Field observation report on biodiversity survey as per GRI 304 standards

GRANULES INDIA LIMITED (UNIT I)
SY. NO. 533,534, 535, 536, 537, 646, 648, 649 AND 650,
IDA BONTHAPALLY, GUMMADIDALA MANDAL,
SANGAREDDY DISTRICT, TELANGANA

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STUDY PERIOD: Summer 2022 Reported on 21.03.2022

Company Name	**:**	**M/s. GRANULES INDIA LIMITED., UNIT I**
Project	**:**	M/s Granules India Limited, (Unit I) obtained Environmental Clearance vide letter SEIAA/TS/MDK-04/2016-3337 dated 08.03.2017. The unit renewed consent for operation (CFO) vide letter no. 200822319761 dated 10.04.2020 valid till 31.03.2025. It is now proposed to expand the manufacturing capacity from 4849 TPM to 5349 TPM.
Category	**:**	Project Category: 5(f) cat B (Synthetic Organic Chemical industry)
Location	**:**	Sy. No. 533, 534, 535, 536, 537, 646, 648, 649 and 650, IDA Bonthapally, Gummadidala Mandal, Sangareddy District, Telangana
Ecological sensitive Areas: **Wetlands, water bodies, coastal zone, biospheres, mountains, forests**	**:**	There are no major water bodies within the study area. Bonthapalle RF at a distance of 0.6 Km in northwest, Jinnawaram RF at a distance of 6.3 Km in southwest, Mangapet RF at a distance of 4.7 Km in east, Royyapalli RF at a distance of 6.5 Km in east, Wailal RF at a distance of 8 Km in south, Dundigal RF at a distance of 8.3 Km in southeast, Nagawaram RF at a distance of 8.3 Km in northwest, Mambapur RF at a distance of 6.8 Km in northwest, Nallavalli RF at a distance of 8.3 Km in northwest, Pottaguda RF at a distance of 9.3 Km in southwest directions respectively.
Longitude & Latitude	**:**	17^0 39' 16.7" (N) latitude and 78^0 21' 25.3" (E) longitude.
Green Belt Area	**:**	Total site area after expansion is 12 acres 32 guntas with a capital cost of Rs. 53 Crores towards acetic acid recovery plant, enhancement of ZLD system and additional utilities. Area as per layout plan : 12241.76 sq m Total Greenbelt area is 4.23 acres = 1.71182ha.

Table of Contents

1. SCOPE & OBJECTIVES OF THE STUDY

1.1. SCOPE:

Scope of work for this study includes to prepare the report as per GRI 304 standards to identification of impacts on biotic and abiotic factors which will affect the present environmental condition through the direct and indirect activities of the project. **This report is designed to be used by organizations about their impacts on the economy, the environment and society.**

The study involved assessment of general habitat type, vegetation pattern, preparation of inventory flora and fauna of terrestrial ecosystem in study area of the project. Biological assessment basically to identify whether there are any rare, endangered, endemic, threatened (REET) species of flora or fauna in the project site or core area as well its buffer zone. This study also involves to identify any ecologically sensitive habitats within the study area. The study also designed to suggest suitable mitigation measures if necessary for protection of wildlife habitats conservation of REET species if any.

1.2. OBJECTIVES OF THE STUDY:

The basic objectives of the study are to evaluate the status of the flora and fauna of the core area (project site) and the buffer areas (up to 10 km radius from boundary of the project site) with specific reference to the rare or endangered or endemic or threatened (REET) species. Diversity indices provide more information than simply the number of species present (i.e., they account for some species being rare and others being common). They serve as valuable tools that enable biologists to quantify diversity in a community and describe its numerical structure. The study is also designed to identify and evaluate the adverse impacts of the proposed project activity and to suggest remedial / mitigation measures in accordance with the objectives as desired by the Ministry of Environment, Forests and Climate Change (MoEF&CC), Government of India (GoI), World bank IFC guidelines, Equator Principles and other international guidelines. The following are the primary objectives for data collection

1. Baseline data of Terrestrial biological environment by studying distribution pattern, community structure, population dynamics and species composition of Flora and Fauna.
2. Areas used by protected, important or sensitive species of Flora and Fauna
3. Ecology of the species such as breeding, nesting, migration and foraging are to be determined for REET Species (if any).
4. Preparation of exhaustive list of Flora and Fauna with special reference to endangered and dominant species.
5. Quantitative analysis ecological parameters such as frequency, density, dominance, Importance Value Indices (IVI) and Shannon – Wiener Indices of diversity of different plant communities.
6. The details on secondary data on the existing Flora and Fauna in the project area
7. Listing out impact related issues from project activities on Eco sensitive areas.
8. Preparing a mitigation plan for each impact identified.
9. Correlation between results analysed from primary field survey with special emphasis on reduction or changes in local biodiversity from the project activities in long term period.
10. Prediction and quantification of impacts of the proposed activity on the REET Species (if any).
11. Preparing a comprehensive Greenbelt plan for five years with financial outlay.
12. Development of a management / mitigation plan to minimize the impacts the proposed project activity on the biotic environment so that there is no net loss of biodiversity.

1.3. ESSENTIALITY OF THIS REPORT AS PER GRI 304 STANDARDS.

This Standard provide information about an organization's impacts related to biodiversity, and how it manages them.

Protecting biological diversity is important for ensuring the survival of plant and animal species, genetic diversity, and natural ecosystems.

In addition, natural ecosystems provide clean water and air, and contribute to food security and human health. Biodiversity also contributes directly to local livelihoods, making it essential for achieving poverty reduction, and thus sustainable development.

1.4. MANAGEMENT APPROACH DISCLOSURES

Management approach disclosures are a narrative explanation of how an organization manages a material topic, the associated impacts, and stakeholders' reasonable expectations and interests. Any organization that claims its report has been prepared in accordance with the GRI Standards is required to report on its management approach for every material topic, as well as reporting topic-specific disclosures for those topics.

During this report preparation, management approach for biodiversity describe its strategy for achieving its policy on biodiversity management.

The Granules India limited's biodiversity strategy contain a combination of elements related to the **prevention, management, and remediation of damage to natural habitats** resulting from the organization's activities.

1.5. 304-1

Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas are given under Chapter II.

Geographic location	17^0 39' 16.7" (N) latitude and 78^0 21' 25.3" (E) longitude.
Subsurface and underground land that may be owned, leased, or managed by the organization	Total site area after expansion is 12 acres 32 guntas with a capital cost of Rs. 53 Crores towards acetic acid recovery plant, enhancement of ZLD system and additional utilities.
Position in relation to the protected area (in the area, adjacent to, or containing portions of the protected area) or the high biodiversity value area outside protected areas	There are no major water bodies within the study area. Bonthapalle RF at a distance of 0.6 Km in northwest, Jinnawaram RF at a distance of 6.3 Km in southwest, Mangapet RF at a distance of 4.7 Km in east, Royyapalli RF at a distance of 6.5 Km in east, Wailal RF at a distance of 8 Km in south, Dundigal RF at a distance of 8.3 Km in southeast, Nagawaram RF at a distance of 8.3 Km in northwest, Mambapur RF at a distance of 6.8 Km in northwest, Nallavalli RF at a distance of 8.3 Km in northwest, Pottaguda RF at a distance of 9.3 Km in

	southwest directions respectively.
Type of operation (office, manufacturing or production, or extractive);	The unit renewed consent for operation (CFO) vide letter no. 200822319761 dated 10.04.2020 valid till 31.03.2025. It is now proposed to expand the manufacturing capacity from 4849 TPM to 5349 TPM.
Size of operational site in km2 (or another unit, if appropriate);	Total site area after expansion is 12 acres 32 guntas
Biodiversity value characterized by the attribute of the protected area or area of high biodiversity value outside the protected area (terrestrial, freshwater, or maritime ecosystem);	There are no Protected areas of high biodiversity value.
Biodiversity value characterized by listing of protected status (such as IUCN Protected Area Management Categories, Ramsar Convention, national legislation).	There are no IUCN red listed category species within the study area. No Ramsar conversion lakes are present in the study area No forest land occupied / utilised by the organisation.

1.6. 304-2

Nature of **significant direct and indirect impacts on biodiversity** with reference to one or more of the following:

Construction or use of manufacturing plants, mines, and transport infrastructure;	Nil
Pollution (introduction of substances that do not naturally occur in the habitat from point and non-point sources);	Nil
Introduction of invasive species, pests, and pathogens; Reduction of species; Habitat conversion;	Nil
Changes in ecological processes outside the natural range of variation (such as salinity or changes in groundwater level).	Nil

Significant direct and indirect positive and negative impacts with reference to the following:

Species affected	No vegetation removal is occur in the present activity
Extent of areas impacted	No significant impact on any flora and fauna of the region
Duration of impacts	No longterm or shorttem impact due to the project activities. Longterm positive impacts are due to greenbelt development,

Reversibility or irreversibility of the impacts.	No such impacts due to the present activitycaptivity

1.7. 304-3

Size and location of all habitat **areas protected** or **restored**, and whether the success of the restoration measure was or is approved by independent external professionals.	33% of the area allotted for greenbelt and species are successfully raised under same habitat. The entire region is fully restored
Whether partnerships exist with third parties to protect or restore habitat areas distinct from where the organization has overseen and implemented restoration or protection measures.	Yes
Status of each area based on its condition at the close of the reporting period.	Greenebelt species photos are enclosed
Standards, methodologies, and assumptions used.	Survey types and methodology adopted are given

1.8. DISCLOSURE 304-4 IUCN RED LIST SPECIES AND NATIONAL CONSERVATION LIST SPECIES WITH HABITATS IN AREAS AFFECTED BY OPERATIONS

Total number of IUCN Red List species and national conservation list species with habitats in areas affected by the operations of the organization, by level of extinction risk: i. Critically endangered ii. Endangered iii. Vulnerable iv. Near threatened v. Least concern are given under floral and faunal lists attached in the report.

