L.	Caesalpiaceae	Tree	Terrestrial	Ornamental
102.	<i>Cassia obtusa</i> L.	Caesalpiaceae	Tree	Terrestrial	Wild
103.	<i>Cassia siamea</i> Lam.	Caesalpiaceae	Tree	Terrestrial	Wild
104.	<i>Ceiba pentandra</i> (L.) Gaertn.	Bombacaceae	Tree	Terrestrial	Wild
105.	<i>Celosia argentea</i> L.	Amaranthaceae	Herb	Terrestrial	Wild
106.	<i>Celosia polygonoides</i> Retz.	Amaranthaceae	Herb	Terrestrial	Wild
107.	<i>Cenchrus barbatus</i> Schumach.	Poaceae	Grass	Terrestrial	Wild
108.	<i>Cenchrus ciliaris</i> L.	Poaceae	Grass	Terrestrial	Wild
109.	<i>Cenchrus setigera</i> Vahl.	Poaceae	Grass	Terrestrial	Wild
110.	<i>Centella asiatica</i> (L.) Urban	Apiaceae	Herb	Semi-aquatic	Wild
111.	<i>Chloris barbata</i> Sw.	Poaceae	Grass	Terrestrial	Wild
112.	<i>Chloris dolichostachya</i> Lagasca	Poaceae	Grass	Terrestrial	Wild
113.	<i>Chloris tenella</i> Koen. ex Roxb.	Poaceae	Grass	Terrestrial	Wild
114.	<i>Chromolaena odorata</i> (L.) King & Robinson	Asteraceae	Shrub	Terrestrial	Exotic
115.	<i>Cissampelos pareira</i> L.	Menispermaceae	Climber	Terrestrial	Wild
116.	<i>Cleome aspera</i> Koen ex. DC.	Capparidaceae	Herb	Terrestrial	Wild
117.	<i>Cleome monophylla</i> L.	Capparidaceae	Herb	Terrestrial	Wild
118.	<i>Cleome viscosa</i> L.	Capparidaceae	Herb	Terrestrial	Wild
119.	<i>Clerodendrum phlomidis</i> L.f.	Verbenaceae	Shrub	Terrestrial	Wild

Sl. No.	Plant Name	Family	Habit	Habitat	Type
120.	<i>Clitoria ternatea</i> L.	Fabaceae	Climber	Terrestrial	Wild
121.	<i>Coccinia grandis</i> (L.) Voigt	Cucurbitaceae	Climber	Terrestrial	Wild
122.	<i>Cocculus hirsutus</i> (L.) Diels	Menispermaceae	Climber	Terrestrial	Wild
123.	<i>Cocculus pendulus</i> (Forst.) Diels	Menispermaceae	Straggler	Terrestrial	Wild
124.	<i>Cocos nucifera</i> L.	Arecaceae	Tree	Terrestrial	Cultivated
125.	<i>Commelina benghalensis</i> L.	Commelinaceae	Herb	Terrestrial	Wild
126.	<i>Commelina clavata</i> Clarke	Commelinaceae	Herb	Terrestrial	Wild
127.	<i>Commelina longifolia</i> Lam.	Commelinaceae	Herb	Terrestrial	Wild
128.	<i>Commiphora mukul</i> Engl.	Burseraceae	Tree	Terrestrial	Wild
129.	<i>Convolvulus arvensis</i> L.	Convolvulaceae	Climber	Terrestrial	Wild
130.	<i>Corchorus aestuans</i> L.	Tiliaceae	Herb	Terrestrial	Wild
131.	<i>Corchorus tridens</i> L.	Tiliaceae	Herb	Terrestrial	Wild
132.	<i>Corchorus trilocularis</i> L.	Tiliaceae	Herb	Terrestrial	Wild
133.	<i>Cordia dichotoma</i> G. Forst.	Boraginaceae	Tree	Terrestrial	Wild
134.	<i>Cordia myxa</i> L.	Boraginaceae	Tree	Terrestrial	Wild
135.	<i>Cordia sebestena</i> L.	Boraginaceae	Tree	Terrestrial	Ornamental
136.	<i>Couroupita guianensis</i> Aubl.	Lecythidaceae	Tree	Terrestrial	Ornamental
137.	<i>Cressa cretica</i> L.	Convolvulaceae	Shrub	Terrestrial	Wild
138.	<i>Crotalaria pallida</i> Dryand. var. <i>obovata</i> (G.Don) Polhill	Fabaceae	Herb	Terrestrial	Wild
139.	<i>Crotalaria pallida</i> Dryand. var. <i>pallida</i> (G.Don) Polhill	Fabaceae	Herb	Terrestrial	Wild

Sl. No.	Plant Name	Family	Habit	Habitat	Type
140.	<i>Croton bonplandianum</i> Baill.	Euphorbiaceae	Herb	Terrestrial	Wild
141.	<i>Cryptolepis buchananii</i> Roem. & Schult.	Asclepiadaceae	Straggler	Terrestrial	Wild
142.	<i>Cucumis melo</i> L.	Cucurbitaceae	Climber	Terrestrial	Wild
143.	<i>Cuminum cyminum</i> L.	Apiaceae	Shrub	Terrestrial	Cultivated
144.	<i>Cuscuta reflexa</i> Roxb.	Convolvulaceae	Climber	Terrestrial	Wild
145.	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Grass	Terrestrial	Wild
146.	<i>Cynoglossum zeylanicum</i> (Vahl ex Hornem.) Thunb. ex Lehm.	Boraginaceae	Herb	Terrestrial	Wild
147.	<i>Cyperus articulatus</i> L.	Cyperaceae	Herb	Aquatic	Wild
148.	<i>Cyperus difformis</i> L.	Cyperaceae	Herb	Semi-aquatic	Wild
149.	<i>Cyperus exaltatus</i> Retz.	Cyperaceae	Herb	Aquatic	Wild
150.	<i>Cyperus halpan</i> L.	Cyperaceae	Herb	Semi-aquatic	Wild
151.	<i>Cyperus iria</i> L.	Cyperaceae	Herb	Semi-aquatic	Wild
152.	<i>Cyperus pangorei</i> Rottb.	Cyperaceae	Herb	Semi-aquatic	Wild
153.	<i>Cyperus rotundus</i> L.	Cyperaceae	Herb	Terrestrial	Wild
154.	<i>Dactyloctenium aegyptium</i> (L.) Willd.	Poaceae	Grass	Terrestrial	Wild
155.	<i>Dactyloctenium aristatum</i> Link.	Poaceae	Grass	Terrestrial	Wild
156.	<i>Dalbergia sissoo</i> Roxb.	Fabaceae	Tree	Terrestrial	Planted
157.	<i>Datura metal</i> L.	Solanaceae	Shrub	Terrestrial	Wild
158.	<i>Delonix elata</i> (L.) Gamble	Caesalpiniaceae	Tree	Terrestrial	Wild
159.	<i>Delonix regia</i> (Boj. ex Hook) Rafin.	Caesalpiniaceae	Tree	Terrestrial	Wild