2. COMPANY OVERVIEW

M/s Granules India Limited, (Unit I) obtained Environmental Clearance from State Environment Impact Assessment Authority (SEIAA), Telangana vide letter SEIAA/TS/MDK-04/2016-3337 dated 08.03.2017. The unit renewed consent for operation (CFO) vide letter no. 200822319761 dated 10.04.2020 valid till 31.03.2025. It is now proposed to expand the manufacturing capacity from 4849 TPM to 5349 TPM. Total site area after expansion is 12 acres 32 guntas with a capital cost of Rs. 53 Crores towards acetic acid recovery plant, enhancement of ZLD system and additional utilities.

2.1. TECHNOLOGY

The technology for the product profile is indigenous based on organic chemistry. The product profile has been finalized based on the market demand and the technology compatibility. The synthesis involves reaction of fine chemicals in a solvent medium, followed by separation and purification.

2.2. PLANT LOCATION & LAYOUT

The site is located at Sy. No. 533, 534, 535, 536, 537, 646, 648, 649 and 650, IDA Bonthapally, Gummadidala Mandal, Sangareddy District, Telangana. The site is situated at the intersection of 17^0 39' 16.7" (N) latitude and 78^0 21' 25.3" (E) longitude. The site is surrounded by Sigachi Laboratories Limited in north, Phylo Chem Pvt. Ltd., in south, Techtran Polylenses Ltd., in east and Samkrg Pistons and Rings Ltd in west directions. The nearest habitation from the plant site is Bonthapally village at a distance of 0.8 kms in west direction. Nearest water body from the site is located at a distance of 0.59 km in north direction. The main approach road is Hyderabad – Narsapur passing at a distance of 1.7 km in east direction. The nearest railway station is Medchal at a distance of 12.87 km in southeast direction and the nearest airport is located at a distance of 48 km in southeast direction. Medchal town is located at a distance of 12.5 km in southeast direction. There are no major water bodies within the study area. Bonthapalle RF at a distance of 0.6 Km in northwest,

Jinnawaram RF at a distance of 6.3 Km in southwest, Mangapet RF at a distance of 4.7 Km in east, Royyapalli RF at a distance of 6.5 Km in east, Wailal RF at a distance of 8 Km in south, Dundigal RF at a distance of 8.3 Km in southeast, Nagawaram RF at a distance of 8.3 Km in northwest, Mambapur RF at a distance of 6.8 Km in northwest, Nallavalli RF at a distance of 8.3 Km in northwest, Pottaguda RF at a distance of 9.3 Km in southwest directions respectively. There are no ecologically sensitive areas like national parks, and sanctuaries within 10 km radius of the site.

3. BIODIVERSITY POLICY

Biodiversity Policy

Biodiversity policy is an integral part of the sustainable guiding principles. We develop procedures, practices and considerations providing a strong basis for conservation and sustainable use of biodiversity and ecosystem.We believe in implementation of biodiversity fulfils the basic necessaries of life and leading to a better standard of living. The diversity among the organisms at various levels in the ecosystem is basis for human survival. Species level conservation only possible if we protect their habitats. Ensure legal compliance with respect to biodiversity by complying rules and regulations related to environment, forest, wildlife, coastal zone regulations and green cover during the planning and execution of projects.

Mapping of biodiversity with our core business operations.

Assessing biodiversity risks and opportunities.

Encouraging relevant stakeholders to support better biodiversity management.

e committed to protect the planet for future generations.

4. SUMMARY OF EB REPORT

A reconnaissance study was carried out during Winter season 2022 with a team of experts in study area of 10 km radius from the project site. Secondary data collected from various sources along with local people and listed out the floral and faunal species at higher level. There are 10 reserved forests present within the study area. Around 172 plant species are recorded from the study area. No migratory corridors or breeding grounds for faunal species present here. Few direct and indirect impacts on ecological aspects are noticed during operation phases of the project and proper mitigation measures were suggested along with detailed greenbelt plan. The quantitative analysis shows that the distribution pattern (A/F ratio is identified as random distribution as the value of A/F ratio is 0.033. The Shannon indices value of study area is 2.565 indicates Moderate diversity (Normal diversity in ecological studies is 1.5 to 3.5 range (Kerkhoff, 2010). Population size and Dominance of the species is 8% and Evenness is around 84% (Indicates the species are evenly distributed in the study area). This might be due to contiguous patches of natural species such as *Azadirachta indica, Prosopis juliflora (near the villages), Peltophorum pterocarpum, Delonix regia* and Subabul (near road side). Raunkiaer's law of frequency classification indicates that species diversity is distributed maximum for 40 to 60% which indicates the most common species in the buffer zone. The major impacts observed from emissions and increase of surrounding temperature levels. This will affect on the crops, terrestrial birds and bat species of the buffer region. The transportation and storage of chemicals also affect vegetation in core zone.

Mitigation measures such as regular monitoring of process emissions and crop yield, population studies of birds and bats in the buffer region are suggested annual basis. Maintainace of greenbelt in core and buffer zones should be as per the five-year plan given under Greenbelt development. Total Greenbelt area is 1.71 ha. The industry already maintained dense green cover with few selected plants. The list of plants that can be further raised in the space available are suggested as per CPCB guidelines.

5. ECOLOGICAL SAMPLING

5.1. INTRODUCTION

Ecological studies are one of the important aspects of Environmental Impact Assessment with a view to conserve environmental quality and biodiversity. The present objective is to study an area of 10 km radius from the project site. Ecological systems show complex inter-relationships between biotic and abiotic components including dependence, competition and mutualism. Biotic components comprise of both plant and animal communities, which interact not only within and between themselves but also with the abiotic components Viz., physical and chemical components of the environment. The main aim of Conservation of Biodiversity is to ensure "No Net Loss" as per Convention on Biological Diversity (CBD), the Ramsar Convention, and the Convention on Migratory Species (CMS). The further loss of biodiversity is unacceptable. Biodiversity must be conserved to ensure it survives, continuing to provide services, values and benefits for current and future generations. This objective is considered during the present ecological assessment.

5.2. RECONNAISSANCE OF THE STUDY AREA

Flora and fauna studies were carried out during Monsoon season (March, 2022). The proposed project site is within the notified industrial corridor surrounded by open land with very less vegetation cover. Most of the region is dry and mesophotic conditions. Vegetation is limited to reserve forests, pond side and road side. There are few tanks present in the study area and 10 Reserve Forest block present in the buffer zone. Bonthaplly, Jinnawaram, Magapet, Royyapalli, Wailal, Mambapur, Natinyayapalli, Nallagutta, Nallayalli reserve forest present in the buffer zone.

The possible impacted Eco sensitive habitats such as RFs and water bodies are studied. Number of sampling points is based on area-species graph method. 20 sampling points are studied for statistical analysis. For the secondary data, working plan from Telangana Forest Department is collected. The faunal species (particularly higher mammals and Birds) present in and around the study area are discussed with elderly people from nearby villages.

There is no protected forest or un-classed Forest (declared Protected under “The Indian Forest Act, 1927”) and “Forest (Conservation) Act, 1980 with Amendments Made in 1988”. (Source: Forest Department). No forest Clearance is required for the proposed development. There are no Scheduled species recorded within the proposed site. No wetland notified under “The Ramsar Convention – 1971” or listed under “the National wetland Conservation Programme – 2009” is reported within 10 km from project boundary.

5.3. SECONDARY DATA

Information collected from authentic sources such as Working plan data of (2002-2012) from the forest department, research articles and information from local villagers on migratory birds status and knowledge on ethno botanical studies from local villagers.

5.4. RATIONALE AND VALIDATION OF SECONDARY DATA:

The ecosystem wise study has been done and reserve forest data collected during earlier field work done in the same industrial corridor was also considered. The data validation done for the species present in the study area (up to 10 sq km radius) from the forest department or local villagers or scientists from Universities, BSI and ZSI.

5.5. SAMPLING LOCATIONS

In core area, sampling locations were taken all along the project site, whereas in buffer area, 20 locations are selected for carrying out statistical analysis **(Table 1).** Under each location, one belt transect (100m X 10m) is laid for the study. Thus, a total of 20 points are analysed for statistical parameter keeping in view of covering all the possible native species of study area.

5.6. SAMPLING LOCATIONS

In core area, sampling locations were taken all along the project site, whereas in buffer area, eight locations are selected for carrying out statistical analysis. Under each location, two belt transects are made at different directions each. Thus, a total of 20 points are analysed for

statistical parameter keeping in view of covering all the possible wild and native species of study area. Map showing 10 points but two belt transects selected from each sampling location where dense vegetation cover present near the reserve forests.

5.7. EQUIPMENT / INSTRUMENTS DEPLOYED

- Digital Camera (NIKON 42 X zoom)
- GPS (Accurate readings available in Mobile and inbuilt camera)
- Binoculars (OLYMPUS 10 X 50 DPSI)
- Field observation book, Field guides, Pen, Measuring tape etc
- PAST –statistical software for Biodiversity.
- MS-Excel for Phyto-sociological calculations and graphs.

5.8. SURVEY TYPES USED:

- Reconnaissance survey (Near Agricultural, Human habitations and Road side)
- Intensive surveys for Ecological sensitive areas
- Stratified Random Sampling method
- Belt transect method for quantification of vegetation cover.
- Point count method for birds
- Indirect evidences
- Personal interviews with local villagers

6. VEGETATION STRUCTURE AND COMPOSITION

During the present study, around 172 floral species are recorded from primary and secondary sources. The overall study area consists of agricultural fallow / Barren / uncultivable / waste land. The list of plant species recorded during field survey and also from literature from the study area is given in Annexure-I.

6.1. VEGETATION IN THE CORE ZONE:

The project site is a private land with manmade ecosystem with few selected trees, shrubs and herbs maintained under Greenbelt. The species selected are as per the CPCB guidelines given under site specific conditions. *Conocarpus erectus* is predominantly raised under greenbelt outside the boundary wall. Coconut, *Anthocephalus* and other tall trees are grown near garden area to control pollutants. Butterflies are fairly attracted to the ornamental plants and water present on grasses during sprinkling. Many flowering herbs and shrubs were maintained in the garden area attracting several bufferfly species such as common crow, plain tiger, Common jezebel, Common Mormon etc. Ornamental species like *Ixora pavetta, Vinca rosea, Plumaria alba, Plumaria pendula, Nerium indicum, Hybiscus rosa-synensis* maintained near the garden area. Near the sides of the road *Peltoforum pterocarpum, Ficus benjamina, Areca sp., Acasia auriculata, Derris indica, Tamarindus indica, Delonix regia, Azadiracta indica* are grown. Several twiners and climbers are present around the trees. Entire ground covered with carpet grass *Axonopus compressus* and other natural Indian grass varieties covered.

10 reserve forests are present in the buffer zone and mostly with mixed and open scrub forests. This area is having few shrubs having xerophytic adaptation. Most of the region is barren and rocky. There are no endangered and endemic plants present in the buffer and core zones. The vegetation at Non Forest areas and RF's were analysed statistically at various points and recorded the diversity and density of individuals. The faunal composition was also estimated based on the direct and indirect evidences.

Balanites aegyptiaca, Caesalpinia bonduc, Tectona grandis, Phoenix aculis, Borassus flabellifera, Azadirachta indica, Prosopis spicegera, Ficus sp, Acacia sp, Tribulus terrstris, Achyranthus aspera, Euphorbia caudifolia, E. tirucelli. Opuntia, Sarcostemma viminale are

mainly restricted to waste and culturable waste lands ands. *Albizia procera, Albizia lebbeck, Delonix regia, Azadirchta indcia, Peltoforum sp., Terminalia catapa, Psidium guava, Dalbergia sissoo* and *Tamarindus indica* are predominant near villages.

6.2. PHYTOSOCIOLOGICAL DATA

The study area is mainly focused through secondary data validation from primary observations. Checklist is prepared and marked the species noticed during rapid assessment. 20 transects were plotted in all the sampling points and finalized the number of transects through Area-Species graph. Among trees species *Prosopis juliflor (47.51), Lantana camara (26.12), Azadirachta indica (25.95), Millettia pinnata (23.84)* are having high IVI value which indicates that their population size, frequency and abudance are high values**.** These species were significant in occupying majority of space and resources in the buffer zone of the study area.

Table 2.: Phytosociological data of trees in the RFs of study area:

S.No	Scientific Name	Density	Rel Density	Frequency	Rel Frequency	Abundance	Rel Abundance	IVI
1	*Azadirachta indica*	0.85	9.29	55.00	8.94	1.55	7.72	25.95
2	*Dalbergia sissoo*	0.20	2.19	15.00	2.44	1.33	6.66	11.28
3	*Tectona grandis*	0.45	4.92	35.00	5.69	1.29	6.42	17.03
4	*Lantana camara*	0.85	9.29	60.00	9.76	1.42	7.08	26.12
5	*Mangifera indica*	0.45	4.92	40.00	6.50	1.13	5.62	17.04
6	*Morinda tinctoria*	0.35	3.83	35.00	5.69	1.00	4.99	14.51
7	*Phoenix sylvestris*	0.55	6.01	45.00	7.32	1.22	6.10	19.43
8	*Prosopis juliflora*	2.00	21.86	70.00	11.38	2.86	14.27	47.51
9	*Butea monosperma*	0.50	5.46	45.00	7.32	1.11	5.55	18.33
10	*Millettia pinnata*	0.75	8.20	45.00	7.32	1.67	8.32	23.84
11	*Erythroxylum monogynum*	0.65	7.10	30.00	4.88	2.17	10.82	22.80
12	*Chukrasia tabularis*	0.60	6.56	55.00	8.94	1.09	5.45	20.95
13	*Ficus benghalensis*	0.35	3.83	35.00	5.69	1.00	4.99	14.51
14	*Peltophorum pterocarpum*	0.60	6.56	50.00	8.13	1.20	5.99	20.68
			100	**615**	**100**	**20.0**	**100**	**300.00**

Figure 2 : Graph showing Important Value Index of dominant tree species in the study area

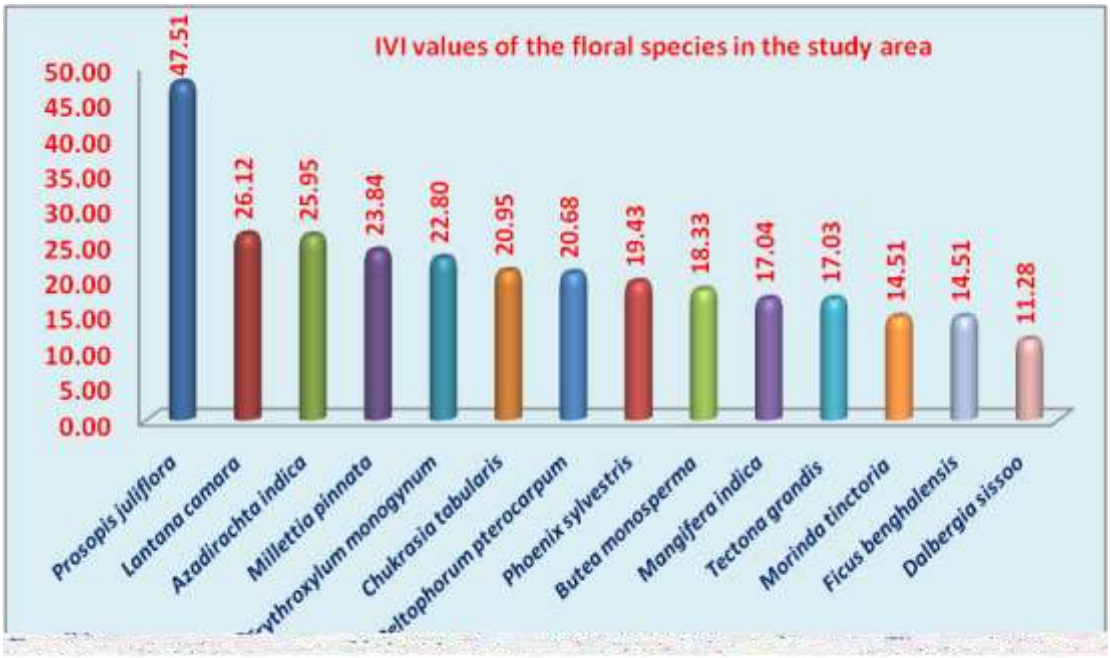
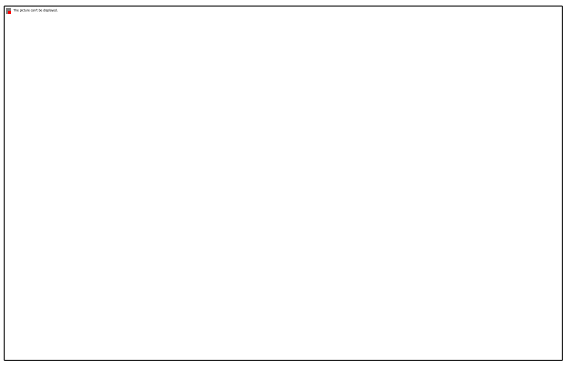
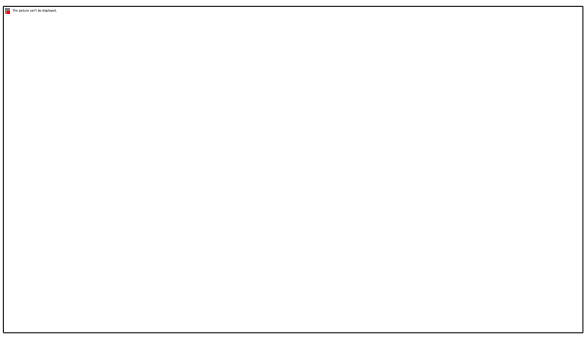
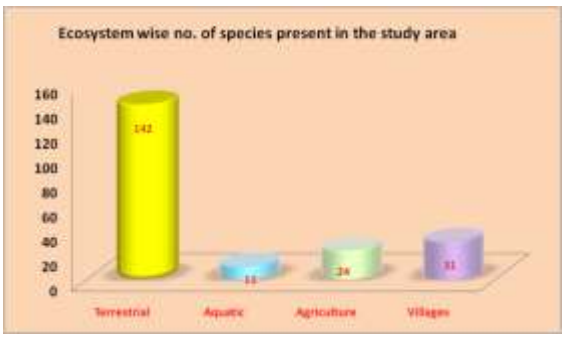


Figure 3: Graph showing habit wise no. of species present in the study area







6.3. VEGETATION ANALYSIS: (DATA INTERPRETATION)

Table 3. : Biodiversity indices values of the sampling sites in study ares:

a	A/F value	0.033
b	Shannon H	2.568
	Simpson 1-D	0.918
c	Dominance D	0.082
	Evenness e^H/S	0.843

a. **Distribution pattern (A/F ratio):** The ratio between abundance and frequency was used to interpret the distribution pattern of species (Whitford, 1949). Distribution pattern of species in the study area is identified as **random distribution** as the value of A/F ratio is **0.033.** This distribution of species is random because of several ecosystems randomly distributed in the study area.

b. The Shannon indices value of study area is **2.568** indicates **Moderate diversity** (Normal diversity in ecological studies is 1.5 to 3.5 range (Kerkhoff, 2010).

c. Population size and Dominance of the species is **8%** and Evenness is around **84%** (Indicates the species are **evenly distributed** in the study area). This might be due to contiguous patches of natural species such as *Azadirachta indica, Prosopis juliflora* (near the villages), *Peltophorum pterocarpum, Delonix regia* and Subabul *(*near road side*)*

d. **Frequency** indicates A<B<C>D>E as per the Raunkiaer's law of frequency classification indicates that species diversity is distributed maximum for 40 to 60%

6.4. FAUNA WITHIN THE CORE AND BUFFER ZONES:

Throughout the study area, there no direct evidence of wild animal species observed. In Mammals, Three stripped Squirrels are sighted apart from few reptilian species. From the secondary source (local people near villages), it is also revealed that presence of common snakes exists here. The faunal composition generally with arboreal and semi arboreal based animals. Within the core zone few common bird species such as Common Crows, Myna are sighted apart from few garden lizards. Butterflies and dragonflies are fairly common near aqatic habitats.