Sl. No.	Plant Name	Family	Habit	Habitat	Type
160.	<i>Desmostachya bipinnata</i> (L.) Stapf	Poaceae	Grass	Terrestrial	Wild
161.	<i>Dicanthium annulatum</i> (Forsk.) Stapf.	Poaceae	Grass	Terrestrial	Wild
162.	<i>Dichrostachys cinerea</i> (L.) Wight & Arn.	Mimosaceae	Shrub	Terrestrial	Wild
163.	<i>Dicoma tomentosa</i> Cass.	Asteraceae	Herb	Terrestrial	Wild
164.	<i>Digera muricata</i> (L.) Mart.	Amaranthaceae	Herb	Terrestrial	Wild
165.	<i>Digitaria bicornis</i> (Lam.) Roem. & Schult.	Poaceae	Grass	Terrestrial	Wild
166.	<i>Dinebra retroflexa</i> (Vahl) Panzer	Poaceae	Grass	Terrestrial	Wild
167.	<i>Diplocyclos palmatus</i> (L.) Jeffrey	Cucurbitaceae	Climber	Terrestrial	Wild
168.	<i>Echinochloa colona</i> (L.) Link	Poaceae	Grass	Semi-aquatic	Wild
169.	<i>Echinops echinatus</i> Roxb.	Asteraceae	Herb	Terrestrial	Wild
170.	<i>Eclipta prostrata</i> (L.) L.	Asteraceae	Herb	Semi-aquatic	Wild
171.	<i>Eichhornia crassipes</i> (Mart.) Solms-Laub.	Pontederiaceae	Herb	Aquatic	Wild
172.	<i>Eleusine indica</i> (L.) Gaertn.	Poaceae	Grass	Terrestrial	Wild
173.	<i>Elytraria acaulis</i> (L.f.) Lindau.	Acanthaceae	Herb	Terrestrial	Wild
174.	<i>Emilia sonchifolia</i> (L.) DC.	Asteraceae	Herb	Terrestrial	Wild
175.	<i>Enicostema axillare</i> (Lam.) Raynal	Gentianaceae	Herb	Terrestrial	Wild
176.	<i>Eragrostis maderaspatana</i> Bor	Poaceae	Grass	Terrestrial	Wild
177.	<i>Eragrostis minor</i> Host	Poaceae	Grass	Terrestrial	Wild
178.	<i>Eragrostis nigra</i> Nees ex Steud.	Poaceae	Grass	Terrestrial	Wild
179.	<i>Eragrostis nutans</i> (Retz.) Nees ex Steud.	Poaceae	Grass	Terrestrial	Wild

Sl. No.	Plant Name	Family	Habit	Habitat	Type
180.	<i>Eragrostis pilosa</i> P. Beauv	Poaceae	Grass	Terrestrial	Wild
181.	<i>Eragrostis</i> sp.	Poaceae	Grass	Terrestrial	Wild
182.	<i>Eragrostis unioloides</i> (Retz.) Nees ex Steud.	Poaceae	Grass	Terrestrial	Wild
183.	<i>Eragrostis viscosa</i> (Retz.) Trin.	Poaceae	Grass	Terrestrial	Wild
184.	<i>Eremopogon foveolatus</i> (Del.) Stapf.	Poaceae	Grass	Terrestrial	Wild
185.	<i>Erythrina crista-galli</i> L.	Fabaceae	Tree	Terrestrial	Ornamental
186.	<i>Erythrina stricta</i> Roxb.	Fabaceae	Tree	Terrestrial	Planted
187.	<i>Eucalyptus</i> sp.	Myrtaceae	Tree	Terrestrial	Planted
188.	<i>Euphorbia cotinifolia</i> L.	Euphorbiaceae	Shrub	Terrestrial	Ornamental
189.	<i>Euphorbia geniculata</i> Ortega	Euphorbiaceae	Herb	Terrestrial	Wild
190.	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Herb	Terrestrial	Wild
191.	<i>Euphorbia nivulia</i> L.	Euphorbiaceae	Shrub	Terrestrial	Wild
192.	<i>Euphorbia rosea</i> Retz.	Euphorbiaceae	Herb	Terrestrial	Wild
193.	<i>Euphorbia thymifolia</i> L.	Euphorbiaceae	Herb	Terrestrial	Wild
194.	<i>Euphorbia tirucalli</i> L.	Euphorbiaceae	Tree	Terrestrial	Wild
195.	<i>Evolvulus alsinoides</i> (L.) L.	Convolvulaceae	Herb	Terrestrial	Wild
196.	<i>Evolvulus nummularius</i> (L.) L.	Convolvulaceae	Herb	Terrestrial	Wild
197.	<i>Ficus benghalensis</i> L.	Moraceae	Tree	Terrestrial	Wild
198.	<i>Ficus microcarpa</i> var. <i>microcarpa</i> L.f.	Moraceae	Tree	Terrestrial	Wild
199.	<i>Ficus microcarpa</i> var. <i>retusa</i> L.f.	Moraceae	Tree	Terrestrial	Wild

Sl. No.	Plant Name	Family	Habit	Habitat	Type
200.	<i>Ficus racemosa</i> L.	Moraceae	Tree	Terrestrial	Wild
201.	<i>Ficus religiosa</i> L.	Moraceae	Tree	Terrestrial	Wild
202.	<i>Filicium decipiens</i> (Wight & Arn.) Thw.	Sapindaceae	Tree	Terrestrial	Wild
203.	<i>Fimbristylis aestivalis</i> (Retz.) Vahl.	Cyperaceae	Herb	Terrestrial	Wild
204.	<i>Fimbristylis argentea</i> (Rottb.) Vahl.	Cyperaceae	Herb	Aquatic	Wild
205.	<i>Fimbristylis bisumbellata</i> (Forssk.) Bubani	Cyperaceae	Herb	Semi-aquatic	Wild
206.	<i>Fimbristylis complanata</i> (Retz.) Link.	Cyperaceae	Herb	Semi-aquatic	Wild
207.	<i>Fimbristylis dichotoma</i> (L.) Vahl.	Cyperaceae	Herb	Semi-aquatic	Wild
208.	<i>Fimbristylis falcata</i> (Vahl.) Kunth.	Cyperaceae	Herb	Terrestrial	Wild
209.	<i>Fimbristylis miliacea</i> (L.) Vahl.	Cyperaceae	Herb	Semi-aquatic	Wild
210.	<i>Fimbristylis ovata</i> (Burm. F.) Kern.	Cyperaceae	Herb	Terrestrial	Wild
211.	<i>Fimbristylis</i> sp.1	Cyperaceae	Herb	Aquatic	Wild
212.	<i>Fimbristylis</i> sp.2	Cyperaceae	Herb	Aquatic	Wild
213.	<i>Fimbristylis tetragona</i> R.Br.	Cyperaceae	Herb	Semi-aquatic	Wild
214.	<i>Flacourtia indica</i> (Burm.f.) Merr.	Flacourtiaceae	Tree	Terrestrial	Wild
215.	<i>Flueggea leucopyrus</i> Willd.	Euphorbiaceae	Shrub	Terrestrial	Wild
216.	<i>Flueggea virosa</i> (Willd.) Baill.	Euphorbiaceae	Shrub	Terrestrial	Wild
217.	<i>Glinus lotoides</i> Linnaeus	Aizoaceae	Herb	Terrestrial	Wild
218.	<i>Gliricidia sepium</i> (Jacq.) Kunth ex Walp.	Fabaceae	Tree	Terrestrial	Exotic
219.	<i>Gloriosa superba</i> L.	Colchicaceae	Herb	Terrestrial	Wild

Sl. No.	Plant Name	Family	Habit	Habitat	Type
220.	<i>Gmelina arborea</i> Roxb.	Verbenaceae	Tree	Terrestrial	Wild
221.	<i>Gomphrena serrata</i> L.	Amaranthaceae	Herb	Terrestrial	Wild
222.	<i>Goniogyna hirta</i> (Willd.) Ali	Fabaceae	Herb	Terrestrial	Wild
223.	<i>Gossypium herbaceum</i> L.	Malvaceae	Shrub	Terrestrial	Cultivated
224.	<i>Grewia tiliifolia</i> Vahl.	Tiliaceae	Tree	Terrestrial	Wild
225.	<i>Grewia villosa</i> Willd.	Tiliaceae	Shrub	Terrestrial	Wild
226.	<i>Hedyotis biflora</i> (L.) Lam.	Rubiaceae	Herb	Terrestrial	Wild
227.	<i>Hedyotis corymbosa</i> (L.) Lam.	Rubiaceae	Herb	Terrestrial	Wild
228.	<i>Helianthus annuus</i> L.	Asteraceae	Shrub	Terrestrial	Cultivated
229.	<i>Heliotropium curasavicum</i> L.	Boraginaceae	Herb	Terrestrial	Wild
230.	<i>Hemidesmus indicus</i> (L.) R. Br.	Asclepiadaceae	Climber	Terrestrial	Wild
231.	<i>Heteropogon contortus</i> (L.) P.Beauv	Poaceae	Grass	Terrestrial	Wild
232.	<i>Hibiscus micranthus</i> L.f.	Malvaceae	Herb	Terrestrial	Wild
233.	<i>Hibiscus tiliaceus</i> L.	Malvaceae	Tree	Terrestrial	Planted
234.	<i>Hibiscus vitifolius</i> L.	Malvaceae	Shrub	Terrestrial	Wild
235.	<i>Holoptelea integrifolia</i> (Roxb.) Planch.	Ulmaceae	Tree	Terrestrial	Planted
236.	<i>Hyptis suaveolens</i> (L.) Poit.	Lamiaceae	Herb	Terrestrial	Wild
237.	<i>Ichnocarpus frutescens</i> (L.) R.Br.	Asclepiadaceae	Climber	Terrestrial	Wild
238.	<i>Imperata cylindrica</i> (L.) Beauv.	Poaceae	Grass	Terrestrial	Wild
239.	<i>Indigofera caerulea</i> Roxb.	Fabaceae	Herb	Terrestrial	Wild