6.5. ENDEMIC, THREATENED AND ENDANGERED SPECIES

From the present survey, it appears that none of the terrestrial species are under endangered and threatened species, and not listed in the Schedule I of the Indian Wildlife (Protection) Act, 1972 as amended in 1991.

As the animals, especially vertebrates move from place to place in search of food, shelter, mate or other biological needs, separate lists for core and buffer areas are not feasible. As such there are no chances of occurrence of any rare or endangered or endemic or threatened (REET) species within the core or buffer area. There are no Sanctuaries, National Parks, Tiger Reserve or Biosphere Reserve or Elephant Corridor or other protected areas within 10 km radius from core area. It is evident from the available records, reports and circumstantial evidence that the entire study area including the core and buffer areas were free from any endangered animals. It is apparent from the list that none of the species either spotted or reported is included in Schedule I of the Wildlife Protection Act. From the list, no Rare or Endangered or Endemic or Threatened (REET) species or any species listed in Schedule I of the Wildlife (Protection) Act. Hence, species specific and habitat specific mitigation measures are not needed in this connection. The project site does not overlap with any of the recognized Ramsar sites. The construction phase does not envisaged excavation or alteration in water bodies hence shall not entail changes in aquatic biodiversity. The construction does not involve diversion or change in the major rivers, canals.

6.6. EFFECT ON MIGRATORY CORRIDORS, NESTING AND BREEDING SITES.

There are no migratory corridors, nesting and breeding sites within the study area.

7. PREDICTION OF IMPACTS ON LOCAL FLORA AND FAUNA

The activities associated with the proposed activity is expansion of Bulk Drug and Intermediates Manufacturing with Production Capacity from 4849 TPM to 5349 TPM have very less impacts on terrestrial flora and fauna of the study area. The additional area of 2 acres land acquired is also studied for any removal of tree species. It was observed that there are no tree species except common herbaceous weeds within the site. There are no REET species, migratory corridors, nesting and Breeding sites within the study area. No significant long-term residual impacts on fauna due to the proposed project. No effluent is going to be discharged on land or in any water body. There will be no significant impacts on local ecological environment. Due to the development of green belt in the study area, the impact on the ecology will be minimal.

7.1. DATA INTERPRETATION FROM QUANTITATIVE ANALYSIS RESULT:

The overall impact of the project on ecological aspects is:

Magnitude: Due to random distribution pattern of the species, and moderate diverisity, the impact magnitude on flora is moderate

Extent: The extent of the impact is on-site as the impacts will be limited to the boundaries of the Site.

Duration: The duration would be short-term as the natural vegetation of the site would be affected during the construction phase.

Intensity or magnitude: The intensity is less during construction and operation phases.

7.2. IMPACT OF PROPOSED EXPANTION ACTIVITY ON ECOLOGICAL FACTORS

Species diversity	No reduction
Habitat loss or fragmentation	Nil
Affect on any additional risk or threat to the rare or endangered or endemic or threatened (REET) species	Nil
Any impairment of ecological functions such as (i) disruption	Nil

of food chains, (ii) decline in species population and or (iii) alterations in predator-prey relationships	
Is it possible to attain the global objectives of "no net loss" of biodiversity	Yes

From the above table, it is very clear that proposed expansion activity shall not impact on the biodiversity of the region. Hence, it is suggested by following certain conservation measures.

There are many trees developed under greenbelt within the industry. All the trees in the core area will be retained. As there are no REET species in the study area, the proposed expansion activity will not pose any threat to local flora and fauna. No direct or indirect damage is expected to the flora and fauna of the buffer zone. As the industry is required to maintain the emission levels and treated effluents within the limits specified by the CPCB / TSPCB, the effects of the industry on the flora and fauna of the buffer zone will be negligible. As the effluent is routed to ETP – ZLD system, waste water will not be discharged out. Further tall, wind resistant and evergreen trees grown in the greenbelt to act a windbreak. Hence, the anticipated environmental impacts on the flora and fauna of the study area are negligible and easily reversible if any. It will not create any kind of environmental stress to the local flora and fauna.

7.3. IMPACT EVALUATION W.R.T. RECEPTOS / SENSITIVE RECEPTORS:

Impacts identification:

Impact on crops: Long-term cumulative impacts are predicted on the surrounding aquatic biota and agriculture crops due to small quantities of emissions. Even though the project authorities using the standard treatment methods as per the CPCB guidelines, the impact on surrounding aquatic and agroecosystems are predicted to be at moderate level.

Impact on birds: Due to the temperature increase from the proposed project, the impact will be more on the terrestrial birds of the region present near reserve forests.

Terrestrial Environment: Most of the surrounding terrestrial region is under industrial corridor and few villages surrounded by. Hence direct and indirect impacts of the present operational system of the plant not going to impact on terrestrial vegetation and animals. However, cumulative impact of all the surrounding industrial pollutants will create major impact on ecosystems of the region along with human health.

7.4. MITIGATION MEASURES PROPOSED:

- ✓ Even though the emissions are within the standard levels prescribed by CPCB, sensitive floral and aquatic and agro ecosystems will get long-term impacts. Hence, all necessary control & measures for prevention of release of toxic contaminants from project as well as for prevention of pollution due to emissions of the project shall be implemented as suggested in other relevant sections of this chapter as well as mentioned in EMP.
- ✓ Environmental education activities are also improving the negative impacts of the site specific industrial and anthropogenic activities.
- ✓ Safety measures & action plan for prevention of spreading of toxic materials being transported shall be provided in transport vehicles to ensure safety & protection of ecological factors during major accidents.
- ✓ Creation & Maintenance of dense greenbelt in and around the industrial premises as per the plan suggested under greenbelt development.
- ✓ No disposal of effluent and solid & hazardous waste on land and in water bodies.

Table 4. showing major impacts vs mitigation measures suggested for the proposed project:

➢ The major impacts observed from fumigative emissions and increase of surrounding temperature levels. This will effect on the crops, tree species present adjoining, terrestrial birds and bat species in reserve forests of the	✓ Regular monitoring of process emissions and crop yield, population studies of birds and bats in the buffer region are suggested annual basis. ✓ No damage should be created on resource base of reserve forests within the buffer

buffer region. ➢ Major impacts on ecology are due to dust and noise emitted from vehicles transporting raw material. ➢ Effect in aquatic biota near Pond nearby. Due to increase of emissions the temperature lavels will alter the aquatic biota.	zone. ✓ Restriction of expansion of unit as per the permitted levels and usage of appropriate pollution control equipment as suggested by CPCB ✓ Care should be taken during material transportation. ✓ Effective management of weed species from the ponds present in the buffer zone and regular monitoring of aquatic biota.

7.5. POSITIVE IMPACTS ON ECOLOGICAL ASPECTS:

Aesthetics:

Due the present plantation activities in the boundary of the site, the aesthetic value of the region will be enhanced besides reduction of effects of pollutants. The beauty of the region will be enhanced. More native plants species that are suitable to the region taken into criteria. Involving local villagers in plantation activities and educating the people on importance of biodiversity leads to protection and conservation of flora and fauna in long term.

Carbon sink: Within the study area i.e in the buffer zone, the mass avenue plantation activities, rehabilitating degraded lands contribute to mitigating climate change. These actions increase the rate and quantity of carbon sequestration in biomass. Introduction of trees on non-forest or degraded forest lands, industrial plantations, Village plantations, restoration of natural forest, watershed protection, orchards and perennial cultures, agro-forestry activities enhance the ecological and economic values.

8. ECOLOGICAL MANAGEMENT

All the plantation activities of the expansion project if any will be commenced along with construction activity, so that it can grow and help in the construction and operation stage of the expansion project. Expansion site is the extension of existing site located in IDA and has already in possession of project proponent. Total Greenbelt area is 1.71 ha.

8.1. GREENBELT DEVELOPMENT

Greenbelt Development is properly maintained under greenbelt zone

8.2. GUIDELINES FOR GREENBELT DEVELOPMENT:

a) Design and development of greenbelt shall be in adherence to industry specific requirements and prevalent climatic conditions. Company shall ensure healthy & dense greenbelt throughout the project life.
b) Company shall follow CPCB guidelines for development & maintenance of greenbelt area.
c) Company shall ensure regular irrigation & fertilization of greenbelt area as required timely.
d) Company shall ensure on re-plantation of same species as per their survival rate.
e) Company shall to plant trees with density of 1500 trees per hectare.
f) Indigenous plant species with fast growth shall be selected under Greenbelt development.
g) The trees shall be planted as per their height in three-tier pattern to ensure that the entire area covered and ensure effective pollution abatement. For this, management will ensure that plantation of trees will include mixture of lower, higher and middle canopy structure, which will be mixed appropriately / proportionately / uniformly.
h) The plantation of fruit bearing trees are not suggested under greenbelt in the APIs / Synthetic Organic Chemical industries because they may cause impacts on human health, birds and other fauna due to bio accumulation toxic effect (Source: https://doi.org/10.3390/horticulturae2030008)

8.3. DESIGN OF GREENBELT:

The following methodology will be adopted during the designing of greenbelt development.

a. Saplings grown in polythene bags (min 2 to 3 ft height) will be planted at a density of 1500 per ha.
b. The spacing will be maintained as per the canopy type and height of the trees i.e 5m X 5m (25 sq.m) for large trees with dense canopy, 3m X 3m (9 sq m) for medium trees with moderate canopy and 2m X 2m (4 sq m) for less canopy trees.
c. Apart from the trees suggested under greenbelt, ornamental plants will be also raised as potted plants, shrubs, herbs, grasses and climbers that can be used as hedge near the garden area that binds the soil.
d. Planting of trees in each row will be in staggered orientation.
e. Tall, evergreen, un-branched trees with very high leaf area index (> 10 m height) will be grown in very high density along the boundary as the outer rows (away from plant side).
f. The short trees (< 10 m height) will be grown in the middle row (towards plant side) of the green belt. The middle row will have multipurpose branched trees.
g. Pits will be made as per the tree size (Normal pit size for tree species is 45 cm X 45cm X 45 cm).
h. Necessary maintenance of irrigation facilities will be done regularly.
i. Each plant will be taken care with appropriate protection measures to increase the survivability rate.
j. Re- plantation shall be done as per the survivability of plant species
k. Organic fertilizers are usually (recycled) plant or animal derived matter will be used as manure.
l. All plants selected are locally adapted, and the present site is capable of supporting their growth with suitable horticultural practices.
m. Plantation technique, protection measures, maintenance cost, water utility, man power, type of plants and financial support shall be followed by the management as per the 5-year plantation programme suggested.