Sl. No.	Plant Name	Family	Habit	Habitat	Type
240.	<i>Indigofera linifolia</i> (L.f.) Retz.	Fabaceae	Herb	Terrestrial	Wild
241.	<i>Indigofera linnaei</i> Ali	Fabaceae	Herb	Terrestrial	Wild
242.	<i>Indigofera</i> sp.	Fabaceae	Herb	Terrestrial	Wild
243.	<i>Indoneesiella echioides</i> (L) Nees.	Acanthaceae	Herb	Terrestrial	Wild
244.	<i>Ipomoea alba</i> L.	Convolvulaceae	Climber	Terrestrial	Wild
245.	<i>Ipomoea aquatica</i> Forssk.	Convolvulaceae	Climber	Aquatic	Wild
246.	<i>Ipomoea carnea</i> Jacq.	Convolvulaceae	Shrub	Aquatic	Wild
247.	<i>Ipomoea hederifolia</i> L.	Convolvulaceae	Climber	Terrestrial	Wild
248.	<i>Ipomoea pes-tigridis</i> L.	Convolvulaceae	Climber	Terrestrial	Wild
249.	<i>Ipomoea quamoclit</i> L.	Convolvulaceae	Climber	Terrestrial	Ornamental
250.	<i>Ipomoea staphylina</i> Roem. & Schultes	Convolvulaceae	Climber	Terrestrial	Wild
251.	<i>Ischaemum indicum</i> (Houtt.) Merr.	Poaceae	Grass	Terrestrial	Wild
252.	<i>Iseilema antheboroides</i> Hack.	Poaceae	Grass	Terrestrial	Wild
253.	<i>Iseilema laxum</i> Hack.	Poaceae	Grass	Terrestrial	Wild
254.	<i>Ixora arborea</i> Roxb. ex Sm.	Rubiaceae	Tree	Terrestrial	Wild
255.	<i>Jatropha curcas</i> L.	Euphorbiaceae	Shrub	Terrestrial	Planted
256.	<i>Jatropha gossypifolia</i> L.	Euphorbiaceae	Shrub	Terrestrial	Wild
257.	<i>Justicia adhatoda</i> L.	Acanthaceae	Shrub	Terrestrial	Ornamental
258.	<i>Justicia betonica</i> Linn.	Acanthaceae	Shrub	Terrestrial	Wild
259.	<i>Lagascea mollis</i> Cav.	Asteraceae	Herb	Terrestrial	Wild

Sl. No.	Plant Name	Family	Habit	Habitat	Type
260.	<i>Lagerstroemia reginae</i> Roxb.	Lythraceae	Tree	Terrestrial	Ornamental
261.	<i>Lantana camara</i> L.	Verbenaceae	Shrub	Terrestrial	Exotic
262.	<i>Lawsonia inermis</i> L.	Lythraceae	Shrub	Terrestrial	Planted
263.	<i>Lemna minor</i> L.	Lemnaceae	Herb	Aquatic	Wild
264.	<i>Leptadenia reticulata</i> Wight & Arn.	Asclepiadaceae	Climber	Terrestrial	Wild
265.	<i>Leucaena leucocephala</i> (L.) Gills	Mimosaceae	Tree	Terrestrial	Exotic
266.	<i>Limonia acidissima</i> L.	Rutaceae	Tree	Terrestrial	Planted
267.	<i>Ludwigia perennis</i> L.	Onagraceae	Herb	Semi-aquatic	Wild
268.	<i>Ludwigia peruviana</i> (L.) Hara	Onagraceae	Herb	Semi-aquatic	Wild
269.	<i>Madhuca longifolia</i> (J.Konig) J.F.Macbr.	Sapotaceae	Tree	Terrestrial	Wild
270.	<i>Malvastrum coromandelianum</i> (L.) Garcke	Malvaceae	Herb	Terrestrial	Wild
271.	<i>Mangifera indica</i> L.	Anacardiaceae	Tree	Terrestrial	Planted
272.	<i>Manilkara hexandra</i> (Roxb.) Dubard	Sapotaceae	Tree	Terrestrial	Wild
273.	<i>Markhamia stipulata</i> Seem.	Bignoniaceae	Tree	Terrestrial	Ornamental
274.	<i>Martynia annua</i> L.	Asteraceae	Herb	Terrestrial	Wild
275.	<i>Maytenus emarginata</i> (Willd.) Ding Hou	Celastraceae	Shrub	Terrestrial	Wild
276.	<i>Melia azedarach</i> L.	Meliaceae	Tree	Terrestrial	Ornamental
277.	<i>Merremia hastata</i> (Hallier f.) Ooststr.	Convolvulaceae	Herb	Terrestrial	Wild
278.	<i>Merremia tridentata</i> (L.) Hall.f.	Convolvulaceae	Herb	Terrestrial	Wild
279.	<i>Millingtonia hortensis</i> L.f.	Bignoniaceae	Tree	Terrestrial	Ornamental

Sl. No.	Plant Name	Family	Habit	Habitat	Type
280.	<i>Mimosa hamata</i> Willd.	Mimosaceae	Shrub	Terrestrial	Wild
281.	<i>Mimusops elengi</i> L.	Sapotaceae	Tree	Terrestrial	Ornamental
282.	<i>Mitragyna parvifolia</i> (Roxb.) Korth.	Rubiaceae	Tree	Terrestrial	Wild
283.	<i>Momordica dioica</i> Roxb. ex. Willd.	Cucurbitaceae	Climber	Terrestrial	Wild
284.	<i>Morinda pubescens</i> J.E. Smith.	Rubiaceae	Tree	Terrestrial	Wild
285.	<i>Moringa oleifera</i> Lam.	Moringaceae	Tree	Terrestrial	Cultivated
286.	<i>Morus alba</i> L.	Moraceae	Shrub	Terrestrial	Cultivated
287.	<i>Mucuna pruriens</i> (L.) DC.	Fabaceae	Shrub	Terrestrial	Wild
288.	<i>Mukia maderaspatana</i> (L.) M. Roem.	Cucurbitaceae	Climber	Terrestrial	Wild
289.	<i>Murraya koenigii</i> (L.) Spreng.	Rutaceae	Tree	Terrestrial	Planted
290.	<i>Murraya paniculata</i> (L.) Jack	Rutaceae	Shrub	Terrestrial	Ornamental
291.	<i>Musa paradisiaca</i> L.	Musaceae	Shrub	Terrestrial	Cultivated
292.	<i>Nicandra physalodes</i> (L.) Gaertn.	Solanaceae	Herb	Terrestrial	Wild
293.	<i>Nyctanthes arbor-tristis</i> L.	Oleaceae	Tree	Terrestrial	Ornamental
294.	<i>Ocimum canum</i> Sims.	Lamiaceae	Herb	Terrestrial	Wild
295.	<i>Oldenlandia umbellata</i> L.	Rubiaceae	Herb	Terrestrial	Wild
296.	<i>Opuntia stricta</i> (Haw.) Haw.	Cactaceae	Shrub	Terrestrial	Wild
297.	<i>Panicum trypheron</i> Schult.	Poaceae	Grass	Semi-aquatic	Wild
298.	Panium sp.	Poaceae	Grass	Semi-aquatic	Wild
299.	<i>Parkinsonia aculeata</i> L.	Fabaceae	Tree	Semi-aquatic	Wild

Sl. No.	Plant Name	Family	Habit	Habitat	Type
300.	<i>Parthenium hysterophorus</i> L.	Asteraceae	Herb	Terrestrial	Exotic
301.	<i>Paspalidium flavidum</i> (Retz.) A. Camus.	Poaceae	Grass	Semi-aquatic	Wild
302.	<i>Paspalum scrobiculatum</i> L.	Poaceae	Grass	Semi-aquatic	Wild
303.	<i>Pavonia odorata</i> Willd.	Malvaceae	Herb	Terrestrial	Wild
304.	<i>Pavonia procumbens</i> (Wall ex Wight & Arn.) Walp.	Malvaceae	Herb	Terrestrial	Wild
305.	<i>Pavonia zeylanica</i> (L.) Cav.	Malvaceae	Herb	Terrestrial	Wild
306.	<i>Pedaliium murex</i> L.	Pedaliaceae	Herb	Terrestrial	Wild
307.	<i>Pedilanthus tithymaloides</i> L.	Euphorbiaceae	Shrub	Terrestrial	Planted
308.	<i>Peltophorum pterocarpum</i> (DC.)	Caesalpiniaceae	Tree	Terrestrial	Planted
309.	<i>Pennisetum americanum</i> (L.) R.Br.	Poaceae	Grass	Terrestrial	Cultivated
310.	<i>Pentatropis microphylla</i> L.	Asclepiadaceae	Climber	Terrestrial	Wild
311.	<i>Pergularia daemia</i> (Forssk.) Chiov.	Asclepiadaceae	Climber	Terrestrial	Wild
312.	<i>Peristrophe bicalyculata</i> (Forssk.) Brummitt.	Acanthaceae	Herb	Terrestrial	Wild
313.	<i>Phoenix loureirii</i> Kunth.	Arecaceae	Shrub	Terrestrial	Wild
314.	<i>Phoenix sylvestris</i> (L.) Roxb.	Arecaceae	Tree	Terrestrial	Planted
315.	<i>Phragmites karka</i> Trin. ex Steud.	Poaceae	Grass	Semi-aquatic	Wild
316.	<i>Phyllanthus amarus</i> Schum. & Thonn.	Euphorbiaceae	Herb	Terrestrial	Wild
317.	<i>Phyllanthus emblica</i> L.	Euphorbiaceae	Tree	Terrestrial	Planted
318.	<i>Phyllanthus maderaspatensis</i> L.	Euphorbiaceae	Herb	Terrestrial	Wild
319.	<i>Phyllanthus reticulatus</i> Poir.	Euphorbiaceae	Shrub	Terrestrial	Wild

Sl. No.	Plant Name	Family	Habit	Habitat	Type
320.	<i>Physalis minima</i> Linn.	Solanaceae	Herb	Terrestrial	Wild
321.	<i>Pistia stratiotes</i> L.	Araceae	Herb	Aquatic	Wild
322.	<i>Pithecellobium dulce</i> (Roxb.) Benth.	Mimosaceae	Tree	Terrestrial	Planted
323.	<i>Plumeria acuminata</i> Ait.	Apocynaceae	Tree	Terrestrial	Ornamental
324.	<i>Plumeria alba</i> L.	Apocynaceae	Tree	Terrestrial	Ornamental
325.	<i>Plumeria rubra</i> L.	Apocynaceae	Tree	Terrestrial	Ornamental
326.	<i>Polyalthia longifolia</i> (Sonner.) Thw.	Annonaceae	Tree	Terrestrial	Ornamental
327.	<i>Polycarpaea corymbosa</i> (L.) Lam.	Caryophyllaceae	Herb	Terrestrial	Wild
328.	<i>Polygala</i> sp.	Polygalaceae	Herb	Terrestrial	Wild
329.	<i>Pongamia pinnata</i> (L.) Pierre	Fabaceae	Tree	Terrestrial	Wild
330.	<i>Portulaca oleracea</i> L.	Portulacaceae	Herb	Terrestrial	Wild
331.	<i>Portulaca quadrifida</i> L.	Portulacaceae	Herb	Terrestrial	Wild
332.	<i>Prosopis cineraria</i> (L.) Druce	Mimosaceae	Tree	Terrestrial	Wild
333.	<i>Prosopis juliflora</i> (Sw.) Dc.	Mimosaceae	Tree	Terrestrial	Exotic
334.	<i>Psidium guajava</i> L.	Myrtaceae	Tree	Terrestrial	Planted
335.	<i>Psilotrichum elliotii</i> Baker & Clarke	Amaranthaceae	Herb	Terrestrial	Wild
336.	<i>Pterolobium hexapetalum</i> (Roth.) Sant. & Wagh	Fabaceae	Straggler	Terrestrial	Wild
337.	<i>Pulicaria wightiana</i> C.B. Clarke	Asteraceae	Herb	Terrestrial	Wild
338.	<i>Punica granatum</i> L.	Punicaceae	Tree	Terrestrial	Cultivated
339.	<i>Pupalia lappacea</i> (L.) Juss.	Amaranthaceae	Herb	Terrestrial	Wild