8.4. SITE - SPECIFIC DESIGN OF GREENBELT AS PER THE LAYOUT PLAN:

The following Site-specific Design of Greenbelt as per the layout plan is suggested here:

1. Green belt is already will developed within the site of 1.71 ha maintained under greenbelt as per guidelines.
2. Near the Boiler and coal shed area more *Conocarpus* trees to be planted.
3. *Neem, Badam, Acacia auriculiformis* and *Polyalthia longifolia* are suggested near HWA shed region.

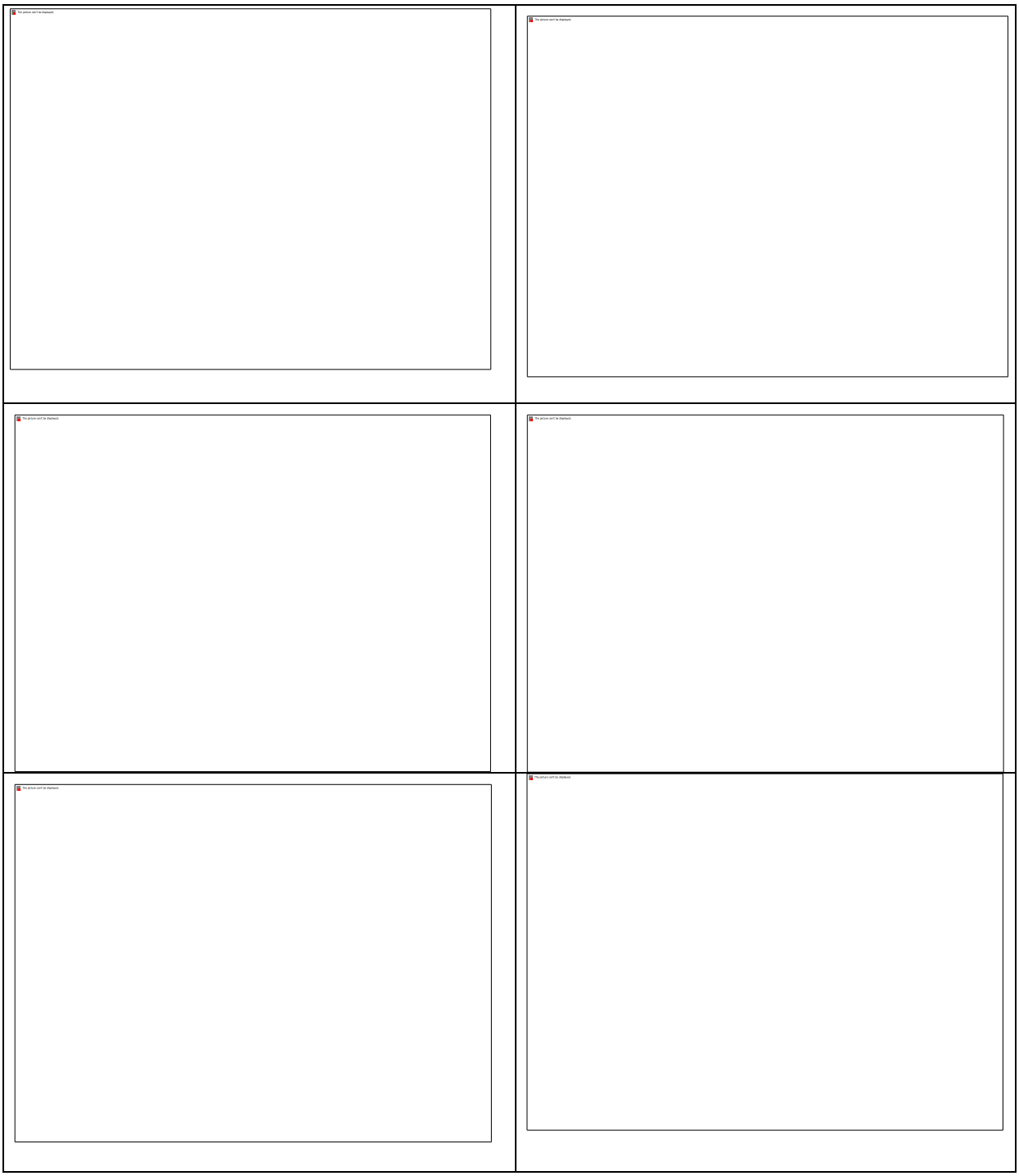
Table 5. List of Trees present under Greenbelt:

S.No	Botanical Name	Common Name	Habit	As per CPCB Manual	Shade	Ornamental	Pollution control
1	*Acacia auriculiformis* Benth.	Earleaf acacia	Tree	A2	Y		Y
2	*Albizia lebbeck* (L.) Benth.	Dirisanam	Tree	A29	Y	Y	Y
3	*Alstonia scholaris (L.) R. Br.*	Devil Tree	Tree		Y	Y	Y
4	*Azadirachta indica* A.Juss.	Neem	Tree	A44	Y		Y
5	*Bauhinia purpurea* L.	Bodhanta	Tree			Y	Y
6	*Bougainvillea spectabilis*	Paper Flower	Tree			Y	
7	*Caesalpinia pulcherrima* L Swartz	Rathna gandhi	Tree	C1		Y	
8	*Callistemon citrinus* (Curtis) Skeels.	Bottle Brush	Tree	C2		Y	Y
9	*Cascabela thevetia* (L.)	Pacha ganneru	Tree		Y	Y	Y
10	*Cocos nucifera* L.	Kobbari	Tree		Y		
11	*Conocarpus erectus* L	Buttonwood tree	Tree		Y		Y
12	*Delonix regia* (Hook.) Raf.	Chittikesaram	Tree	D3	Y	Y	Y
13	*Dendrocalamus strictus* Nees	Bamboo	Tree	D4	Y	Y	Y
14	*Elaeis oleifera* (H.B.K) Cortes	African oil palm tree	Tree		Y	Y	Y
15	*Eucalyptus citriodora* Hook.	Lemon scented gum	Tree	E4	Y		Y
16	*Ficus benghalensis*	Marri	Tree		Y		Y
17	*Ficus benjamina* L.	Pedda Juvvi	Tree	F2		Y	Y
18	*Grevillea robusta* A. Cunn. ex R.Br.	Silver Oak	Tree		Y		Y
19	*Grewia hirsuta* Vahl	Jaani Chettu	Tree		Y	Y	
20	*Ixora coccinea* L.	Ramabanam	Tree	I3	Y	Y	
21	*Leucaena leucocephala* (Lam.) de Wit	Jabarichettu	Tree		Y		Y
22	*Manilkara hexandra*	Khirni tree	Tree		Y		Y
23	*Manilkara zapota*	Sapota	Tree				Y
24	*Millettia pinnata* (L.) Panigrahi	Kanuga	Tree	D5	Y		Y
25	*Mimisops elangi* L	Pogada	Tree	M10	Y	Y	
26	*Musa paradisiaca*	Banana tree	Tree		Y		

27	*Neolamarckia cadamba*	Kadamba	Tree		Y	Y	
28	*Nerium odoratum* Lam.	Ganneru	Tree	N1		Y	Y
29	*Peltophorum pterocarpum* DC	Konda chintha	Tree	P1	Y		Y
30	*Phoenix sylvestris* (L.) Roxb.	Eethachettu	Tree			Y	
31	*Plumeria alba* L.	Deva ganneru White	Tree			Y	
32	*Plumeria rubra* L.	Deva ganneru Pink	Tree			Y	
33	*Polyalthia longifolia* (Sonn.) Thwaites	Ashoka mara	Tree	P9	Y		Y
34	*Psidum guayava* Linn.	Guava	Tree	P20	Y		
35	*Roystonea regia*	Royal palm tree	Tree		Y	Y	
36	*Saraca indica*	Asoka tree	Tree			Y	Y
37	*Spathodea campanulata* P. Beauv	African tulip tree	Tree		Y	Y	
38	*Tamarindus indica* Linn.	Chinta	Tree	T2	Y		Y
39	*Tectona grandis* L.f.	Saguavni	Tree	T4	Y		Y
40	*Terminalia catappa* L.	Baadam	Tree	T8	Y		Y
41	*Thevetia neriifolia*	Pacha ganneru	Tree		Y	Y	
42	*Aloe vera* (L.) Burm.f.	Kithanara	Herb			Y	
43	*Catharanthus roseus* (L.) G.Don	Billaganneru	Herb			Y	
44	*Chlorophytum comosum*	Spider Plant	Herb			Y	
45	*Dracaena marginata*	Dragon Tree	Herb			Y	
46	*Dracaena trifasciata*	Snake Plant	Herb			Y	
47	*Epipremnum aureum* (Linden & André)	Golden pothos	Vine			Y	