Sl. No.	Plant Name	Family	Habit	Habitat	Type
340.	<i>Quisqualis indica</i> L.	Combretaceae	Climber	Terrestrial	Ornamental
341.	<i>Randia dumetorum</i> (Retz.) Poiret.	Rubiaceae	Shrub	Terrestrial	Wild
342.	<i>Randia parviflora</i> (Thunb.) Lam.	Rubiaceae	Shrub	Terrestrial	Wild
343.	<i>Rhynchosia minima</i> (L.) DC.	Fabaceae	Herb	Terrestrial	Wild
344.	<i>Ricinus communis</i> L.	Euphorbiaceae	Tree	Terrestrial	Cultivated
345.	<i>Rivea hypocrateriformis</i> (Desr.) Choisy	Convolvulaceae	Straggler	Terrestrial	Wild
346.	<i>Rottboellia cochinchinensis</i> (Lour.) Clayton	Poaceae	Grass	Terrestrial	Wild
347.	<i>Ruellia patula</i> Jacq.	Acanthaceae	Herb	Terrestrial	Wild
348.	<i>Ruellia tuberosa</i> L.	Acanthaceae	Herb	Terrestrial	Wild
349.	<i>Saccharum officinarum</i> L.	Poaceae	Grass	Terrestrial	Cultivated
350.	<i>Saccharum spontaneum</i> L.	Poaceae	Grass	Semi-aquatic	Wild
351.	<i>Salicornia brachiata</i> Miq.	Chenopodiaceae	Shrub	Semi-aquatic	Wild
352.	<i>Sapindus emarginatus</i> Vahl.	Sapindaceae	Tree	Terrestrial	Wild
353.	<i>Scirpus articulatus</i> Linn.	Cyperaceae	Herb	Aquatic	Wild
354.	<i>Scoparia dulcis</i> L.	Scrophulariaceae	Herb	Semi-aquatic	Wild
355.	<i>Sebastiania chamaelea</i> (L.) Muell.-Arg.	Euphorbiaceae	Herb	Terrestrial	Wild
356.	<i>Sehima nervosum</i> (Rottl.) Stapf.	Poaceae	Grass	Terrestrial	Wild
357.	<i>Sehima sulcatum</i> (Hack.) A. Camus	Poaceae	Grass	Terrestrial	Wild
358.	<i>Senna alata</i> (L.) Roxb.	Caesalpiniaceae	Shrub	Terrestrial	Ornamental
359.	<i>Senna auriculata</i> (L.) Roxb.	Caesalpiniaceae	Shrub	Terrestrial	Wild

Sl. No.	Plant Name	Family	Habit	Habitat	Type
360.	<i>Senna italica</i> Mill.	Caesalpiniaceae	Herb	Terrestrial	Wild
361.	<i>Senna occidentalis</i> (L.) Link	Caesalpiniaceae	Herb	Terrestrial	Wild
362.	<i>Senna tora</i> (L.) Roxb.	Caesalpiniaceae	Herb	Terrestrial	Wild
363.	<i>Sesamum indicum</i> L.	Pedaliaceae	Shrub	Terrestrial	Cultivated
364.	<i>Sesbania sesban</i> (Jacq.) W.Wight	Fabaceae	Tree	Terrestrial	Planted
365.	<i>Sesbania</i> sp.	Fabaceae	Shrub	Terrestrial	Wild
366.	<i>Setaria italica</i> (L.) P. Beauv	Poaceae	Grass	Terrestrial	Wild
367.	<i>Sida acuta</i> Burm.f.	Malvaceae	Herb	Terrestrial	Wild
368.	<i>Sida cordata</i> (Burm. f.) Borss.	Malvaceae	Herb	Terrestrial	Wild
369.	<i>Sida cordifolia</i> L.	Malvaceae	Herb	Terrestrial	Wild
370.	<i>Sida rhombifolia</i> L. var. <i>retusa</i> (L.) Borss.	Malvaceae	Herb	Terrestrial	Wild
371.	<i>Sida rhombifolia</i> L. var. <i>rhombifolia</i>	Malvaceae	Herb	Terrestrial	Wild
372.	<i>Sida spinosa</i> Linn.	Malvaceae	Herb	Terrestrial	Wild
373.	<i>Solanum surattense</i> Burm. f.	Solanaceae	Herb	Terrestrial	Wild
374.	<i>Sonchus oleraceus</i> L.	Asteraceae	Herb	Terrestrial	Wild
375.	<i>Sorghum bicolor</i> (L.) Moench	Poaceae	Grass	Terrestrial	Cultivated
376.	<i>Spermacoce hispida</i> L.	Rubiaceae	Herb	Terrestrial	Wild
377.	<i>Spermacoce ocymoides</i> Burm.f.	Rubiaceae	Herb	Terrestrial	Wild
378.	<i>Sporobolus coromandelianus</i> (Retz.) Kunth	Poaceae	Grass	Terrestrial	Wild
379.	<i>Sporobolus indicus</i> (L.) R.Br.	Poaceae	Grass	Terrestrial	Wild