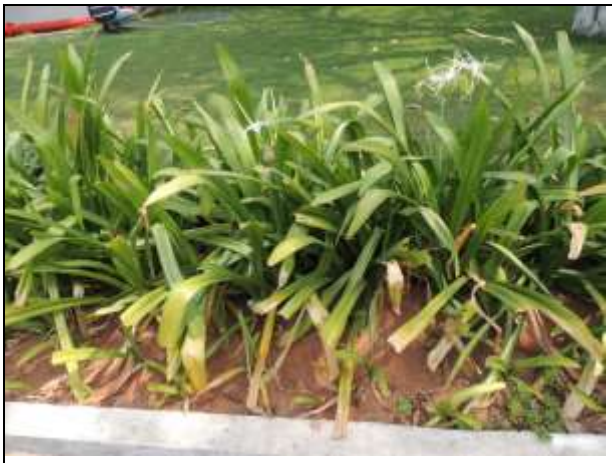
Y: yes

Plants raised under greenbelt area within the industrial corridor:




SAFETY



	 REMEMBER Your Family Needs You WORK SAFELY
	
	

Table 6. List of Trees proposed under Greenbelt:

S.No	Botanical Name	Common Name	As per CPCB Manual	Site	No	Space in m	Each	Area (m2)
1	*Acacia auriculiformis* Benth.	Earleaf acacia	A2	A1	10	3 X 3	9	90
2	*Azadirachta indica* A.Juss.	Neem	A44	A1	5	5 X 5	25	125
3	*Bauhinia racemosa* Lam.	Basavanapada	B8	C	5	2 X 2	4	20
4	*Caesalpinia pulcherrima* L Swartz	Rathna gandhi	C1	A3	10	2 X 2	4	40
5	*Cascabela thevetia* (L.)	Pacha ganneru		C	25	2 X 2	4	100
6	*Conocarpus erectus* L	Buttonwood tree		A2	30	3 X 3	9	270
7	*Delonix regia* (Hook.) Raf.	Kempu tori	D3	A1	5	5 X 5	25	125
8	*Derris indica* (Lam.) Bennett	Kanuga	D5	A2	20	3 X 3	9	180
9	*Ficus benjamina* L	Pedda Juvvi	F2	A3	20	2 X 2	4	80
10	*Ficus religiosa* Linn.	Raavi	F7	A1	3	5 X 5	25	75
11	*Grewia hirsuta* vahl	Jibilika		A3	10	3 X 3	9	90
12	*Ixora coccinea* L.	Ramabanam	I3	C	20	2 X 2	4	80
13	*Mimisops elangi* L	Pogada	M10	A3	20	3 X 3	9	180
14	*Nerium odoratum* Lam.	Ganneru	N1	C	20	2 X 2	4	80
15	*Plumeria alba* L.	Deva ganneru		B	10	3 X 3	9	90
16	*Polyalthia longifolia* (Sonn.) Thwaites	Ashoka mara	P9	A1	30	2 X 2	4	120
17	*Roystonea regia*	Royal palm tree		B	20	2 X 2	4	80
18	*Tabernaemontana divaricata* Linn	Chandakantham	T1	C	10	2 X 2	4	40
19	*Terminalia catappa* L.	Baadam	T8	A2	20	2 X 2	4	80
20	*Thespesia populneoides* (Roxb) Kastel	Ganga Raavi	T10	A1	5	5 X 5	25	125
					298			**2070**

Table 7. Proposed financial Budget for the Maintenance of existing Greenbelt development (Rs in Lakhs)

S.No	Component	Total estimate	First year	Second year	Third year	Fourth year	Fifth year
1	Cost of trees and ornamental plants	1.0	1.0	0	0	0	0
2	Soil (10 trucks @5000) = 0.5L	0.5	0.5	0	0.0	0.0	0.0
3.	Pit making 100 no * Rs 50 = Rs 0.5 L / Landscaping Total =1 L	1.0	1.0	0	0	0	0.0
4	Gardener's Cost AMC (1 Nos) LS 2 Lakhs per Annum	10.0	2.0	2.0	2.0	2.0	2.0
5	Fertilizers cost	3	1.0	0.50	0.50	0.50	0.50
6	Water supply and Protection	5.0	1.0	1.0	1.0	1.0	1.0
	Grand Total	**20.5**	**6.5**	**3.5**	**3.5**	**3.5**	**3.5**

Table 8. LIST OF PLANT SPECIES RECORDED (* secondary data)

S.No.	*Botanical Name*	Common name	Family	Habit
1*	*Acacia auriculiformis* Benth.	Australia thumma	Leguminosae	Tree
2*	*Acacia chundra* (Rottler)Willd.	Sandra	Mimosaceae	Tree
3*	*Acacia leucophloea* (Roxb.)	Tella thumma	Leguminosae	Tree
4*	*Acacia nilotica* (L.) Delile	Nalla thumma	Leguminosae	Tree
5*	*Aegle marmelos* (L.) Corrêa	Velaga	Rutaceae	Tree
6*	*Ailanthus excelsa* Roxb	Pedda manu	Simaroubaceae	Tree
7*	*Alangium salviifolium* (L.f.) Wangerin	Vuduga chettu	Cornaceae	Tree
8*	*Albizia amara* (Roxb.) B.Boivin	Konda sigara	Leguminosae	Tree
9	*Albizia lebbeck* (L.) Benth.	Dirisanam	Leguminosae	Tree
10*	*Alstonia scholaris* R.BR	Edakula pala	Apocynaceae	Tree
11	*Anogeissus latifolia* (Roxb. ex DC.) Wall.	Chirumanu	Combretaceae	Tree
12	*Anthocephalus cadamba* (Roxb.) Miq.	Kadambe	Rubiaceae	Tree
13	*Azadirachta indica* A.Juss.	Vepa	Meliaceae	Tree
14	*Bauhinia purpurea* L.	Bodhanta	Leguminosae	Tree
15	*Borassus flabellifer* L.	Thadi chettu	Arecaceae	Tree
16*	*Butea monosperma* (Lam.) Taub.	Modhuga	Leguminosae	Tree
17	*Cascabela thevetia* (L.) Lippold	Pacha ganneru	Apocynaceae	Tree
18*	*Cassia fistula* L.	Rela	Leguminosae	Tree
19	*Cassia siamea* Lam.	Seema thangedu	Leguminosae	Tree
20	*Casuarina equisetifolia* L.	Sarugudu	Casuarinaceae	Tree
21*	*Ceiba pentandra* (L.) Gaertn	Tella buruga	Malvaceae	Tree
22	*Chukrasia tabularis* A.Juss.	Konda vepa	Meliaceae	Tree
23	*Citrus limon* (L.) Burm. f.	Nimma	Rutaceae	Tree
24	*Cocos nucifera* L.	Kobbari	Arecaceae	Tree
25	*Conocarpus erectus L.*	Buttonwood tree	Combretaceae	Tree
26*	*Dalbergia sissoo* DC.	Sisu	Leguminosae	Tree
27	*Delonix regia* (Hook.) Raf.	Chittikesaram	Leguminosae	Tree
28*	*Dendrocalamus strictus*(Roxb.) Nees	Sanna vedru	Graminae	Tree
29	*Diospyros melanoxylon* Roxb	Tunki	Ebenaceae	Tree
30	*Eucalyptus globulus* Labill.	Neelagiri thylam	Myrtaceae	Tree
31	*Ficus benghalensis* L.	Marri	Moraceae	Tree
32	*Ficus hispida* L.f.	Medipandu	Moraceae	Tree
33	*Ficus religiosa* L.	Ravi	Moraceae	Tree
34*	*Gmelina asiatica* L.	Kavavagummudu	Lamiaceae	Tree
35	*Leucaena leucocephala* (Lam.) de Wit	Jabarichettu	Leguminosae	Tree
36*	*Limonia acidissima* L.	Velaga	Rutaceae	Tree
37	*Mangifera indica* L.	Mamidi	Anacardiaceae	Tree
38	*Millettia pinnata* (L.) Panigrahi	Kanuga	Leguminosae	Tree

39*	*Morinda tinctoria* Roxb.	Maddichettu	Rubiaceae	Tree
40	*Pavetta indica* L.	Lakkapapidi	Rubiaceae	Tree
41	*Peltophorum pterocarpum* (DC.) K.Heyne	Kondachintha	Leguminosae	Tree
42*	*Phoenix sylvestris* (L.) Roxb.	Eethachettu	Arecaceae	Tree
43	*Phyllanthus emblica* L.	Usiri	Phyllanthaceae	Tree
44	*Pithecellobium dulce* (Roxb.) Benth.	Sima chinta	Leguminosae	Tree
45	*Plumeria alba*	Tella devaganneru	Apocynaceae	Tree
46	*Plumeria rubra*	Erra devaganneru	Apocynaceae	Tree
47*	*Prosopis chilensis* (Molina) Stuntz	Mulla thumma	Leguminosae	Tree
48	*Prosopis juliflora* (Sw.) DC.	English tumma	Mimosaceae	Tree
49	*Pterospermum heyneanum* G.Don	Duddika	Malvaceae	Tree
50	*Samanea saman* (Jacq.) Merr.	Nidraganeeru	Sapindaceae	Tree
51*	*Sapindus emarginatus* Vahl	Kunkudu	Sapindaceae	Tree
52*	*Soymida febrifuga* (Roxb.) A. Juss.	Somi	Meliaceae	Tree
53	*Syzygium cumini* (L.) Skeels	Neredu	Myrtaceae	Tree
54	*Tamarindus indica* L.	Chintha	Leguminosae	Tree
55	*Tecoma stans* (L.) Juss. ex Kunth	Pasupu ganneru	Bignoniaceae	Tree
56	*Tectona grandis* L.f.	Teak	Lamiaceae	Tree
57*	*Terminalia catappa* L.	Badham	Combretaceae	Tree
58	*Thespesia populnea* (L.) Sol. ex Corrêa	Ganga Raavi	Malvaceae	Tree
59	*Trema orientalis* (L.) Blume	Boggu chettu	Ulmaceae	Tree
60	*Ziziphus mauritiana* Lam.	Reni	Rhamnaceae	Tree
61	*Abutilon indicum* (L.) Sweet	Thutturubenda	Malvaceae	Shrub
62*	*Agave americana* L.	Gitta nara	Asparagaceae	Shrub
63	*Caesalpinia bonduc* (L.) Roxb.	Gacha podha	Leguminosae	Shrub
64	*Caesalpinia pulcherrima* (L.) Sw.	Rathna gandhi	Leguminosae	Shrub
65*	*Calotropis gigantea* (L.) Dryand.	Tella jilledu	Apocynaceae	Shrub
66	*Calotropis procera* (Aiton) Dryand.	Erra jilledu	Apocynaceae	Shrub
67	*Capparis zeylanica* L.	Arudonda	Capparaceae	Shrub
68	*Catunaregam spinosa* (Thunb.) Tirveng.	Manga	Rubiaceae	Shrub
69*	*Clerodendrum phlomidis* L.f.	Kond-takal	Lamiaceae	Shrub
70*	*Erythroxylum monogynum* Roxb.	Dedaraaku	Erythroxylaceae	Shrub
71	*Euphorbia tirucalli* L.	Tirukalli	Euphorbiaceae	Shrub
72	*Grewia hirsuta* Vahl	Jaani Chettu	Tiliaceae	Shrub
73	*Grewia flavescens* Juss.	Jana	Malvaceae	Shrub
74*	*Helicteres isora* L.	Gooba thadu	Malvaceae	Shrub
75	*Hyptis suaveolens* (L.) Poit.	Danthitulasi	Lamiaceae	Shrub
76*	*Ipomoea carnea* Jacq.	Rubber mokka	Convolvulaceae	Shrub
77	*Ixora coccinea* L.	Ramabanam	Rubiaceae	Shrub
78*	*Jasminum roxburghianum* Wall. ex C.B.Clarke	Garuda malli	Oleaceae	Shrub

79	*Lantana camara* L.		Verbenaceae	Shrub
80	*Leonotis nepetifolia* (L.) R.Br.	Rana bheri	Lamiaceae	Shrub
81	*Opuntia dillenii* (Ker Gawl.) Haw.	Naga jamudu	Cactaceae	Shrub
82	*Phoenix acaulis* Roxb.	Chitteetha	Palmae	Shrub
83	*Senna auriculata* (L.) Roxb.	Tangedu	Leguminosae	Shrub
84	*Senna occidentalis* (L.) Link	Kasintha	Leguminosae	Shrub
85	*Solanum pubescens*Willd.	Uchintha	Solanaceae	Shrub
86	*Solanum surattense* Burm. f.	Nela vakudu	Solanaceae	Shrub
87*	*Xanthium strumarium* L.	Marula-Mathangi	Asteraceae	Shrub
88*	*Ziziphus oenopolia* (L.) Mill.	Parimi	Rhamnaceae	Shrub
89	*Azolla pinnata subsp. africana* (Desv.)		Salviniaceae	Hydrophyte
90*	*Eichornia crassipes* Solms		Pontederiaceae	Hydrophyte
91*	*Hydrilla Rich.*		Hydrocharitaceae	Hydrophyte
92*	*Ipomoea aquatica*	Thooti Koora	Convolvulaceae	Hydrophyte
93*	*Lemna minor* Hegelm.		Araceae	Hydrophyte
94	*Limnophila heterophylla* R. Br.		Plantaginaceae	Hydrophyte
95	*Typha angustata*	Jammu	Typhaceae	Hydrophyte
96*	*Acalypha indica L.*		Euphorbiaceae	Herb
97*	*Achyranthes aspera L*	Uttareni	Amaranthaceae	Herb
98	*Aerva lanata* (L.) Juss	Thelaga pindi	Amaranthaceae	Herb
99*	*Aeschynomene aspera L*	Neeti jeeluga	Leguminosae	Herb
100*	*Ageratum conyzoides* (L.) L.	Vasavi	Asteraceae	Herb
101	*Aloe vera*	Kithanara	Tiliaceae	Herb
102	*Alternanthera sessilis* (L.) R.Br. ex DC.	Ponagantiaku	Amaranthaceae	Herb
103*	*Amaranthus spinosus L.*	Mulla thotakoora	Amaranthaceae	Herb
104*	*Amaranthus viridis L.*	Chilakathotakoora	Amaranthaceae	Herb
105*	*Andrographis echioides*	Chalavala puri kada	Acanthaceae	Herb
106*	*Argemone mexicana L.*	Brahmadandi	Papaveraceae	Herb
107	*Asparagus racemosus*	Pilliteegalu	Asperagaceae	Herb
108	*Barleria prionitis L.*	Pachagorinta	Acanthaceae	Herb
109	*Blumea mollis* (D. Don) Merr.	Kukkapogaku	Asteraceae	Herb
110*	*Boerhavia diffusa L.*	Atikimamidi	Nyctaginaceae	Herb
111*	*Borreria hispida* Spruce ex K.Schum.		Rubiaceae	Herb
112*	*Catharanthus roseus* (L.) G.Don	Billaganneru	Apocynaceae	Herb
113	*Celosia virgata Jacq.*	Guruga	Amaranthaceae	Herb
114	*Cleome aspera* J.König ex DC		Cleomaceae	Herb
115*	*Cleome viscosa L.*	Kukka vomintha	Cleomaceae	Herb
116*	*Crotalaria juncea L*	Janumu	Leguminosae	Herb
117	*Croton bonplandianus* Baill.	Vana mokka	Euphorbiaceae	Herb
118	*Desmodium dichotomum* (Willd.) DC.		Leguminosae	Herb

119*	*Eclipta alba (L.) Hassk.*	Guntagalagara	Asteraceae	Herb
120	*Euphorbia hirta L.*	Nanubalu	Euphorbiaceae	Herb
121*	*Evolvulus alsinoides* (L.) L		Convolvulaceae	Herb
122*	*Gomphrena serrata L.*	Tella bendumalli	Amaranthaceae	Herb
123*	*Indigofera hirsuta L.*	Kolapattitulu	Leguminosae	Herb
124	*Indigofera linnaei Ali*		Leguminosae	Herb
125*	*Justicia procumbens L.*		Acanthaceae	Herb
126	*Leucas aspera*	Tummi	Lamiaceae	Herb
127*	*Ludwigia perennis L.*	Lavangakaya mokka	Onagraceae	Herb
128	*Mimosa pudica*	Atthi pathi	Leguminosae	Herb
129	*Mollugo cerviana* (L.) Ser.		Molluginaceae	Herb
130	*Ocimum canum Sims*	Kukka Tulasi	Lamiaceae	Herb
131*	*Oldenlandia umbellata L.*	Chiru veru	Rubiaceae	Herb
132*	*Oxalis corniculata*	Indian Sorrel	Oxalidaceae	Herb
133	*Parthenium hysterophorus L.*	Vayyaribhama	Asteraceae	Herb
134*	*Pavonia zeylanica* Cav.	Karubenda	Malvaceae	Herb
135	*Phyllanthus amanus*	Nela Usiri	Euphorbiaceae	Herb
136*	*Phyllanthus maderaspatensis L.*		Phyllanthaceae	Herb
137*	*Plumbago zeylanica L*	Agnimaata	Plumbaginaceae	Herb
138	*Portulaca oleracea L.*	Pappu Kura	Portulacaceae	Herb
139*	*Sesuvium portulacastrum* (L.) L.	Thikka Kura	Aizoaceae	Herb
140	*Sida acuta Burm.f.*	Medabirusaku	Malvaceae	Herb
141	*Sida cordifolia L.*	Chiru Benda	Malvaceae	Herb
142*	*Sonchus oleraceus* (L.) L.		Compositae	Herb
143*	*Sphaeranthus indicus L.*	Bodasaramu	Asteraceae	Herb
144	*Tephrosia purpurea* (L.) Pers.	Vempali	Leguminosae	Herb
145*	*Tribulus terrestris L*		Zygophyllaceae	Herb
146	*Tridax procumbens (L.) L.*	Gaddichamanthi	Asteraceae	Herb
147*	*Triumfetta pentandra* A.Rich.	Chirusitrika	Malvaceae	Herb
148*	*Urena lobata L.*	Pedda benda	Malvaceae	Herb
149	*Vanda tessellata*	Kodikalla chettu	Orchidaceae	Herb
150*	*Vernonia cinerea* (L.) Less.		Compositae	Herb
151	*Waltheria indica L.*	Nalla Benda	Malvaceae	Herb
152	*Ziziphus nummularia*	Nela regu	Rhamnaceae	Herb
153*	*Brachiaria eruciformis*		Poaceae	Grass
154*	*Cynodon dactylon*	Garika	Poaceae	Grass
155*	*Cyperus castaneus*		Poaceae	Grass
156*	*Cyperus flavidus*		Cyperaceae	Grass
157*	*Cyperus rotundus L.*		Cyperaceae	Grass
158	*Digitaria ciliaris*		Poaceae	Grass

159*	*Eragrostis tenella*		Poaceae	Grass
160*	*Zizania latifolia*		Poaceae	Grass
161	*Abrus precatorius L.*	Gurivinda	Leguminosae	Climber
162	*Asparagus racemosus* Willd.	Pilli Gaddalu	Asparagaceae	Climber
163	*Cissus quadrangularis L.*	Nalleru	Vitaceae	Climber
164	*Clitoria ternatea L.*	Sanku-Pushpamu	Leguminosae	Climber
165	*Cuscuta reflexa* Roxb.		Convolvulaceae	Climber
167	*Dioscorea pentaphylla*	Adavi gunusuthega	Dioscoreaceae	Climber
168	*Ipomoea macrantha*		Convolvulaceae	Climber
169	*Ipomoea nil* (L.) Roth.		Convolvulaceae	Climber
170*	*Ipomoea obscura* (L.) Ker Gawl.		Convolvulaceae	Climber
171	*Pergularia daemia* (Forssk.) Chiov.	Dustapu-Teega	Apocynaceae	Climber
172*	*Rivea hypocrateriformis* Choisy.	Bodditeega	Convolvulaceae	Climber

Seconary data Source: Forest department Working plan data (2004-2014), Hyderabad circle, Telangana

* indicates that data is collected from Secondary source

LIST OF FAUNA & THEIR CONSERVATION STATUS

Table 9. .Checklist of Mammalian species in the Study Area (* indicates Pirmary data)