Sl. No.	Plant Name	Family	Habit	Habitat	Type
380.	<i>Sterculia foetida</i> Linn.	Sterculiaceae	Tree	Terrestrial	Ornamental
381.	<i>Streblus asper</i> Lour.	Moraceae	Tree	Terrestrial	Wild
382.	<i>Striga asiatica</i> (L.) Kuntze	Scrophulariaceae	Herb	Terrestrial	Wild
383.	<i>Suaeda fruticosa</i> Forssk. ex J.F. Gmelin	Chenopodiaceae	Herb	Semi-aquatic	Wild
384.	<i>Suaeda nudiflora</i> (Willd) Moq.	Chenopodiaceae	Herb	Semi-aquatic	Wild
385.	<i>Synadenium grantii</i> Hook.f.	Euphorbiaceae	Shrub	Terrestrial	Planted
386.	<i>Synedrella nodiflora</i> (L.) Gaertn.	Asteraceae	Herb	Terrestrial	Wild
387.	<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	Tree	Terrestrial	Planted
388.	<i>Tamarindus indica</i> L.	Caesalpiniaceae	Tree	Terrestrial	Planted
389.	<i>Tamarix troupii</i> Hole	Tamaricaceae	Shrub	Semi-aquatic	Wild
390.	<i>Taraxacum officinale</i> F.H.Wigg	Asteraceae	Herb	Terrestrial	Wild
391.	<i>Tecoma stans</i> (L.) Kunth	Bignoniaceae	Tree	Terrestrial	Ornamental
392.	<i>Tectona grandis</i> L.f.	Verbenaceae	Tree	Terrestrial	Wild
393.	<i>Tephrosia purpurea</i> (L.) Pers.	Fabaceae	Herb	Terrestrial	Wild
394.	<i>Tephrosia villosa</i> (L.) Pers.	Fabaceae	Herb	Terrestrial	Wild
395.	<i>Terminalia arjuna</i> (Roxb.) Wight & Arn.	Myrtaceae	Tree	Terrestrial	Planted
396.	<i>Terminalia catappa</i> L.	Myrtaceae	Tree	Terrestrial	Ornamental
397.	<i>Themeda quadrivalvis</i> (L.) Kuntze	Poaceae	Grass	Terrestrial	Wild
398.	<i>Themeda triandra</i> Forssk.	Poaceae	Grass	Terrestrial	Wild
399.	<i>Thespesia populnea</i> (L.) Soland ex Correa	Malvaceae	Tree	Terrestrial	Wild

Sl. No.	Plant Name	Family	Habit	Habitat	Type
400.	<i>Thevetia peruviana</i> K.Schum	Apocynaceae	Tree	Terrestrial	Wild
401.	<i>Thunbergia grandiflora</i> Roxb.	Acanthaceae	Straggler	Terrestrial	Ornamental
402.	<i>Tinospora cordifolia</i> (Willd.) Miers ex Hook. f. & Thoms.	Menispermaceae	Climber	Terrestrial	Wild
403.	<i>Tribulus lanuginosis</i> L.	Zygophyllaceae	Herb	Terrestrial	Wild
404.	<i>Tribulus terrestris</i> L.	Zygophyllaceae	Herb	Terrestrial	Wild
405.	<i>Trichodesma indicum</i> (L.) R. Br.	Boraginaceae	Herb	Terrestrial	Wild
406.	<i>Tridax procumbens</i> L.	Asteraceae	Herb	Terrestrial	Wild
407.	<i>Trigonella foenum-graecum</i> L.	Fabaceae	Herb	Terrestrial	Cultivated
408.	<i>Triticum vulgare</i> L.	Poaceae	Grass	Terrestrial	Cultivated
409.	<i>Triumfetta pentandra</i> A. Rich	Tiliaceae	Herb	Terrestrial	Wild
410.	<i>Triumfetta rhomboidea</i> Jacq.	Tiliaceae	Herb	Terrestrial	Wild
411.	<i>Triumfetta rotundifolia</i> Lam.	Tiliaceae	Herb	Terrestrial	Wild
412.	<i>Typha angustifolia</i> L.	Poaceae	Grass	Aquatic	Wild
413.	Unknown sp.	Salvadoraceae	Tree	Terrestrial	Wild
414.	<i>Urena lobata</i> L. subsp. <i>lobata</i>	Malvaceae	Herb	Terrestrial	Wild
415.	<i>Urena lobata</i> L. subsp. <i>sinuata</i> (L.) Borss.	Malvaceae	Herb	Terrestrial	Wild
416.	<i>Vernonia cinerea</i> (L.) Less.	Asteraceae	Herb	Terrestrial	Wild
417.	<i>Vigna trilobata</i> (L.) Verdc.	Fabaceae	Herb	Terrestrial	Wild
418.	<i>Vigna mungo</i> (L.) Wilczek	Fabaceae	Herb	Terrestrial	Cultivated
419.	<i>Vigna radiata</i> (L.) Verdc.	Fabaceae	Herb	Terrestrial	Cultivated

Sl. No.	Plant Name	Family	Habit	Habitat	Type
420.	<i>Waltheria indica</i> L.	Sterculiaceae	Herb	Terrestrial	Wild
421.	<i>Xanthium indicum</i> Koen.	Asteraceae	Herb	Terrestrial	Wild
422.	<i>Zea mays</i> L.	Poaceae	Grass	Terrestrial	Cultivated
423.	<i>Ziziphus mauritiana</i> Lam.	Rhamnaceae	Tree	Terrestrial	Wild
424.	<i>Ziziphus nummularia</i> (Burm.f.) Wight & Arn.	Rhamnaceae	Shrub	Terrestrial	Wild
425.	<i>Ziziphus oenoplia</i> (L.) Mill.	Rhamnaceae	Straggler	Terrestrial	Wild
426	<i>Zornia gibbosa</i> Span.	Fabaceae	Herb	Terrestrial	Wild

Appendix 4. List of butterflies in and around the study area

No.	Common name	Scientific name	Family	Status
Family I. Papilionidae				
1	Blue Mormon	<i>Papilio polymnestor</i>	Papilionidae	Endemic
2	Common Mormon	<i>Papilio polytes</i>	Papilionidae	
3	Common Rose	<i>Pachliopta aristolochiae</i>	Papilionidae	
4	Crimson Rose	<i>Pachliopta hector</i>	Papilionidae	Schedule I & Endemic
5	Lime Butterfly	<i>Papilio demoleus</i>	Papilionidae	
Family II. Pieridae				
6	Common Emigrant	<i>Catopsilia pomona</i>	Pieridae	
7	Common Jezebel	<i>Delias eucharis</i>	Pieridae	
8	Common Grass yellow	<i>Eurema hecabe</i>	Pieridae	
9	Common Gull	<i>Cepora nerissa</i>	Pieridae	Schedule II
10	Common Wanderer	<i>Pareronia valeria</i>	Pieridae	
11	Crimson Tip	<i>Colotis danae</i>	Pieridae	
12	Great Orange Tip	<i>Hebomoia glaucippe</i>	Pieridae	
13	Mottled Emigrant	<i>Catopsilia pyranthe</i>	Pieridae	
14	Psyche	<i>Leptosia nina</i>	Pieridae	
15	Small Grass Yellow	<i>Eurema brigitta</i>	Pieridae	
16	Small Orange Tip	<i>Colotis etrida</i>	Pieridae	
17	White Orange Tip	<i>Ixias marianne</i>	Pieridae	
18	Yellow Orange Tip	<i>Ixias pyrene</i>	Pieridae	
Family III. Nymphalidae				
19	Angled Castor	<i>Ariadne ariadne</i>	Nymphalidae	
20	Chocolate Pansy	<i>Precis iphita</i>	Nymphalidae	
21	Common Bush Brown	<i>Mycalesis perseus</i>	Nymphalidae	
22	Common Castor	<i>Ariadne merione</i>	Nymphalidae	
23	Common Crow	<i>Euploea core</i>	Nymphalidae	Schedule IV
24	Common Evening Brown	<i>Melanitis leda</i>	Nymphalidae	
25	Common Leopard	<i>Phalanta phalantha</i>	Nymphalidae	
26	Danaid Egfly	<i>Hypolimnas misippus</i>	Nymphalidae	Schedule II
27	Dark Blue Tiger	<i>Tirumala septentrionis</i>	Nymphalidae	
28	Double-branded Crow	<i>Euploea sylvester</i>	Nymphalidae	Endemic
29	Glassy Tiger	<i>Parantica aglea</i>	Nymphalidae	
30	Joker	<i>Byblia ilithyia</i>	Nymphalidae	
31	Lemon Pansy	<i>Junonia lemonias</i>	Nymphalidae	
32	Peacock Pansy	<i>Junonia almana</i>	Nymphalidae	
33	Plain Tiger	<i>Danaus chrysippus</i>	Nymphalidae	
34	Striped Tiger	<i>Danaus genutia</i>	Nymphalidae	
35	Tawny Coster	<i>Acraea violae</i>	Nymphalidae	
36	Yellow Pansy	<i>Junonia hierta</i>	Nymphalidae	

No.	Common name	Scientific name	Family	Status
Family IV. Lycaenidae				
37	Common Cerulean	<i>Jamides celeno</i>	Lycaenidae	
38	Common Pierrot	<i>Castalius rosimon</i>	Lycaenidae	Schedule I
39	Rounded Pierrot	<i>Tarucus extricatus</i>	Lycaenidae	
40	Tiny Grass Blue	<i>Zizula hylax</i>	Lycaenidae	
41	Zebra Blue	<i>Lepotes plinius</i>	Lycaenidae	
Family V. Hesperidae				
42	Brown Awl	<i>Badamia exclamationis</i>	Hesperidae	
43	Common Banded Owl	<i>Hasora chromus</i>	Hesperidae	
44	Common Grass Dart	<i>Taractrocera maevius</i>	Hesperidae	
45	Indian Skipper	<i>Spialia galba</i>	Hesperidae	
46	Rice Swift	<i>Borbo cinnara</i>	Hesperidae	

*Schedule of Wildlife Protection Act 1972

PLATE I. Some bird species recorded from the area



Bank Myna- *Acridotheres ginginianus*



Yellow-wattled Lapwing- *Vanellus malabaricus*



Black Ibis- *Pseudibis papillosa*



Indian Peafowl- *Pavo cristatus*



Laughing Dove- *Streptopelia senegalensis*



Spot-billed Duck- *Anas poecilorhyncha*



Black-headed Ibis- *Threskiornis melanocephalus*



Black-shouldered Kite- *Elanus caeruleus*

PLATE II. Snapshots of Project environs & biodiversity



View of Ship breaking yard at Alang



A view of Nuclear Power plant site



Polluted coastal area



Proposed Township area



Painted Storks nesting in Bhavnagar city



Comb Duck- *Sarkidiornis melanotos*



Rose-ringed Parakeets



Garden Lizard

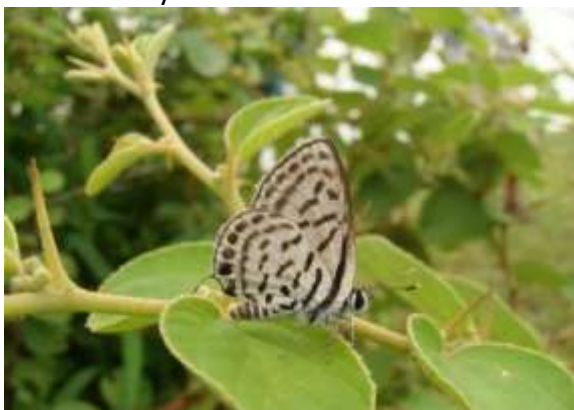
PLATE III. Snapshots of biodiversity from the study area



Lemon Pansy- *Junonia lemonias*



Nilgai- *Boselaphus tragocamelus*



Rounded Pierrot- *Tarucus extricatus*



Great eggfly- *Hypolimnas bolina*



Gram Blue- *Euchrysops cnejus*



Painted Stork- *Mycteria leucocephala*



Joker- *Byblia ilithyia*



Fulvous Whistling ducks