Scientific Name	Common Name	WPA Status	IUCN
Canis aureus	Jackal	Schedule II	LC
Sus scrofa	Wild pig	Schedule III	LC
Felis chaus	Jungle cat	Schedule II	LC
Semnopithecus entellus	Deccan Hanuman Langur	Part-II of Sch-II	LC
Macaca mulatta	Macaque Rhesus	Part-I of Sch-II	LC
Semnopithecus entellus	Grey lungur	Part-I of Sch-II	LC
Herpestes edwardsii	Indian grey Mongoose	Part II of Schedule II	LC
Bendicota bengalensis	Indian mole rat	Schedule V	LC
Mus musculus	House Mouse	Schedule V	LC
Ananthana ellioti	Tree shrew	Schedule V	LC
Rattus rattus	House rat	Schedule V	LC
Bendicota indica	Bandicoot rat	Schedule V	LC
Mus booduga	Little Indian Field mouse	Schedule V	LC
Cynopterus sphinx	Short-Nosed Fruit Bat	Schedule V	LC
Rousettus leschenaulti	Fruit bat	Schedule V	NT
Pipistrellus coromandra	Indian Pipistrelle	Schedule V	LC
Rhinopoma hardwickii	Lesser Mouse-Tailed Bat	Schedule V	LC
Lepus nigricollis	Black-naped Hare	Schedule IV	LC
Funambulus palmarum	Three striped palm squirrel	Schedule IV	LC

IUCN: International Union for Conservation of Nature and Natural Resources;

EX: Extinct; CR: Critically Endangered; EN: Endangered; VU: Vulnerable; NT: Near Threatened; LC: Least Concern; DD: Data Deficient. IW(P)A: Indian Wildlife (Protection) Act, 1972.

Source:

- Working plan of Ranga Reddy District Vol II (Telangana State Forest Department)
- Vivek Menon (2014), *Indian Mammals: A Field Guide.* Hachette Book Publishing India Pvt. Ltd., Gurgaon, India, pp 1-522;
- IUCN (2015). *The IUCN Red List of Threatened Species.* Version 2015-4;

List of Bird species :

Scientific Name	Common Name	IUCN Status	IWPA (1972) Status
Phalacrocorax niger	Little cormorant	LC	Sch-IV
Ardea cinerea	Grey heron	LC	Sch-IV
Ardeola grayii	Pond heron	LC	Sch-IV
Bubulcus ibis	Cattle egret	LC	Sch-IV
Egretta garzetta	Little egret	LC	Sch-IV
Ixobrychus cinnamomeus	Chestnut bittern	LC	Sch-IV
Pseudibis papillosa	Black ibis	LC	Sch-IV
Porphyrio porphyrio	Purple moorhen	LC	Sch-IV
Fulica atra	Coot	LC	Sch-IV
Vanellus indicus	Red wattled lapwing	LC	Sch-IV
Strptopelia chinensis	Spotted dove	LC	Sch-IV
Psittacula cyanocepahala	Blossomheaded parakeet	LC	Sch-IV
Eudynamis scolopacea	Koel	LC	Sch-IV
Athene brama	Spotted owlet	LC	Sch-IV
Apus affinis	House swift	LC	Sch-IV
Cypsiurus parvus	Palm swift	LC	Sch-IV
Ceryle rudis	Lesser Pied kingfisher	LC	Sch-IV
Merops leschenaultii	Chestnutheaded bee-eater	LC	Sch-IV
Merops philippinus	Blue tailed bee-eater	LC	Sch-IV
Merops orientalis	Small green bee-eater	LC	Sch-IV
Coracias benghalensis	Indian roller	LC	Sch-IV
Megalaima viridis	Small green barbet	LC	Sch-IV
Megalaima haemacephala	Crimson breasted barbet	LC	Sch-IV
Pitta brachyura	Indian pitta	LC	Sch-IV
Ermeopterix grisea	Ashycrowned finch-lark	LC	Sch-IV
Hirundo concolor	Dusky crag martin	LC	Sch-IV
Hirundo rustica	Eastern swallow	LC	Sch-IV
Dicrurus adsimilis	Black drongo	LC	Sch-IV
Dicrurus caerulescens	Whitebellied drongo	LC	Sch-IV
Dicrurus paradiseus	Greater racket-tailed drongo	LC	Sch-IV
Artamus fuscus	Ashy swallow-shrike	LC	Sch-IV
Sturnus malabaricus	Greyheaded myna	LC	Sch-IV
Sturnus pagodarum	Brahminy myna	LC	Sch-IV
Acridotheres tristis	Common myna	LC	Sch-IV
Corvus splendens	House crow	LC	Sch-IV
Corvus macrorhynchos	Jungle crow	LC	Sch-IV

Scientific Name	Common Name	IUCN Status	IWPA (1972) Status
Pericrocotus cinnamomeus	Small minivet	LC	Sch-IV
Pycnonotus cafer	Redvented bulbul	LC	Sch-IV
Turdoides affinis	Whiteheaded babbler	LC	Sch-IV
Copsychus saularis	Magpie-Robin	LC	Sch-IV
Saxicoloides fulicata	Indian robin	LC	Sch-IV
Monticola solitarius	Blue rock thrush	LC	Sch-IV
Zoothera citrina	White-throated ground thrush	LC	Sch-IV
Turdus merula	Blackbird	LC	Sch-IV
Parus major	Grey tit	LC	Sch-IV
Parus xanthogenys	Yellowcheeked tit	LC	Sch-IV
Anthus hodgsoni	Indian tree pipit	LC	Sch-IV
Anthus trivialis	Tree pipit	LC	Sch-IV
Motacilla flava	Yellow wagtail	LC	Sch-IV
Dicaeum agile	Thickbilled flowerpecker	LC	Sch-IV
Dicaeum erythrorhynchos	Tickell's flowerpecker	LC	Sch-IV
Nectarinia zeylonica	Purplerumped sunbird	LC	Sch-IV
Nectarinia asiatica	Purple sunbird	LC	Sch-IV
Zosterops palpebrosa	White-eye	LC	Sch-IV
Passer domesticus	House sparrow	LC	Sch-IV
Ploceus philippinus	Baya	LC	Sch-IV
Ploceus manyar	Streaked weaver bird	LC	Sch-IV
Lonchura punctulata	Spotted munia	LC	Sch-IV
Lonchura malacca	Blackheaded munia	LC	Sch-IV
Anas poecilorhyncha	Spot-billed Duck	LC	Sch-IV

*Status assigned by the IUCN, where – CR – Critically Endangered; EN – Endangered; LC – Least Concern; NT – Near Threatened; VU – Vulnerable, DA – Data Deficient, NE – Not Evaluated, R : Resident; RM : Resident Migratory; M: Migratory.

Reptiles

Scientific Name	Common Name	IUCN	IWPA
Bungarus caeruleus	Krait		Not listed
Dendrelaphis tristis	Common Tree Snake	LC	
Echis carinatus	Saw scaled wiper		
Eryx conicus	Russells earth boa		
Eryx johii	Johns earth boa		
Lycodon aulicus	Common wolf snake		

Naja naja	Indian Cobra	LC	Sch- II
Ptyas mucosus	Common Rat snake	LC	Sch- II
Trimeresurus gramineus	Green pit viper	LC	Sch- IV
Hemidactylus flaviviridis	North house gecko		
Cyrtodactylus kacchensis	Black rock gecko		
Hemimidactylus brooki	House gecko	LC	
Vipera russelli	Russel Viper	LR	Sch- II
Calotes rouxi	Forest Calottes	LC	
Calotes versicolor	Common garden lizard	LC	
Ophisops microlepis	Skink		
Mabuya carinata	Common Skink	LC	
Chamaeleon zelanicus	Chameleon	VU	Sch- II

Amphibians

Family	Species	Common name	IUCN status	C I T E S Appendix	IWPA (1972) Status
Bufonidae	*Duttaphrynus stomaticus Lüken*	Marbled toad	LC	Not Listed	Schedule IV
Bufonidae	*Duttaphrynus melanostictus* Schneider	Common Indian toad	LC	Not Listed	Schedule IV
Microhylidae	*Microhyla ornata* (Dumėril & Bibron)	Ornate narrow mouthed Frog	LC	Not Listed	Schedule IV
Dicroglossidae	*Hoplobatrachus tigerinus* (Daudin)	Indian bull frog	LC	II	Schedule IV
Dicroglossidae	*Euphlyctis hexadactylus* (Lesson)	Indian pond frog	LC	Not Listed	Schedule IV
Dicroglossidae	*Sphaerotheca breviceps* (Schneider)	Indian burrowing frog	LC	Not Listed	Schedule IV
Dicroglossidae	*Euphlyctis cyanophlyctis* (Schneider)	Skittering frog	LC	II	Schedule IV

Butterflies

S. No.	Scientific Name	Common Name	Status
	Family – Nymphalidae		
1	*Acraea violae*	Tawny Coster	C

2	*Danaus chrysippus chrysippus*	Plain Tiger	VC
3	*Danaus genutia genutia*	Striped Tiger	C
4	*Precis almana almana*	Peacock Pansy	C
5	*Precis hierta hierta*	Yellow Pansy	VC
	Family -Lycaenidae		
6	*Castalius rosimon rosimon*	Common Pierrot	Schedule I of Part IV
7	*Chilades laius*	Lime Blue	VC
8	*Freyeria trochylus*	Grass Jewel	VC
9	*Tarucus nara*	Rounded Pierrot	VC
	Family -Pieridae		
10	*Colotis eucharis eucharis*	Plain Orange Tip	C
11	*Ixias pyrene sesia*	Yellow Orange Tip	VC
12	*Catopsilia pomona*	Common Emigrant	VC
13	*Eurema hecabe simulata*	Common Grass Yellow	VC
	Family -Hesperiidae		
14	*Borbo bevani*	Bevan's Swift	R
	Family -Papilionidae		
15	*Papilio demoleus*	Lime Butterfly	UC
16	*Papilio polytes stichius*	Common Mormon	C